

**DETERMINANTS OF AGRICULTURAL RISK MANAGEMENT BEHAVIOUR
OF CROP FARMERS IN NIGERIA**

BY

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MATRIC NO. 125113

**A THESIS IN THE DEPARTMENT OF AGRICULTURAL EXTENSION
AND RURAL DEVELOPMENT**

SUBMITTED TO THE

**FACULTY OF AGRICULTURE AND FORESTRY IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE**

DEGREE OF DOCTOR OF PHILOSOPHY

OF THE

UNIVERSITY OF IBADAN, IBADAN

APRIL 2014

DEDICATION

This work is dedicated to Allah (SWT), the One;

....Who causes to grow for mankind the crops, the olives, the date palms and every kind of fruit.

....Who Alone knows the unseen (such as the fluctuations in weather pattern).

And to the love and sacrifices of my inestimable father- Alhaji Abdulfattah Abidoye Olajide.

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ABSTRACT

Agricultural risks constitute a fundamental challenge in Nigeria, leading to low productivity among farmers. Farmers risk management behaviour determines the extent to which they overcome risk types. Information on crop farmers' risk management behaviour in Nigeria is however scanty. Therefore determinants of agricultural risk management behaviour of crop farmers in Nigeria were investigated.

Multistage sampling technique was used. Of the agro-ecological zones, Coastal, Rainforest and Guinea savannah were randomly selected. Thereafter, 10% of the states in the zones (Lagos, Osun and Niger) and 10% of the Local Governments Areas (LGAs) in the states were selected. Two communities were selected from each of the LGAs and 15% of crop farmers were chosen in the selected communities to give 323 crop farmers. Interview schedule was used to collect data on respondents' risks types, risk exposure levels and risk management strategies. Indices were used to categorise farmers on their risk types (production, marketing, financial and social) and risk behaviour (superior, active, di-function, mono-function and part-time risk managers). Data were analysed using descriptive statistics, chi-square, Pearson Product Moment Correlation, ANOVA and multinomial logistic regression at $p=0.05$.

Most (90.0%) respondents were males, married (89.7%), and had at least primary school education (62.3%) with farm sizes of less than 5 hectares (72.3%). Age and years of farming experience were 53.2 ± 10.5 and 28.3 ± 12.1 years respectively. Majority (94.2%) identified inadequate cash-flow, pests and diseases (91.3%), ill-health of farmer/farm employee (89.0%) and volatility in output price (85.5%) as types of agricultural risks. Respondents were more vulnerable to production (9.85) and financial (9.84) risks. Majority (81.3%) were moderately or highly exposed to agricultural risks. Risk management strategies highly utilised were reducing leverage (2.94), maintaining good relations with contracting partners (2.73), use of fertilizers (2.65) and use of improved seedlings (2.57), while 73.9% of the farmers that had crop insurance coverage affirmed that it was effective in managing risks. Use of risk management strategies was low for 47.1%, with marketing strategies being the least (1.17) utilised. Superior agricultural risk managers accounted for 14.2%; active (26.8%); di-function (33.2%); mono-function (21.9%) and part-timers (3.9%), with the coastal zone having the highest percentage of superior (19.0%) and active (43.1%) risk managers. There were significant relationships between level of risk management and each of sex, marital status, educational level and farm size. While the Guinea savannah zone had the highest level (259.58) of agricultural risk exposure, the coastal zone had the highest level (75.89) of

agricultural risk management. Significant predictors of agricultural risk management behaviour were farm size, organization membership and risk exposure level for mono-function and active managers. Di-function and superior managers were significantly predicted by farm size and risk exposure level respectively.

Crop farmers in the zones encountered more of production and financial risks and lacked adequate risk management strategies. Their low level of insurance coverage indicated that factors other than awareness determined participation in insurance. Crop farmers should utilise more risk management strategies in order to reduce their risk exposure levels.

Keywords: Agricultural risks, Crop farmers', risk management, Agricultural risk management behaviour

Word count: 490

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ACKNOWLEDGEMENT

All praises and adorations belong to Allah the Bestowal of knowledge for making this academic pursuit a success. May He shower His blessings on the best of mankind Muhammad (SAW) and all his followers till the day of judgement.

My deep appreciation goes to my supervisor Dr L. A. Akinbile for his tutoring, patience and encouragement during the course of this research. Indeed he has shown me that he is not just my teacher but my mentor. May Allah in His infinite mercy, guide, guard and grant him, His blessings. I appreciate my Head of Department, Prof A. A. Ladele for his fatherly role towards the completion of this work. Special thanks to other members of my supervisory committee; Dr K. K. Salman and Dr O. B. Oyesola for their advice and commitment. I also acknowledge the interest and support of other lecturers in the department: Prof A. E. Adekoya, Drs; J. O. Oladeji, O. T. Yekinni and B. R. Olajide for their constructive comments.

To my darling husband of inestimable value- Muhammad Adebisi (Ifemi), I cannot have wished for anything more than the bliss he gives me. Thank you for your support in all manners. May Allah grant him bliss in both lives. To my children; Labeedah, Abdallah and Habeebullah, thank you for your support (including turning my laptop into your toy). May you all be blessed.

To my wonderful mothers- Alhaja Sinot Olajide and Alhaja Fawziyah Adedamola; thank you for your prayers, affection and time (most especially the nannies I turned you to).

Special thanks to my siblings- Abdulwaheed and Baseerah; Faheed and Lateefah; Abdulmajeed and Baseerah; Kehinde and Risqat; Abdulhakeem and Halimah; Moshood and Eniola; Ibrahim and Aisha. And the Abdulfattah Gbadamosi family, the Ojularis, the Shofunlayos; they have all been very supportive and I am glad to say we finally realised our dream. Here I cannot but remember one of my mentors; the late Dr Olukade for his words of encouragement. He was one of those special people that believed in me and encouraged me to pursue my Ph.D. I wish him Allah's bliss in his grave.

Dr Afusat Jagun Hassan, I will always appreciate you, as you laid the first step in getting this degree. Special thanks too to my friends (Dr Sidiqat Aderinoye-Abdulwahab; Mahrufah Yusuf-Oshoala; Kawthar Alabi Adeniyi; Simiat Uthman; Aisha Hassan; Saidat Shonoiki; Hasanah Ajani; Bola Osunwole; Victor Chibuzor Umunakwe and Felix Ighodo) for their support. May we always bring happiness to one another.

Thanks also to Mahruf Aderemi, Sheyi Olukayode, Mayowa Omotosho, Tunde Adedamola and Daud Balogun for their moral support during my fieldwork and post data analysis.

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CERTIFICATION

I certify that this research work was carried out under my supervision by Miss Faosiyat Oyeyemi Olajide in the Department of Agricultural Extension and Rural Development, University of Ibadan, Nigeria.

Date

Dr L. A. Akinbile, B.Sc, M.Sc, Ph.D (Ibadan) Nigeria

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CHAPTER ONE

INTRODUCTION

1.1 1.1 Background to the study

Agriculture serves as the foundation of the economy in many developing countries, as it is the prime source of income for most families and businesses. In Nigeria in spite of the dominant role of the petroleum sector, agriculture contributes a high share of the GDP and also serves as the largest employer of labour (Alegieuno, 2010). Although, agriculture dominates major economic policies in many countries, Morales *et al* (2008) observed that it is also considered as one of the most vulnerable sectors of any economy. This is because agricultural production takes place in an environment characterised by high levels of risks due to changing biophysical, economic, political and institutional conditions (Chong 2005; Ibitayo, 2006), and these conditions are often beyond the control of agricultural producers (Mishra & Uematsus, 2011). Any farm production decision plan is typically associated with several potential outcomes. This means that due to complexities of physical and economic systems, the outcomes of farmers' production decisions and actions are uncertain. As a result of this, many possible outcomes are usually associated with a single action or production plan. According to Olson (2004), agricultural risks stem from five basic sources:

1. Production risks: these refer to variations in crop yields/livestock production due to weather conditions (such as excessive rainfall and drought), diseases and pests, seed/breed quality and inefficient production techniques. For instance, with regards to weather conditions, Africa is one of the most vulnerable continents to climate variability because of multiple stresses and low adaptive capacity. This variability can distort crop calendar and change the distribution of animal diseases and parasites, thereby threatening food production and security (Anuforum, 2009).
2. Marketing (Price) risks: these are related to the variations in commodity prices and quantities that can be marketed as a result of increases in supply, changed demand or loss of marketing power due to small size of farm sellers relative to buyers. For example, price fluctuations due to oversupply (glut) of farm products (such as crops) and marketing difficulties often lead to financial losses, or even bankruptcy on the part of farmers. Marketing risks also include fluctuation in input costs, inefficient storage and fluctuation in transporting costs of farm produce.
3. Financial risks: these relate to farmers' access to funds and their ability to pay bills when due. Financial risks also include variations in interest rates of borrowed funds and inability

of farmers to pay back borrowed funds (default risk) due to a shortage in liquidity. For example, unexpected changes may occur in access to credit or other sources of income and this affects the financial viability of the farm in terms of cash-flow.

4. Legal and environmental risks: these relate to changes in government regulations on environment and farming practices and the possibility that lawsuits may be initiated against the farmer/farm by other businesses or individuals. For example, changes in government policies on food safety and environmental practices such as regulations on use of pesticides and herbicides may impact on farmers' production decisions. Changes in government regulations on tax provisions and payment also create legal risks for farmers.
5. Human Resources (Social) risks: these refer to the possibility that family or farm labourers/employees may not be available to provide labour or management as a result of breach in contracts, disability, accident, sickness or death. Social risks also include loss in yield due to theft and contracting risks. Occurrence of war or conflict around farming area may also distort farming operations due to insecurity.

With this diversity in risks sources, farmers need to manage their risks effectively in order to withstand adverse outcome and to avoid threatening the existence of an enterprise as the base for income generation (Hardaker *et al*, 1997). Risk management is therefore an essential aspect of the farming business (Salimonu & Falusi, 2009). According to Organisation for Economic, Cooperation and Development (OECD, 2009), risk management refers to the system of measures/strategies by individuals and organizations that contribute to reducing, controlling and regulating risks. These strategies start with decisions on the farm/household, on the set of outputs to be produced, the allocation of farm resources, the use of other inputs and techniques as well as the diversification of activities on and off-farm. As observed by Mojarradi *et al* (2008), risk management strategies attempt to address risk problems prior to the occurrence of the potential harming event (ex-ante). These strategies can either be formal or informal (Cervantes-Godoy *et al*, 2013).

Ex-ante informal strategies are arrangements that involve individuals/households or groups such as communities or villages, while ex-ante formal strategies are market-based activities and publicly provided mechanisms (World Bank, 2001). Ex-ante informal strategies include: use of improved and resistant seedlings, avoidance of highly risky crops, pests control, irrigation, using farmers' cooperative, sequential marketing, diversification of income sources and enterprise diversification. Diversification of income sources occurs when a farmer does not rely entirely on income derived from farming only. This implies that the farmer (or his/her spouse or other family members) has non-farm income source(s).

Diversification of enterprises refers to the production of two or more crops or livestock enterprises simultaneously by a farmer. Sequential marketing involves gradual release of a commodity into the market for sale, instead of dumping the entire quantity at once to depress market price, while cooperative marketing agreement is a way of sharing market risks with others and increasing marketing power to source more favourable prices.

Ex-ante formal strategies include: forward contracts, commodity exchange/future market, and agricultural insurance. Forward contracting is a mechanism through which farmers agree with a buyer to deliver a proposed quantity of a commodity at an agreed price. The principal benefits of forward contracts are helping farmers reduce price risk and stabilising their income (Kingwell, 2000; Liddle, 2004). Commodity exchange is an exchange for buying and selling commodities for future delivery. Commodity exchanges are markets where raw or primary products are exchanged. A commodity exchange where future contracts are traded is also referred to as future market. Future markets/ commodity exchange markets are standardised in terms of contract terms and are traded in organised exchanges under rules and regulations (Larson et al, 1998). An example in Nigeria is the Abuja Securities and Commodity Exchange (ASCE). The ASCE is primarily involved with the trading of commodities such as maize, sorghum and millet. The Abuja Securities & Commodity Exchange (ASCE) was originally incorporated as a Stock Exchange on June 17, 1998, but it was converted to a commodity exchange on August 8, 2001. The conversion was due to the need for an alternative institutional arrangement that would manage the effect of price fluctuations in the marketing of agricultural produce after the abolishment of commodity Boards in 1986. The ASCE was therefore established to reduce the inherent risks in agricultural marketing. However, the ASCE is yet to achieve the purpose for which it was created, as a result of the dominance of the stock market and lack of proper understanding of how the commodity market works (This Day Live, 2012). In order to improve the operations of the exchange, Commodities Brokers Association of Nigeria (CBAN) was inaugurated in Jan 2014. CBAN is a crop of trained professionals who are to drive the operations of commodity exchanges in Nigeria. The Abuja Securities and Commodity Exchange has also concluded plans to set up a market information system for 12 commodity markets in the country. According to Abdurrahim (2014), the market information systems for the 12 major markets would be replicated in the 36 states in Nigeria so as to enable people get information about commodities prices in Nigeria, thus reducing farmers' level of exposure to marketing risks.

Farmers may also manage risks through insurance, which according to Olubiyo et al, (2009) is one of the best strategies to address farm risks. Njavro et al, (2007) also asserted that insurance is probably the best known risk pooling tool. In Nigeria, agricultural insurance has been implemented by the Federal Government through the Nigerian Agricultural Insurance Corporation (NAIC). The corporation was established to protect Nigerian farmers from the effects of natural hazards by introducing measures that ensure a prompt payment of appropriate indemnity (compensation) sufficient to keep the farmer in business after suffering a loss. Its primary mandate is to provide insurance cover to all categories of farmers namely: small, medium and large scale holders, either in groups or as individuals. The scheme was also subsidised by 50% by the Federal Government (NAIC, 2010). Kailiang and Wenjun (2007) opined that financial subsidy is necessary and crucial in implementing agricultural insurance.

As agricultural risk management is an essential task for farmers; one of the most fundamental and complex decision that a farmer has to make is the choice of a portfolio of risk management strategies which would provide the best income safety net for him/her. Farmers may therefore implement diverse risk management strategies in the context of their production plans, the available portfolio of financial, physical and human capital.

1.2 Statement of the problem

Food insecurity is a fundamental challenge in Nigeria (Abu, 2012); despite the fact that the Gross Domestic Product (GDP) growth of the country is largely driven by agriculture with the crop sub-sector contributing about 85% of the agricultural GDP (Eluhaiwe, 2008; Federal Ministry of Agriculture and Water Resources, 2008). This crisis has further been intensified by high level of subsistence farming in Nigeria (Olawepo, 2010; IFAD, 2012; Haliru, 2012), increasing population (Afolayan et al, 2010) and low agricultural productivity levels (Ajayeoba, 2010).

The low agricultural productivity level is a function of the multitude of risks farmers face (such as production, marketing, financial and social risks) and the extent to which they are able to manage risks (Rao and Bockel, 2008). Haile (2009) thus asserted that food insecurity is partly due to lack of appropriate risk management capacities in Nigeria. Accordingly, part of the key features of the new agricultural policy in Nigeria is the reduction of risks and uncertainties in agriculture. Therefore, investments in farm risks management are important channels in raising the nation's food security level.

An integral part of this investment is an assessment of farmers' perceptions and preferences with regards to agricultural risks (especially those pertaining to crop production) in the country. Moreover, as crop farmers' ability to gauge and manage risks adequately determine their success or otherwise, farmers need to utilise risk management strategies which according to Le and Cheong (2009) will enhance their ability to sustain their businesses. One notable risk management strategy is agricultural insurance (Sadati *et al*, 2010). However, as valuable as it is, Olson (2004) observed that few farmers usually utilise agricultural insurance schemes while Abdulmalik *et al* (2013) affirmed that there is a low level of participation in insurance activities in Nigeria. Hence, investigating the perceptions of farmers' on the effectiveness of crop insurance in managing farm risks cannot be overemphasised.

Given the importance risks play in investment and behavioural decisions of crop farmers; Kahan (2008) observed that farmers need to understand risks and have risk management skills to better anticipate problems and reduce consequences. OECD (2009), also posited that studies investigating sources of risks, perceived risk exposure and risk attitude will contribute to the efficient allocation of agricultural resources. In spite of the fundamental role of farmers' risk management behaviour on agricultural productivity and food security, Lien *et al* (2003) observed that little work has been done in practice to examine how farmers perceive risks and risk management. Understanding the determinants of farmers' production behaviour (such as their risk management behaviour) is therefore of primary concern (Mendola, 2007).

Furthermore, as farmers confront different situations (for example differences in agro-ecological zones or vegetations) their experience and preferences toward risks may have a major effect on decision-making in each given situation. For instance, in the case of production risk such as weather, coastal communities are more prone to floods, while those in the savannah are more prone to drought. Thus, with the highly diversified agro-ecological nature of Nigeria, it is essential to analyse farmers' risk perceptions based on their localities and how these variations influence their risk management behaviour.

In line with the foregoing, the study sought to provide answers to the following questions:

1. What are the types of agricultural risks perceived by crop farmers?
2. How do crop farmers perceive their level of risk exposure?
3. What attitude do crop farmers have towards agricultural risks?
4. What are the risk management strategies utilised by crop farmers?

5. How do crop farmers perceive effectiveness of agricultural insurance in managing risks?
6. At which level of risk management do crop farmers operate?
7. Which factors determine the risk management behaviour of farmers?

1.3 Objectives of the study

The general objective of the study was to identify the determinants of agricultural risk management behaviour of crop farmers in Nigeria. The specific objectives were to:

1. Identify the types of agricultural risks perceived by crop farmers in the study area.
2. Determine crop farmers' perception of their level of risk exposure.
3. Describe the attitude of crop farmers towards agricultural risks.
4. Describe the risk management strategies utilised by crop farmers in the study area.
5. Examine crop farmers' perception of the effectiveness of agricultural insurance in managing risks.
6. Determine crop farmers' level of agricultural risk management.
7. Identify the determinants of risk management behaviour of crop farmers.

1.4 Hypotheses of the study

The hypotheses of the study stated in null form are as follows:

1. There is no significant relationship between selected socioeconomic characteristics of crop farmers and their level of risk management.
2. There is no significant relationship between crop farmers' perceived level of risk exposure and their level of risk management.
3. There is no significant difference in crop farmers' perceived level of risk exposure across the three agro-ecological zones.
4. There is no significant relationship between crop farmers' attitude towards agricultural risks and their level of risk management.
5. There is no significant difference in crop farmers' attitude towards agricultural risks across the three agro-ecological zones.
6. There is no significant difference in crop farmers' level of risk management across the three agro-ecological zones.

1.5 Significance of the study

Given the variety of risks inherent in agricultural production, crop farmers' livelihood can only be guaranteed when effective and efficient strategies are formulated against possible losses and failures in production. Understanding agricultural risk is therefore a starting point to help farmers make good managerial decisions in situations of risks. According to Haile (2008), risk identification and assessment are ways of improving early warning systems and crises prevention. An assessment of crop farmers' risk exposure level would help in building the policy framework on risk management.

Efforts to understand the risk perceptions and preferences of farmers as well as the determinants of their risk management behaviour are also necessary in order to impact vigilance and establish level of awareness on available strategies. Moreover, researches on risks sources and strategies can be helpful in saving cost and time in extension activities.

Furthermore, strengthening effective risk management capabilities can help deal with the growing food crises in the country. For instance, knowing how farmers perceive agricultural insurance will provide policy makers and industry operators the necessary information on what to focus on in order to improve the adoption of agricultural insurance in Nigeria.

1.6 Delimitation of the study

This study focuses only on the production, marketing, financial and social sources of risks, because the legal/environmental sources of risks are not well developed in Nigeria.

1.7 Theoretical and conceptual definition of terms

Risk: the potential deviation between the expected and the real outcomes resulting from an economic decision (Székely & Pálinkás, 2009). It may also be defined as the chance of a bad outcome; the variability of outcomes; and the uncertainty of outcomes in farm activities.

Attitude towards risk: a chosen response to uncertainty that matters and it is influenced by perception (Hillson and Murray-Webster, 2005). Attitude to risk also refers to farmers' state of mind on those uncertainties that can affect their production.

Risk exposure level: the product of the severity (magnitude of loss) and the likelihood of occurrence of identified risks (PMI, 2004).

Risk Perceptions: these refer to perceived sources/types of risks as well as the risk exposure level of farmers.

Risk management: the system of measures/strategies by farmers aimed at reducing, controlling and regulating risks (OECD, 2009). Such measures include diversification of farm enterprise, pest control practices, forward pricing of inputs, cooperative marketing, crop insurance, maintaining adequate records, securing back up labour and maintaining good human relations with labourers and contacting partners.

Level of risk management: the extent of utilization or application of management practices or tools that reduce farm risks.

Risk management behaviour: farmers extent of utilization of risk management strategies based on the risk source. It is the farmers' level of risk management and is reflected in behavioural types. These behavioural types are superior risk managers, active risk managers, di-function risk managers, mono-function risk managers and part-time risk managers.

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section deals with the following subsections:

1. Concept of risk: definition of risks
2. Categorisation of agricultural risks: categories of agricultural risks according to different authors
3. Agricultural risk management: definition of risk management and methods of managing risks
4. Crop farming and risk management: examples of risk management strategies (based on the four sources of risks measured in the study) available to crop farmers.
5. Risk perception and risk exposure: concept of risk perception and risk exposure, methods of measuring perception, factors affecting risk perception ,calculating risk exposure level
6. Attitude towards agricultural risks: definition, methods of measuring risk attitude and types of risk attitude
7. Agricultural insurance: definition, types and advantages of index based over traditional insurance
8. The Nigerian Agricultural Insurance Corporation (NAIC): establishment and operations of the corporation
9. Review of literature on agricultural risk management studies: review on attitude to risks and effects of socioeconomic variables on attitude to risks, variables affecting risk perceptions and use of risk management strategies.

2.2 Concept of risk

Risk is the uncertainty of decision-makers with regards to future events, which is reflected in incomplete information and can result in economic losses or deviations from a-priori fixed target values (Mehr & Hedges, 1963). It may also be defined as the potential deviation between the expected and the real outcomes resulting from an economic decision (Székely & Pálinkás, 2009). According to PMI (2004), risk is an uncertain event or condition that could have a positive or negative effect on one or more objectives. In relation to agricultural production therefore, risk refers to the uncertainty with regards to the farming

environment, which can cause deviations in farm's profitability. Thus agricultural risk is connected with unpredictable circumstances which determine the final output, value and cost of any agricultural production process (Cervantes-Godoy *et al*, 2013). For instance, when aggregate crop yield changes sharply, farm prices can fluctuate substantially and farmers may realise returns that differ greatly from their expectations. This indicates that risks may lead to both positive and negative outcomes; however, a negative outcome has greater importance and is more considered by most decision makers because a negative outcome may result in serious adverse consequences thereby threatening the existence of an economic entity.

Risk and uncertainty are sometimes interchanged and while some scholars such as Knight (1921) made a distinction between the two (risk as known probabilities of future events and uncertainty as unknown probabilities of future event), others such as Moschini and Hennessy (2001) observed that this distinction is not very operative since there is widespread acceptance of probabilities as subjective beliefs. As observed by OECD (2009), there is no risk without some uncertainty and most uncertainties typically imply some levels of risks.

2.3 Categorisation of agricultural risks

Agriculture constitutes one of the most important sectors of the Nigerian economy as its contributions in terms of employment generation, gross domestic product (GDP) and foreign exchange cannot be underestimated. Although Nigerian agriculture is characterised by a highly diversified agro-ecological condition which makes the production of a wide range of agricultural products possible, smallholder farmers constitute the bulk of agricultural producers in the country. They are therefore an important group that requires attention. Increasing their productivity and incomes can thus make a substantial contribution to food security (Zhou, 2010; Apata *et al*, 2011). These small holders farmers usually operate under constrained conditions and these conditions may often be intensified by the diversity of risks inherent in agriculture. Nigerian farmers like farmers in other countries face a variety of risks; however the dominance of the crop sector in the nation's agricultural production suggests that the key risks will largely be characteristic of crop farming.

As highlighted by Wenner (2010), farmers are confronted with an array of risks that affect their financial returns and overall welfare. These agricultural risks have been categorised in several ways by authors. For example, Baquet *et al* (1997); White (2002), categorised agricultural risks into five basic sources;

- (1) **Production risk:** this is one of the typical features of agriculture (World Bank, 2005). It occurs as a result of the uncertain natural growth processes of crops and livestock. Agricultural producers cannot usually predict with certainty the quantity and quality of output their production process will yield, due to external factors such as weather, disease, pests, genetics, machinery efficiency, and the quality of inputs. For instance, unpredictable weather can expose farm households to significant production uncertainties and this can result in food insecurity. Production risks are often industry or enterprise specific. For example, while changes in soil fertility may affect a crop farmer, a poultry farmer would not be concerned with this risk. The diversity in agro-ecological conditions of Nigeria also shapes the prominence of certain risks in certain parts of the country, for example production risks such as floods and drought. The impact of climate change will also likely lead to increased severe weather conditions. As observed by Medugu (2009) Nigeria is one of the countries expected to be most affected by the impacts of climate change through sea level rise along her coast line, intensified desertification, erosion and flooding disasters and general land degradation. Also as global warming increases, agricultural adaptation to climate change will only be meaningful, if irrigated agriculture gains prominence. However as agricultural production in Nigeria is still predominantly rain-fed; it will particularly be vulnerable to the impacts of climate change. The change in weather conditions may also influence the occurrence of pests and diseases, which is feared by most farmers as one of the major risks with very huge potential production loss. Nigeria witnessed significant flooding lately in several parts of the country leading to substantial economic loss.
- (2) **Market or Price risk:** this refers to uncertainty about the prices farmers will receive for commodities or the prices they must pay for inputs due to the high volatility in the prices of agricultural commodities. As observed by Miller, Dobbins, Pritchett, Boehlje and Ehmke (2004), price uncertainty has always been a major consideration in farming, while farm commodity prices have fluctuated dramatically in recent years due to technological change which has made more of the inputs involved in production to be purchased. The nature of price risk varies significantly from commodity to commodity and it also depends on the consumers' ability to substitute products and on the extent of market integration- which is dependent on infrastructure and the types of markets available. Market risk also occurs when delivering farm produce to markets as farmers face huge losses when they are unable to deliver perishable farm products to the right market at the right time. This is a significant source of risk in many developing countries, as a result of

lack of infrastructures and well developed institutions. Price risks depend on the consumers' ability to substitute products and on the extent of market integration. Market integration is dependent on infrastructure and the types of markets available. According to Luke (2011), farmers are exposed to unpredictable competitive markets for inputs and outputs, while the high transportation and marketing costs in developing countries usually isolate local rural markets from national and international markets.

- (3) Financial risk: this occurs as a result of the method in which capital is acquired and financed and how farmers organize their businesses and acquire production assets. It reflects the farmer's ability to pay financial obligations. Financial risk has three basic components: the cost and availability of debt capital; the ability to meet cash flow needs in a timely manner and the ability to maintain and grow equity (Miller, 2008). When a farmer borrows money, the farmer creates an obligation to repay debt and because the debt has to be repaid within a certain period, financial resources are thereby diverted from farming activity. Cash flows are also important because of ongoing farm obligations, such as cash input costs, debt repayment and family living expense. As many agricultural production cycles extend over long periods, farmers must predict expenses they will only be able to recover after marketing their farm products. Other aspects of financial risks are; increasing interest rates, the prospect of loans being called by lenders, and restricted credit availability.
- (4) Institutional/ Legal/Environmental risks: these risks are generated by unforeseen changes in regulations that affect farmers' activities. Changes in government regulations and legal policies affect agricultural production and they can have significant impact on farmers' profitability. Examples of such government policies include; tax laws, regulations for chemical use, restrictions in conservation practices or land use. For instance, government's decision to limit imports of a certain crop will affect the crop's price. There is also growing concern globally over the impact of agriculture on the environment as well as the production of genetically modified organisms (GMO).
- (5) Social/Personal/ Human Resources risks: these refer to factors such as problems with human health or personal relationships that can affect the farm business. Accidents, illness, death, and divorce are examples of personal crisis that can threaten farm viability. Social risks may also be in the form of contracting risk; which refers to the reliability of contracting partners (Harwood *et al*, 1999). Social risks can also involve assets and this includes theft, fire, or loss or damage to equipment/ buildings/livestock.

According to Holzmann and Jorgensen (2001), agricultural risks can be classified in to six and these are: natural, health, social, economic, political and environmental. A summarised classification of agricultural risks has also been made by other authors. For example, Lehner (2002) classified agricultural risks into two:

- (1) Internal risks; these are risks which can be influenced by farmers. The sources of internal risks are located primarily within the farm and they can often be managed through internal measures, such as improved hygiene or financial management. Examples are equipment and financial risks.
- (2) External risks; these risks are beyond farmers' influence. They are derived from a farm's environment so the farmer has little (if any) control over them. Examples are market and political risks.

Based on the classification made by Huirne et al (2000); Székely and Palinkas (2009), agricultural risks are classified as either business risks (which includes production, market, personal and institutional risks) or financial risks (issues related to financing business operations). Lagerkvist (2005) also categorised agricultural risks into three categories:

- (1) Economic risks; these are risks related to exposure to an uncertain economic outcome of the farm business.
- (2) Social and personal risks; these are related to the social and personal context of the farmer and concern the retroactions to the farm business operation from that context.
- (3) Environmental risks; these refer to the dependence of agricultural production on the natural environment and their impact on the natural environment.

As explained by Boehlje (2002), an alternative taxonomy is to categorise risk as tactical/operational risk and strategic risk. Tactical risks are the traditional risks faced by farm and agribusiness firms and they can be categorised as business risk and financial risk. Business risk is the inherent uncertainty in the financial performance of the firm independent of the way it is financed; while financial risk is the added variability of net returns to owner's equity that results from the financial obligation associated with debt financing. Strategic risks focus on the sensitivity of the strategic direction and the ultimate value of a company to uncertainties in the business climate such as: political, government policy, macro-economic, social and natural contingencies. They also include industry dynamics encompassing input markets, product markets, competitive and technological uncertainties. As a result of availability of information to measure tactical risks as well as the availability of accepted

tools and techniques to transfer these risks to others (such as insurance), tactical risks are often easier to manage than strategic risks.

According to Hardaker *et al*, (2004), three major types of risk in farming can be identified; yield, price and transaction risks, while Ellis (1988), identified four types of risks: natural hazards (weather, pests and diseases), market fluctuations (of output prices), social uncertainty (due to differences over control of resources) and state actions and wars.

Nmadu *et al* (2012) described agricultural risks as exogenously-caused or endogenously-induced. Exogenous risks arise from extreme weather conditions or threats of disease and pest outbreaks and are independent of farmers' production decisions e.g. drought. Endogenous risk is incurred solely by farmers' production decisions e.g. a change in the quality of seedling used for production.

Risks can also be differentiated on their level of occurrence. Systemic risks are those risks that affect and are common to all farm households (such as price and weather risks). These risks occur when there is a high degree of correlation among individuals in the same region or country. Risks that are specific to a particular farmer such as local pest or disease infections are called idiosyncratic risks. Idiosyncratic risks are independent or uncorrelated with any other risks. Holzmann and Jorgensen (2001) summarised the systemic characteristic of risks as micro (idiosyncratic) meso (affecting a whole community) and macro (affecting a whole region or country). Risks can also be categorised based on their level of occurrence and magnitude of impact. Normal risks are those with high frequency of occurrence, but low damage. Catastrophic risks are events associated with low probability of occurrence (rare) leading to major and usually irreversible losses with potentially adverse impact (severity) on farm production. For example, arable farmers can be exposed to extreme weather events, such as excessive rainfall and drought, which may result in potential damage to crops resulting in heavy losses for farms. In between these two are medium risks and these are risks associated with a medium level of occurrence and medium impact. According to Ali and Kapoor (2008) the types of risks influence the ability and means used to manage and cope with the risks. In general, the types of risks faced by farmers depend on the type of farming systems, climate, policies and the institutional environment (Hazell & Norton, 1986). Boehlje *et al* (2005) concluded that the total risks farmers face is much more complex and pervasive than is often perceived.

2.4 Agricultural risk management

Although, risk may sometimes be inevitable, it is often manageable (Agriculture Outlook, 2000). Risk management involves choosing among alternatives for reducing risks that threaten the economic success of a farm business (Harwood et al, 1999). According to Székely and Palinkas, (2009), it is the range of strategies and instruments applied, to avoid or minimise losses and to utilise opportunities. Kostov and Lingard (2003) defined it as the process of simplifying the decision problem aimed at restructuring it in such a way that the risk is excluded. Risk management is therefore an essential tool for farmers to anticipate, avoid and react to shocks. For an individual farmer, risk management involves finding the preferred combination of activities that will reduce the effects of risks on his/her farm. The focus of risk management should be on risk that matters and this requires an evaluation of tradeoffs between changes in risk, expected returns and entrepreneurial freedom.

Hardaker et al (1997) characterised the process by which farmers arrive at risk management decisions and practices. The risk management process starts with the farmers acquiring knowledge of their own context. Then the risks are identified, analysed and assessed. After assessment, if action is deemed worthwhile, the farmer then selects the most suitable option/strategy for avoiding, preventing or managing the risks. The process is then continuously monitored.



Figure 1: Risk management process: Hardaker et al (1997)

Managers have a variety of mechanisms for managing risk and each method depends upon the nature of the risk involved. According to Miller et al (2004), four general methods for managing risk are: avoidance, reduction, assumption/retention, and transfer.

1. Avoidance: one strategy farmers can employ is to avoid specific risks by organizing the business so that certain types of risk are absent. Due to the financial conditions under which most farmers live, they often avoid activities that involve more risk but which frequently could bring more income gains. This inability to manage risk and accumulate and retain wealth can lead to a poverty trap (World Bank, 2001). For example, a farmer may decide not to select a particular agricultural enterprise due to its level of risk.
2. Reduction: this refers to the process of lowering the risks associated with the business venture. Farmers may reduce risk by diversifying across different agricultural enterprises.
3. Assumption/retention; this is the process of retaining or accepting risks with the objective that assuming this increased risk is to maintain, control and/or enhance overall profitability. Assumption may occur simply because the risks cannot be transferred. Risks can be borne by maintaining liquid assets so as to build the operations capacity to bear risk.
4. Transfer/ Shift: this occurs when one party lowers their risk by shifting that risk to someone else. It is often in exchange for a fee and the more risk that is shifted, the higher the cost. Examples are crop insurance and forward contracts.

Luke (2011) asserted that risk management strategies can be classified into two broad categories; ex-ante and ex-post risk management strategies. Farmers implement ex-ante strategies because of lack of mechanisms to cope with risks ex-post. Some of the strategies that are usually used include: irrigation, crop insurance, growing resistant varieties, forward contracting, income and enterprise diversification as well as increasing the political participation of farmers in decisions which affect their welfare and their future. Ex-post risk strategies are coping strategies once livelihoods are threatened. Ex-post strategies include: sale of productive assets such as livestock, re-deploying labour, using up food reserves on farm and drawing down on other savings and asset liquidation. Risk management may also be broadly classified as either on-farm measures or risk sharing strategies (European Commission, 2005). Strategies relating to on-farm measures include; selection of products benefitting from public intervention, diversification of enterprise and vertical integration. Risk sharing measures include; marketing and production contracts, off farm diversification and insurance. Hoogerveen *et al* (2005) also made a distinction between prevention and mitigation risk management strategies; while prevention strategies aim at reducing the probability of the risk occurring, mitigation strategies help to reduce the impact of a future risky event. According to Holzmann and Jogersen (2001), risk management strategies can be

based on arrangements made at different institutional levels: farm household or community arrangements, market based mechanisms and government policies.

In making risk management decisions, farmers consider and respond to a combination of external and internal factors, such as market access, the resources available to the farm household, attitude toward risk and perceptions of risk management strategies.

2.5 Crop farming and risk management

The risk management strategies utilised by crop farmers differ since risks and the willingness/ability to bear risks differ from farm to farm. Hence crop farmers may utilise a variety of risk management tools simultaneously. Some risk management strategies (based on the four sources of risks considered in this study) are discussed below.

2.5.1 Production risk management strategies

These strategies help farmers in reducing large losses in yields as a result of uncertain natural growth processes of crops that can be caused by fluctuations in weather, quality or quantity of input use.

- Diversification of enterprise; this refers to the production of two or more crop enterprises simultaneously by a farmer (Alimi & Ayanwale, 2005). Farmers' ability to mitigate risk by diversifying may to a certain extent allow farmers to adopt riskier high-return crops (Lanjouw & Lanjouw, 2001). Yield variability on the farm can be reduced by combining different production processes through diversification. It may include different crops, combinations of crops and livestock, different end points in the same production process or different variations in the same crop. Diversification entails that a favourable gain in one farm enterprise help cope with a loss in another farm enterprise. Depending on the farm's situation, however, the costs of diversifying may outweigh the benefits, as diversifying often requires specialized equipment; a broader range of managerial expertise and labour. Moreover the advantages of diversification may often be limited by resources, climatic conditions and market outlets.
- Flood Control; This can be through channelization or by having adequate drainage. This helps to reduce yield risks as a result of excessive rainfall
- Supplemental irrigation due to abnormal weather such as drought is another means to protect against variation in yield. This is especially important for crop farmers.

- Cultural practices; this can be used to reduce yield risk. Such practices include minimum soil tillage, crop rotation and shifting cultivation. These are practices that help to improve soil fertility.
- Excess machine capacity; this improves the rate at which farmers plant and harvest crops. By having such resources, the farmer can avoid delays at either planting or harvest that may reduce yield losses
- Other production management strategies include; use of improved and resistant seedlings/breeds, buying seedlings/birds/fingerlings from reputable sources, fertilizer application, consulting people with crop/poultry/aquaculture knowledge, pests control, use of new/well maintained machinery/equipment and avoidance of highly risky crops/using crops benefitting from public intervention for example cassava and cocoa.

2.5.2 Marketing risk management strategies

These strategies aim at minimising farmers' income by shifting marketing risks either by locking in prices, guaranteeing an outlet for farm products or by spreading risks across market types and time.

- Contracting; This is a relationship or co-ordination between farmers and buyers (e.g. agribusiness firms) where the characteristics of the product, such as price, quantity, quality, are set by the parties involved before the time of delivery (Cervantes-Godoy *et al* 2013). Contracting can reduce risk by guaranteeing prices, market outlets, or other terms of exchange in advance. There are two types of contracts; production contracts and marketing contracts. Production contracts are contracts that prescribe production processes to be used and/or specify who provides inputs. These contracts typically give the contractor (the buyer of the commodity) considerable control over the production process (Perry, 1997). They usually specify in detail the production inputs, the quality and quantity of a particular commodity that is to be supplied by the contractor. Firms usually enter into production contracts with farmers to ensure timeliness and quality of commodity deliveries, and to gain control over the methods used in the production process. Production contracting is also ideal when there is a high variability in supply. Contract production is common in the poultry and livestock industries. A major advantage for the farmer is that a favourable price/market is guaranteed for the output. However the disadvantage is that the farmer loses the opportunity of benefiting from upside price potential, since the sale of the product is fixed by conditions of the contract.

Likewise the farmer has a risk of losing his/her only sale outlet when the contract is terminated (EC, 2008). The loss of flexibility and profit opportunities in the market place is however offset by the cost of receiving a predictable cash flow. Marketing contracts; these are either verbal or written agreements between a buyer and a farmer that set a price and/or an outlet for a commodity before harvest or before the commodity is ready to be marketed (Perry, 1997). They are also referred to as forward contracts. The major difference between marketing and production contracts is that in marketing contracts, ownership of the commodity is generally retained by the farmer while the commodity is produced, management decisions (such as varieties/breeds, or input use and timing) are typically taken by the farmer. Forward contracting reduce price risk by allowing farmers to agree and be sure of the price they will sell their agricultural commodities in future before they are ready for disposal

- Vertical integration; a vertically integrated firm retains ownership or control of a commodity across two or more phases of production and/or marketing. This decreases risk associated with the quantity and quality of inputs - backward integration or outputs - forward integration. Vertical integration also diversifies profit sources across two or more production processes.
- Sequential marketing; this involves gradual release of the commodity for sale into the market instead of dumping the entire quantity at once to depress market price. Sequential marketing (spreading of sales) is possible if the agricultural product is either non-perishable or an effective and economic storage facility exists (Alimi & Ayanwale, 2005).
- Storage: this is a way of avoiding seasonally low prices. Storage is effective when the products are not perishable and there is a realistic expectation of a market price increase. However, stored commodities may deteriorate and may also be stolen.
- Cooperative marketing; this is a way of sharing market risks with others and increasing market power to source more favourable prices. Farmers can join a farmers' cooperative to achieve this.
- Direct sales: selling directly to final consumers can enhance profitability and reduce risks. Examples are farmers selling their farm products along roadsides or in markets.
- Forward contracts; a future contract is an agreement priced and entered on an exchange to trade at a specified future time a commodity or other asset with specified attributes (or in the case of cash settlement, an equivalent amount of money).

- Future markets/ Commodity exchange markets are standardised in terms of contract terms and are traded in organised exchanges under rules and regulations (Larson *et al*, 1998). They are usually for specific standardized products. In developing countries, access to futures market is low. An example in Nigeria is the Abuja Securities and Commodity Exchange (ASCE). The ASCE is primarily involved with the trading of commodities such as maize sorghum and millet. A commodity option gives the holder the right, without obligation, to buy or sell a futures contract at a specific price within a specified period of time, regardless of the market price of the future.
- Other marketing risk management strategies include; forward price of inputs, using and sharing marketing information with others and keeping adequate records of farm produce.

2.5.3 Financial risk management strategies

These strategies help farmers in reducing large losses or bankruptcy as a result of fluctuations in prices or income. They help to enhance the viability of the farm enterprise

- Diversification of income sources; diversification is an effective way of reducing income variability. This occurs when a farmer does not rely entirely on income derived from farming only. This implies that the farmer (or his/her spouse or other family members) has non-farm income source(s). Earning off-farm income is another strategy that farmers may use to mitigate the effects of agricultural risk on farm family household income. Diversification can ensure sufficient cash flow for meeting production costs, debt commitments, and family expenses. In fact, it may provide a more reliable stream of income than farm returns, although it can also increase the probability of stopping the farm enterprise.
- Liquidity; this involves the farmer's ability to generate cash quickly and efficiently in order to meet his or her financial obligations. Liquidity can be enhanced by holding cash, stored commodities, or other assets that can be converted to cash on short notice without incurring a major loss. Farmers may also hold liquid credit reserves by securing access to additional capital from lenders through an open line of credit.
- Reduced leverage; leveraging refers to the farmer's use of debt to finance farm operations. That is, the farmer makes use of the use of borrowed funds to help finance the farm business. Increasing the degree of leverage increases the likelihood that in a year of low farm returns the producer will be unable to meet his or her financial obligations, and this heightens the potential for bankruptcy. According to Harwood *et al* (1999), highly

leveraged farmers operate in an environment of greater financial risk than those who choose a low leveraged farm structure. The optimal amount of leverage depends on several factors, including farm profitability, the cost of credit, tolerance for risk, and the degree of uncertainty in income.

- Controlling family expenditure; in most subsistence farming households, household expenses usually interacts with farm income, hence farmers may reduce financial risk by controlling household expenditure.
- Membership of cooperatives; Farmers can also increase their access to credit by joining a cooperative.
- Marketing Cooperatives; joining a marketing cooperative provides the opportunity to benefit from volume sales or purchases. These benefits may be in form of enhanced prices or reduced costs.
- Crop insurance; the use of insurance involves the exchange of a fixed, relatively small payment (premium) for protection from uncertain, but potentially huge losses. The benefits of crop insurance are that it ensures a reliable level of cash flow and allows more flexibility in the farmers' marketing plans. Crop insurance helps farmers to survive disasters and it can also serve as collateral for operating loans, thereby enhancing farmers' access to credit. As observed by Hardaker *et al* (1997), the idea behind insurance is that of risk pooling, which involves combining the risks faced by a large number of individuals who contribute through premium payments to a common fund that is used to cover the losses incurred by any individual in the pool. Hence, insurance is more attractive to risk-averse farmers. Farmers should consider some critical factors when deciding whether or not to buy crop insurance. Such factors include: how much loss can the farmer withstand without insurance; what are the trade-offs between insurance costs and potential losses; what are the major sources of crop risk in the farmer's area and how often can the farmer have a disastrous or below average yield in a year.
- Monitoring financial ratios; ratios such as debt-to-asset, debt-to-equity, and asset turnover are important in monitoring overall financial performance. Trend monitoring also helps farmers to be able to predict future costs and prices
- Maintaining adequate records of financial transactions; information on farm transaction is critical in evaluating past performance and in planning for future accomplishments. This information is usually provided through farm records.

Other financial risk management strategies include: adjusting timing of capital expenses/keeping fixed cost low; making credit arrangement before production starts; maintaining credit reserves; controlling production costs; sharing information on risk management and leasing/renting farm equipment rather than buying.

2.5.4 Human/ personal risk management strategies

These strategies aim at minimizing the impact of social risks on crop farmers

- Developing good human relations with employees and contracting partners so as to improve motivation and reliability; Human resources are both a source of risk and an important part of risk management, because at the core of dealing with every risk lies people such as farm employees, customers and labourers.
- Buying personal insurance for employees as well as for the farmer.
- Securing emergency/backup labour in case of labour problems/shortages.
- Securing labour contracts and fixing labour price before production starts.
- Having backup equipment in case of emergencies
- Using cultural practices to reduce theft such as using scarecrow to scare off birds and using native medicine against thieves.
- Improving farm security by fencing farm or using guards.

Management of risk is an important activity for farmers worldwide and farmers manage risks through a continuous adaptive process, whereby decisions are made based on perceptions of the external environment, resources and the farmers' own attitudes and preferences (IFAD, 2000). Different farmers confront different situations, hence their experience and preferences toward risk have a major effect on decision-making (Nguyen *et al*, 2005). This means that in considering farm risks, the agro-ecological context, the production systems, the household types, farmers' goals, attitude towards risks, risk sources as well as the level of risk exposure are crucial. Therefore the management task facing farmers is to choose a combination of strategies that best suits the unique conditions of their particular farm and personal circumstances.

2.6 Risk perception and risk exposure

Farmers' risk-management decisions are usually influenced by their personal experience and subjective perceptions of a particular risk. According to Zinn (2009), from a realist perspective, risk is seen as a real threat.

Farmers risk perceptions can be measured directly or indirectly. In the direct method, risk perception can be measured with a questionnaire. With the aid of a Likert scale, farmers can quantify their subjective expected probability of a risk and the magnitude of loss if the risk occurs. However the direct method only estimates probability and outcomes in relative terms. In the indirect method, the measures of central tendency and variation are indirectly derived from probability distribution functions (Smidts, 1990). Difficulties in risk perception elicitation may however occur in catastrophe situations due to lack of data. When a farmer moves from events with considerable historical and scientific data to those where there is greater uncertainty and ambiguity, assessing risk perception may not be so easy. Moreover Boehlje (2002) affirmed that risk characteristics influence how the risk is perceived. Hence, different types of risk generate different reactions. According to Breukers *et al* (2009), a number of risk characteristics affect risk perceptions and these factors include:

- (1) Controllability; if risk management strategies are readily available, the risk is likely to be perceived as a threat and vice versa.
- (2) Familiarity; farmers may not have a higher perception of new risks than familiar risks due to lack of experience on new risks. New risks may thus be underestimated if farmers are not aware of them. According to Kunreuther (2002), decision-makers estimate the likelihood of an event by the ease with which they can imagine or recall past instances of the event and in cases where the information on an event is conspicuous, many people will tend to overestimate the probability of the event occurring. For instance, the farmer's subjective probability of flood or drought occurring characteristically increases if any of the two events has just recently occurred. Garvin (2001) corroborated this fact by stating that personal experience and memory influence the way people perceive risks. Familiarity can also be likened to the availability heuristic- which relates to the ease with which an instance is brought to mind. People tend to think that events are more probable if they can recall an incident of its occurrence.
- (3) Scale of impact; Risk perception may be higher for risks that have immediate consequences, long-term impacts or affect a large area, than for risks which consequences may not be immediate.

- (4) Personal damage; if people are personally affected by the consequences of the event related to the risk, they will perceive a higher risk than when the consequences are incurred by others.
- (5) Visibility; events that are difficult to imagine are often attached a lower probability of occurrence. Visibility can be likened with vividness- which refers to how concrete or imaginable an event is. Thus, Ogurtsov (2008) asserted that farmers are affected more strongly by vivid information than by pallid, abstract, or statistical information.
- (6) Socio-demographics; risk perception and decision-making vary considerably among farms as a result of differences in socio-demographic circumstances. For instance education can affect priorities of farmers, and thus their attitudes. It may also influence the level of understanding of a risk, which also affects risk perception. Women may also perceive risk differently from men. Likewise, age may also have influence on perceptions.
- (7) Farm characteristics; the technical farm structure (such as farm size, organisational structure of the farm and the presence of off-farm activities) determines the magnitude of possible consequences of the risk. Moreover, the financial position of a farm may also affect risk preference. For example, excess of resources leads to relaxation of controls and reduced fears of failure leading to high levels of risk taking. It may also affect farmers access to informational and educational resources related to agricultural risks. Psychological characteristics; for example as a result of bad past experiences farmers may be stimulated to take risk reducing measures. The managerial capabilities of the farmer may also risk perception and risk-management decisions.
- (8) Location of the farmer/farm; geographic location partly determines the activities and market circumstances of agricultural producers.
- (9) External sources of information; these can significantly influence farmers' decisions. Farmers are more likely to be influenced by expert opinion on topics which they lack knowledge on than on topics they believe they understand. They may also be selective in the evidence they will accept (Siegrist & Cvetovich, 2004).
- (10) Farmers' social network; farmers who have frequent social contacts with other farmers in their area are liable to experience some degree of dependency and are likely to account for the other's interests when taking decisions.
- (11) Absence/presence of safety measures; people adjust the riskiness of their behaviour/ attitude towards risks in the presence of safety measures.

As risk may be socially constructed, individual and group responses to risk may vary and may be influenced by societal culture.

Risk perception is a decision maker's assessment of the risk inherent in a particular situation. It therefore reflects the decision maker's interpretation of the likelihood of exposure to the risk. Hence, risk perception is a subjective statement of risk by decision-makers and it is a mental interpretation of risk, as the chance of a loss occurring and the magnitude of the loss. This means how often is a potentially harmful event going to occur and what are the consequences when it does occur.

Therefore, in measuring risks, farmers are usually more concerned with the probability of occurrence of adverse consequences and the ability of these consequences to disrupt business significantly. This can also be likened to their level of risk exposure level, since level of risk exposure is the product of likelihood of identified risks to occur and consequence of the identified risk (Zinn, 2009). Likelihood refers to the probability of the risk occurring and according to Briggeman *et al* (2004) it is the chance that a potential or exposure event will occur. For example the likelihood that drought could occur during the production period. Consequence refers to the severity or potential loss expected. For instance the impact of drought on crop yields, such as the level at which yield is reduced. A recent development in risk exposure level is risk score-carding.

According to Boehlje (2002) risk score-carding identifies the potential sources of risk for a particular business, to assess the severity of those risks, and to aggregate these scores into an overall risk assessment that can then be compared to a standard which discriminates acceptable from unacceptable risks. For each of the risk types identified under each risk category, the probability of occurrence and the magnitude of the potential consequences are evaluated on a scale. A pair of numbers can then assess each risk for a specific business. For example, if a crop farmer records a pair of numbers (such as 1, 3) for drought, this would indicate a ranking of 1 on the probability of occurrence scale and 3 on the potential consequence/ severity scale. This score coordinates can then be used to create a graphical synopsis of risk exposures of different types of risks.

Risk perception is important in understanding farmers' managerial decisions and behaviour. Another factor that plays an important role in understanding farmer's behaviour apart from risk perception is attitude towards risks.

2.7 Attitude towards agricultural risks

Given that agriculture is a risky business, an important factor in explaining farmers' risk management behaviour is their attitude towards risk. An attitude may be defined as a learned disposition to behave in a consistently favourable or unfavourable way with respect to a given object (Schiffman & Kanuk, 2000). Attitude to risk is a chosen response to uncertainty that matters and it is influenced by perception (Hillson & Murray-Webster, 2005). Risk attitude deals with a decision-maker's interpretation of a risk and how much the decision maker dislikes the outcomes resulting from the risk. According to Dillon and Hardaker (1993) attitude to risks refers to the extent to which a decision-maker is willing to face risk (risk preference) or seeks to avoid risk (risk aversion). Risk attitude therefore reflects the extent to which a decision maker generally or consistently dislikes or likes the risk content. Farmers' attitude to risk is important in understanding their behaviours as individuals' preferences influence a wide variety of risk-taking behaviour. For instance, Wencong *et al* (2006) asserted that a decision maker's risk preference (attitude towards risks) affects the type of agricultural activities and corresponding scales that he/she will select. They added that given a fixed amount of productive resources such as capital and arable land, the combination of production activities with the highest level of expected income/risk would be selected if the decision maker was a risk taker. Attitude towards risks is also a unique reflection of a person's personality and it is influenced by socioeconomic factors and life experiences (Bard & Barry, 2000).

As observed by Ajzen (2002), attitude is one of the considerations that guide human behaviour. Thus, attitude to risks influences how a farmer perceives risks and manages his business. Ascertaining the attitude of farmers toward risk is therefore 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 (Dadzie & Acquah, 2012). For example in the context of agricultural risk management, the more risk averse a farmer is, the more aggressive the farmer is in managing or minimizing his or her exposure to risk and hence, the higher the level of risk management (Hardaker *et al* 1997).

Anderson, Dillon and Hardaker (1977) and Barry (1984), observed that attitude towards risks have been studied using different theories (such as safety first, prospect theory and expected utility theory) and elicitation techniques (such as experimental methods, direct elicitation of utility functions and observed economic behaviour). According to Gomez-limon *et al* (2002), the direct estimation of the utility function method involves direct interaction

with the decision maker, who expresses his or her preferences among various alternatives. Regression techniques can then be used to obtain the utility function of decision makers. Experimental methods (often regarded as a variant of the direct elicitation of utility functions method) uses real bets instead of hypothetical gains and losses. The observed economic behaviour method is based on the difference between the observed behaviour and that predicted by the empirical models. The direct estimation of utility functions through preferences among various alternatives can be found in the works of Hamal and Anderson (1982), Feinerman and Finkelshtain (1996) while experimental methods using real bets is in Binswanger and Sillers (1983).

All these methods have often been criticised. Some of the criticisms in the direct estimation method include: interviewer bias, the selection of probabilities, reluctance to play lottery games, lack of reality of the scenarios in place and insufficient experience on the part of the decision maker in the evaluation of hypothetical situations. The observed economic behaviour method, difficulties such as the influence of other non-monetary objectives in the decision-making process (e.g. leisure) and constraints (financial limitations, lack of technical information, etc.) that influence attitudes to risk arise (Dadzie & Acquah, 2012). Furthermore, the experimental method often proves to be difficult to implement in practice, since the financial costs involved in a real situation with many producers is too high. Moreover Bard and Barry (2000); Gomez-Limon *et al* (2002) have also observed that elicitation techniques are often too costly and time consuming in terms of implementation. Bard and Barry (2000) therefore concluded that since true risk attitudes are not always apparent, attitude to risks should usually be measured indirectly and this can be through attitudinal scale. Attitudinal scale defines a scale of statements that reflect the respondent's attitude towards an underlying variable and establishes a score that reflects a quantitative measurement of the attitude. Lagerkvist (2005) used this approach to examine farmers risk attitudes through their responses to sources of risks, while Bard and Barry (2000), also used a likert scale to assess risk attitudes by obtaining farmers' opinions towards risk management tools.

2.7.1 Types of attitude towards agricultural risks

Sauer (2011) asserted that as a result of differences in chosen adjustment decisions on farm level, risk attitudes vary across farmers. Farmers' attitudes towards risks can be classified in to three types; risk averse, risk preferring (seekers) and risk neutral.

Risk averse farmers are characterised as cautious individuals who have preferences for less risky sources of income. Such a farmer is willing to sacrifice some level of expected return so as to reduce the probability of a loss. Such a farmer would always want to avoid risks and would diversify among a variety of production activities taking account of their risk features (Qasim, 2012). According to Winsen *et al* (2011) a risk averse person will not accept whatever risk no matter the increase in return. Risk averse farmers usually have low risk bearing ability and are also called risk avoiders. Ellis (2000) described a risk-averse person as one who prefers a situation in which a given income is certain to a situation yielding the same expected value for income but which involves uncertainty. As a risk averse farmer would take managerial decisions to reduce risks (or variation in income rather than decisions to maximise income); this prompts the farmer to utilise as many risk management strategies he is able to.

Risk-seeking/preferring farmer takes the challenge of having greater income volatility in exchange for anticipated higher returns (Qasim, 2012). Such farmers are willing to take the risk of doing better than expected while being aware of the possibility of doing less-well than expected. Risk seekers are more adventurous and they are usually more concerned with the potentials of a substantial gain than a loss. They also have a greater risk bearing ability, as they are willing to take huge risks in order to maximise profits on investment.

A risk-neutral farmer is indifferent between certain and uncertain outcomes with the same expected value of income. They usually ignore the risk features when making decisions. Risk neutral individuals lie between the other two groups. They have acceptable levels of risk bearing ability and their focus is usually not that of highest outcome or largest losses. Also, their primary concern is to achieve a substantial outcome over time.

Underwood and Ingram (2010) however identified four different groups of risk attitude profiles: managers, maximisers, conservators and pragmatists. Maximisers seek for risks, letting the possible gain outweigh the possible negative consequences of any given risk while, conservators avoid any risks no matter the possible profits. Risk managers carefully select between risk as to maximise profit and at the same time minimise losses, while pragmatist are indifferent of the risk and instead behave in such a way to leave the most options open. Furthermore, the authors also identified the four different risk environments in which producers operate. Boom times are characterised by little risk and high profit while, recession times are defined by high risk low profit. Uncertain times are characterised by times in which risks and profits are uncertain, and moderate times are defined as times when

both risk and profits are moderate. They concluded that in any given situation risk attitude should be adapted to the prevailing risk environment.

2.8 Agricultural insurance

Agricultural insurance is the stabilisation of income, employment, price and supplies of agricultural products by means of regular and deliberate savings and accumulation of funds in small instalments by many in favourable time periods to defend some or few of the participants in bad time periods (Arene, 2005). It is a confident supporting tool for financial resources of agricultural producers/ investors and it is an effective tool for risk management in agriculture (Sadati et al, 2010). Agricultural insurance schemes are a potential tool to cope with income losses through indemnity payments and therefore stabilize income and economic performance of farms (Wondimagegn *et al*, 2011). Insurance is frequently used to cover the financial consequences of many risks (Pritchett *et al*, 1996). It can also serve as a security for losses resulting from natural disasters. The fundamental principle of insurance is to pay a premium for someone else to take the risk so as to reduce the risk exposures due to price and yield variability. As observed by Skees (2003), an insurance contract requires no collateral or repayment history and the basic requirement is *ex ante* financing of the risk via a premium. He further stressed that among the poorest of the poor the inability to pay premiums of any form may also preclude any form of insurance.

According to Miller, Dobbins *et al* (2004), the number of alternative crop insurance programmes has expanded rapidly in recent years, while Skees (2003) affirmed that traditional approaches to agricultural insurance are often problematic due to the correlation between crop risks as well as the hidden and asymmetric information problems, which create ample opportunity for abuse.

For an insurance programme to be successful, the insurer must have adequate information about the nature of the risks being insured. However this is extremely difficult for farm level yield insurance as farmers will always know more about their potential crop yields than any insurer, hence the insurer may not be able to properly classify risk, thus making the insurance unsustainable. These asymmetric information leads to adverse selection in which farmers who know that they have been favourably classified buy the insurance, while those who have not been favourably classified do not buy. Therefore, insurers need to acquire better information to properly classify and assign premium rates.

Furthermore crop insurers must also be able to monitor farmers' behaviour, as there are cases where insured farmers may change their behaviour in a way that increases their risk exposure levels. This is also known as moral hazard. For example an insured farmer may negligently become careless in their use of risk management tools (e.g reducing fertilizer or using low quality seedlings). Therefore, it is important that insurers are able to access the cause of loss and the impact of the loss without relying on information provided by the insured farmers. However this is not usually the case with multiple-peril crop insurance, as it is usually difficult to identify if a loss has occurred due to some covered risk events or due to poor management. It is also not easy to measure the magnitude of loss without relying on information provided by the farmer. Index based insurance products have been developed to mitigate the traditional problems associated with multiple-peril crop insurance. These products are an alternative form of insurance that make payments based on either area yields or some objective weather event such as temperature or rainfall, rather than on measures of farm yields. Index insurance is a different approach to insuring crop yields and the precondition for index insurance to work best for the individual farmer is correlated risk. Skees (2004) itemised the relative advantages and challenges associated with index insurance as against traditional multiple-peril crop insurance. These advantages include;

1. No moral hazard: Moral hazard cannot occur under index based insurance because the indemnity does not depend on the individual producer's realised yield.
2. No adverse selection: Index insurance is based on widely available information, so there are no informational asymmetries to be exploited, hence there is no adverse selection under index based insurance.
3. Low administrative costs: Unlike farm-level multiple-peril crop insurance policies which require underwriting and inspections of individual farms, index insurance products indemnities are paid based on the realised value of the underlying index as measured by government agencies or other third parties.
4. Standardized and transparent structure: The terms of the contracts are usually relatively easy for purchasers to understand since the index insurance policies are sold in various denominations as simple certificates with a structure that is uniform across underlying indexes.
5. Availability and negotiability: Since they are standardized and transparent, index insurance policies can easily be traded in secondary markets.

6. Reinsurance function: Index insurance can be used to transfer the risk of widespread correlated agricultural production losses. Thus, it can be used as a mechanism to reinsure insurance company portfolios of farm-level insurance policies.

There challenges that must be addressed if index insurance markets are to be successful include;

1. Basis Risk: The occurrence of basis risk depends on the extent to which the insured's losses are positively correlated with the index. Without sufficient correlation, "basis risk" becomes too severe, and index insurance is not an effective risk management tool. Careful design of index insurance policy parameters (coverage period, trigger, measurement site, etc.) can help reduce basis risk.
2. Security and dissemination of measurements: The viability of index insurance depends critically on the underlying index being objectively and accurately measured. The index measurements must then be made widely available in a timely manner.
3. Precise actuarial modeling: There is need for sufficient historical data on the index and actuarial models that use these data to predict the likelihood of various index measures.
4. Education: Index insurance policies are typically much simpler but significantly different than traditional farm level insurance policies, hence some level of education may be needed to help potential users assess whether or not index insurance instruments can provide them with effective risk management. This can be through training and educative materials.
5. Marketing: A marketing plan must be developed that addresses how, when, and where index insurance policies are to be sold.
6. Reinsurance: In most transition economies, insurance companies do not have the financial resources to offer index insurance without adequate and affordable reinsurance. Effective arrangements must therefore be made between local insurers' international reinsurers, national governments, and possibly international development organizations.

In conclusion, Teweldemedhin and Kafidii (2009) observed that the decision to buy insurance against risk in agriculture should be an economic one which requires the consideration of two critical factors.

- (1) The amount of loss that a farmer can withstand without insurance.
- (2) The trade-offs between insurance costs and potential losses.

An enabling environment is a prerequisite for effective and efficient insurance markets in developing countries like Nigeria. This includes the availability of insurance

companies and the range of products available to farmers. These components are largely missing in developing countries. For example, Olubiyo *et al* (2009) observed that, private insurance companies in Nigeria do not have agricultural insurance schemes; hence this limits the participation of farmers in insurance schemes in the country. The Nigerian Agricultural Insurance Corporation (NAIC) was the only insurance company available for farmers in the country until 2012, when the monopoly of NAIC on agricultural insurance was disbanded.

2.9 The Nigerian Agricultural Insurance Corporation (NAIC)

NAIC was established in 1984 with the mandate of providing insurance cover to all categories of farmers, namely – small, medium and large scale holders, either in groups or as individuals (NAIC, 2010). According to Kwatri (2007), NAIC was established because the general insurance companies were not interested in agricultural insurance due to the high rate of natural disasters associated with the agricultural industry. The scheme at inception began with the underwriting of two crops items: rice and maize and two livestock items: cattle and poultry. It gradually progressed into covering majority of the crops and livestock items obtainable in the country including export crops such as cocoa, Tea/coffee, cotton and rubber.

The corporation has since inception, issued out almost a million policies with the volume of risk amounting to about N100 billion thereby earning the corporation a premium sum of about N2 billion. The corporation has also settled claims worth about N500m to various farmers and cooperative groups (NAIC, 2010). The Corporation's standard procedure is that claims vouchers must be processed within 24 hours and such claims settled within a maximum of one week. In order to make the purchase of insurance more attractive to farmers in the country, the Federal government subsidised the premiums by 50% (i.e farmers pay only 50% of the premium, while the state and federal government pay the 50% balance). According to EC (2008), subsidised insurance programmes have not lead to the development of a private market for crop insurance; hence there is a need for government to facilitate the creation and sharing of information and databases so as to overcome the problem of setting up viable insurance mechanisms. A worthwhile venture in this regard by the Nigerian government was the disbandment of NAIC from the monopoly of exclusivity of agricultural insurance so as to stimulate competition in the agricultural sector. Although, NAIC has the exclusive right to insure all subsidised agricultural risks, opportunities abound for other insurance companies in the areas of commercial unsubsidised agricultural risks.

2.10 Review of literature on agricultural risk management studies

The economic analysis of risk management requires some quantification of farmers' preferences (attitude to risks) and perceptions with respect to risk; as well as the strategies/activities implemented by farming households to manage risks.

With regards to farmers' attitude to risks, several studies have concluded that farmers are risk averse in nature. Such studies include; Torkamani and Haji-Rahimi (2001); Salimonu (2007); Ayinde (2008); Ajijola *et al* (2011). Several factors influencing farmers' preferences on risks have also been identified. For example, Mehta (2012) observed that that non-farm income helps farmers to take more risk. Also, while Yesuf and Bluffstone (2007); Ayinde (2008); Ding *et al* (2010) observed that farmers having more income are usually more risk seeking than others, Cohen and Einav (2007); Onyemauwa *et al* (2013); Ihli *et al* (2013) concluded that farm income and risk aversion are positively correlated. Ghadim and Pannell (1999); Yesuf and Bluffstone (2007); Nielsen *et al* (2013) also concluded that age positively correlates with farmers' risk aversion level. Also, according to Hoag, Keske and Goldbach (2011), women show a slightly higher aversion to risk than men, while Kisaka,-Iwayo *et al* (2005) observed that risk aversion is higher among farmers having more dependants. With regards to the effect of education on risk aversion, Mishra and Goodwin (2005); Wissink (2013) concluded that higher education increases the willingness to take risks (lesser risk aversion).

In relation to farmers' perceptions on sources of agricultural risks, Lucas and Pabuayon (2011) asserted that age has negative effects on farmers risk perception. Also, according to Adeola (2012), older farmers are likely to perceive the environmental hazards of pesticides than young due to accumulated knowledge and experience of farming systems. Egondi *et al* (2013) found out that married people in one of their study area had a higher perception of health risks, while individuals with at least primary level education perceived higher levels of air pollution than those without primary level education. In terms of the effect of credit on farmers perception Lucas and Pabuayon, (2011) affirmed that availability of credit is positively related with farmers' perception of risk, while Synder (2004) observed that lower income leads to a greater perception of risk. However, Patrick *et al* (1985) concluded that farmers' perceptions varied across geographic areas and by farm type, while Wilson *et al* (1993) observed that risk perceptions were highly complex and individualistic in nature.

To quantify farmers' perceptions on risk sources, Briggerman *et al* (2004) designed a score card (involving likelihood, potential and exposure) to assess the risks faced by an agricultural firm, while Zinn (2009) affirmed that risk exposure is a function of likelihood of occurrence of risks and consequence of the risks. Shadbolt *et al* (2010) diverted from other previous studies on risks by considering the negative and positive sides of risks. Their study considered farmers' perceptions of risks and likelihood of the events occurring.

Farmers have also ranked their perceived sources of risks based on level of importance. Production and price risks appear to be very important to farmers as seen in the works of Meuwissen *et al* (2001); Lien *et al* (2003); Le and Cheong (2009); Fakayode *et al* (2012). Family health; access to market; output and input price variability were however the most important types of risks to farmers as found in Njavro *et al* (2005). The research carried out by Mac Nicol *et al* (2007), identified sources of risk that commercial sugarcane farmers in the province of KwaZulu-Natal (KZN) South Africa, perceive to pose the greatest threat to the viability of their businesses. According to the study, the most important risk sources were found to be the threat posed by land reform, minimum wage legislation and the variability of the sugar price. In USDA (1997), farmers' degree of concern was greatest regarding changes in government laws and regulations, decreases in crop yields or livestock production and uncertainty regarding commodity prices.

Although production and price risks have been considered very important, Le and Cheong (2009) observed that while production risk management strategies were perceived as being effective, price risk management strategies had lower levels for perceived effectiveness. However, according to Meuwissen *et al* (2001), farmers' perceptions do not necessarily mean actual usage of the strategies. Farmers' risk perceptions may also change over time. Gray *et al* (2009) identified possible reasons for change in farmers' risk perceptions. For example, they suggested that increased importance of accidents and health problems may be related to the farm ownership structure and increased awareness of laws related to health and safety, while reduction in perceived risks related to rainfall variability could be due to farmers using strategies to manage rainfall risks.

Concerning risk management decisions, Velandia *et al* (2009) examined factors influencing producers' risk management adoption decisions while taking into consideration the possibility of simultaneous utilization of multiple reducing instruments and the potential correlations among these adoption decisions. Also, Hucks *et al* (2011) analyzed awareness and knowledge of risk management techniques and found out that significant relationship

exists between education and risk management. Breukers *et al* (2009) explained that higher level of education influences the level of understanding of a risk and this may indicate a higher knowledge of risk management tools to combat the risk.

Nadhomi *et al* (2013), concluded that age of household head was negatively related with adoption of soil and water conservation practice (a risk management tool used to mitigate risk of erosion) while Hucks *et al* (2011) observed that larger farmers had greater risk management knowledge than those with smaller farms. Wondimagegn *et al* (2011) accessed the patterns, trend and determinants of crop diversification at farm level. They found out that access to market information and irrigation intensity significantly and positively affect crop diversification. Livestock ownership was significant but however negative suggesting that household with larger number of livestock are less likely to grow more crops.

Juma *et al* (2009) studied the effects of production risk on farm technology adoption among small holder farmers and they found out that yield variability and the risk of crop failures affect technology adoption decisions in low-income, rain-fed agriculture. The direction and magnitude of effects depend on the farm technology under consideration. They concluded that although productivity gains are necessary, they are not sufficient conditions to attract farmers to adopt new technologies and agricultural innovations; what matters more is the implication of risks.

Psychological factors may also have greater influence on farmers' use of risk management strategies than socioeconomic variables (Gomez-limon *et al*, 2002). The effect of psychological variables on risk management were also highlighted by Ajieh (2010) who identified lack of trust in settlement as part of the constraints influencing adoption of agricultural insurance in Nigeria.

In relation to the use of insurance as a risk management tool, Ogurtsov (2008) addressed the impact of farmer's personal risk characteristics (risk perception and risk attitude) on catastrophe insurance purchase. The results showed that farm and farmer's personal characteristics had a significant impact on actual (catastrophe) insurance purchase. Also, insurance subsidies were one of the main reasons to purchase insurance coverage as seen in some of the previous agricultural studies on crop insurance such as Mishra and Goodwin, (2003); Sherrick *et al* (2004); Babcock and Hart, (2005).

CHAPTER THREE

THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1 Theoretical framework

The theoretical approach used to guide this study was drawn from the following theories: Social Cognitive Theory, Theory of Planned Behaviour, Pest Belief Model and Perceived Attributes Theory. These theoretical components provide insights into the factors that influence crop farmers' assessments of agricultural risks as well as their use of risk management strategies.

3.1.1 Social cognitive theory

The Social Cognitive Theory of Bandura (1986) describes individuals as self organising, proactive, self reflecting and self regulating. Individuals are conceptualised as being governed by a triadic reciprocal interaction which occurs between human behaviour, environmental factors and personal factors (such as cognitive, affective and biological events). People learn by observing others with the environment, behaviour and personal factors all influencing development.

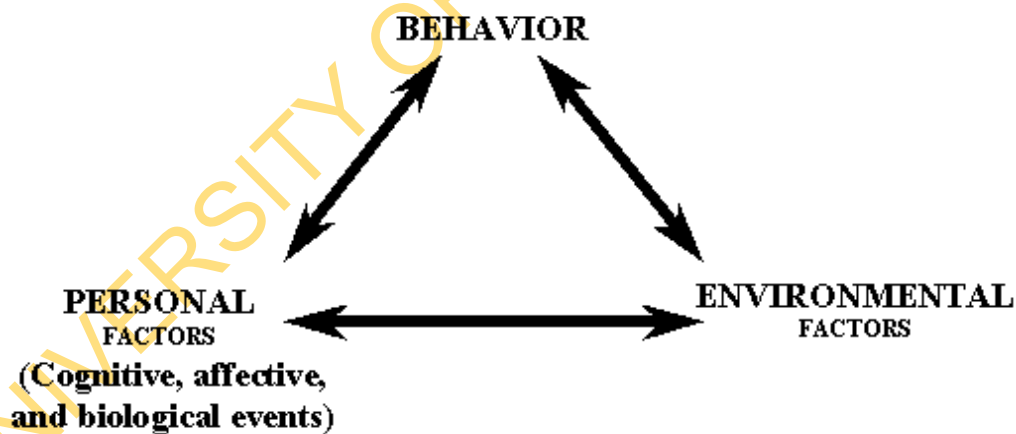


Figure 2: Social Cognitive theory, Bandura (1986)

The social cognitive theory helps to understand the interactions that exist between farmers' behavior, environment and personal factors. Therefore, in understanding farmers' behavior, one must take into account both the individual (the farmer's life history of learning and experiences) and the environment (those stimuli that the person is aware of and responding to). The characteristics of the farmers as well as his/her environment are thus important in the study of risk perceptions and risk management behavior. For instance, farmers risk management behavior influences and is influenced by their environment (such as differences in agro-ecological zones, availability of necessary inputs and actions of fellow farmers with regards to risks,) and farmers characteristics (such as educational level, knowledge of risk management tools and risk perceptions).

3.1.2 Theory of planned behaviour

The theory of planned behaviour propounded by Ajzen in 1985 predicts human behaviour. The theory states that individual performance of a given behaviour is primarily determined by the person's attitude towards the behaviour, the influence of the person's social environment (subjective norms) and the person's perceived behavioural control over the opportunities, resources, and skills necessary to perform the behaviour.

Attitude towards the behaviour refer to the degree to which performance of a specific behaviour is positively or negatively valued and it indicates that an individual has a favourable or unfavourable attitude towards the behaviour. Subjective norms indicate the perceptions on whether people are expected to perform the recommended behaviour by their friends, family and the society, while perceived behavioural control refers to an individual's perceived ease or difficulty of performing a particular behaviour.

A behavioural intention is formed from attitude towards the behaviour, subjective norm, and perceived behavioural control. The more favourable the attitude towards behaviour and subjective norm, and the greater the perceived behavioural control, the stronger the person's intention to perform the behaviour in question would be.

In relation to this study, farmers' attitude to risk is partly explained by the degree to which they positively or negatively value risk, the perceptions of their friends, family and the society on risks and their ability to carry out the skills/tasks necessary to achieve their aims. This theory is thus crucial in understanding farmers' attitude to risk.

3.13 Pest belief model

The pest belief model is a framework predicting the relationships between beliefs and pest management decisions. According to Heong and Escalada (1999), pest management behaviour is determined by four components:

- (1) Perceived susceptibility: this refers to the subjective risk of getting pest attacks if no precautions are taken. .
- (2) Perceived severity: this refers to the severity of the pest attack.
- (3) Perceived benefits: this refers to the degree to which a certain action reduces the perceived susceptibility or severity of the pest attack and
- (4) Perceived barriers: the perceived negative aspects of a particular action.

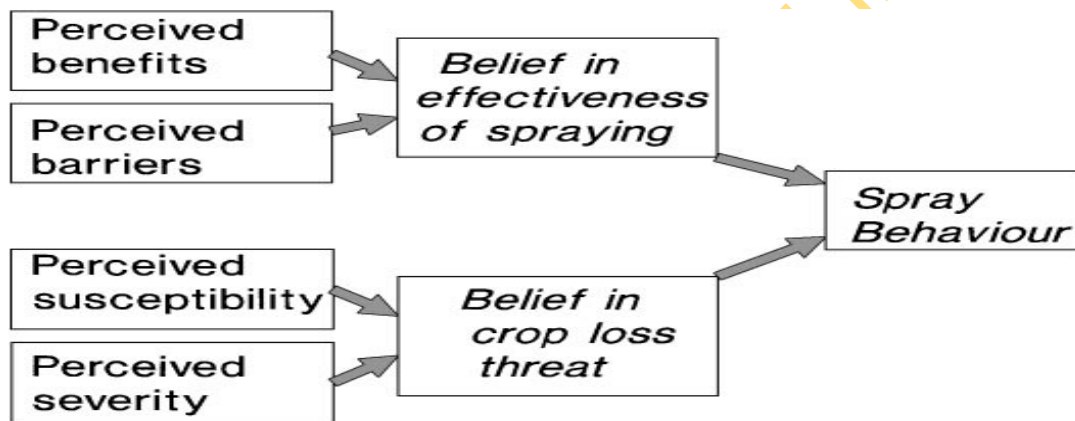


Figure 3: The Pest Belief Model, Heong and Escalada (1999)

In the context of this study, farmers risk management behaviour can therefore be governed by these four components: the likelihood of occurrence of agricultural risks (perceived susceptibility); the severity or economic impact of the risks (perceived severity); the efficacy of the risk management strategy (perceived benefits) and the perceived negative aspect of a risk management strategy such as its cost (perceived barriers). Farmers perceived level of susceptibility and severity will lead to belief in their level of risk exposure, while perceived benefits and barriers will lead to their belief in the effectiveness of using risk management strategies. The pest belief model is brought in to this study so as to be able to understand the link between farmers' beliefs/ risk perceptions and their risk management behaviour.

3.1.4 Perceived attributes theory of innovation

The Perceived attributes theory of Rogers (1995), explained the five attributes upon which an innovation is judged: that it has an advantage over other innovations or the present circumstance (relative advantage), that it is compatible with the circumstances into which it will be adopted (compatibility), that that it is not too complex to learn or use (complexity), that it can be tried out (trialability) and that results are visible or can be observed (observability). For example, farmers may judge agricultural insurance on the basis of its compatibility with their own values or on the level of complexity such as documentary requirement, or based on its advantage of allowing a farmer to be able to substitute a certain small expense for the possibility of a large uncertain loss.

In relation to this study, farmers' use of risk management strategies can therefore be influenced by five attributes: the advantages the strategy has (relative advantage) compatibility of the strategy with farmers' values (compatibility); comprehension of the strategy (complexity) triability of the strategy as well as the visibility of the positive results of using the strategy (observability). The perceived attribute theory is brought in to this study so as to be able to understand farmers' adoption of risk management tools.

3.2 Conceptual framework

The determinants of agricultural risk management behaviour of crop farmers in Nigeria are conceptualised based on the roles played by the independent and intervening variables in explaining the dependent variable (Figure 4).

Farmers' socioeconomic characteristics (such as age, sex, educational level, farming experience, farm enterprise and farm size) often influence their perceived sources of risks and attitude towards agricultural risks. The above variables together with the farmers' agro-ecological zone may also determine farmers' perception of their level of risk exposure. Farmers perceived level of risk exposure and their socioeconomic characteristics affect their participation in agricultural insurance scheme and this ultimately determines their perception of the effectiveness of agricultural insurance in managing risks. All these variables are expected to influence crop farmers' level of agricultural risk management behaviour. For example, higher levels of educational attainment or larger farm sizes are usually associated with a high risk attitude which in turn stimulates a lower level of risk management. Likewise a higher perceived level of risk exposure is expected to stimulate a farmer's interest in risk

management strategies (such as crop insurance) and this increases the farmer's level of risk management.

Furthermore, government policies on risk management, farmers' access to risk reducing technologies, lack of infrastructural facilities, poverty level and outcome history are also variables which can affect farmers' level of risk exposure, their perception of the effectiveness of agricultural insurance as well as their risk management behaviour. For example, lack of good roads may affect farmers' access to markets for farm products thus increasing their exposure to agricultural risks. According to Cervantes-Godoy *et al* (2013), institutional and political settings in developing countries are frequently less developed thus contributing to a greater incidence of market imperfections in key areas such as credit and insurance and this in turn lowers farmers' access to risk management tools and strategies.

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INDEPENDENT VARIABLES

INTERVENING VARIABLES **DEPENDENT VARIABLE**

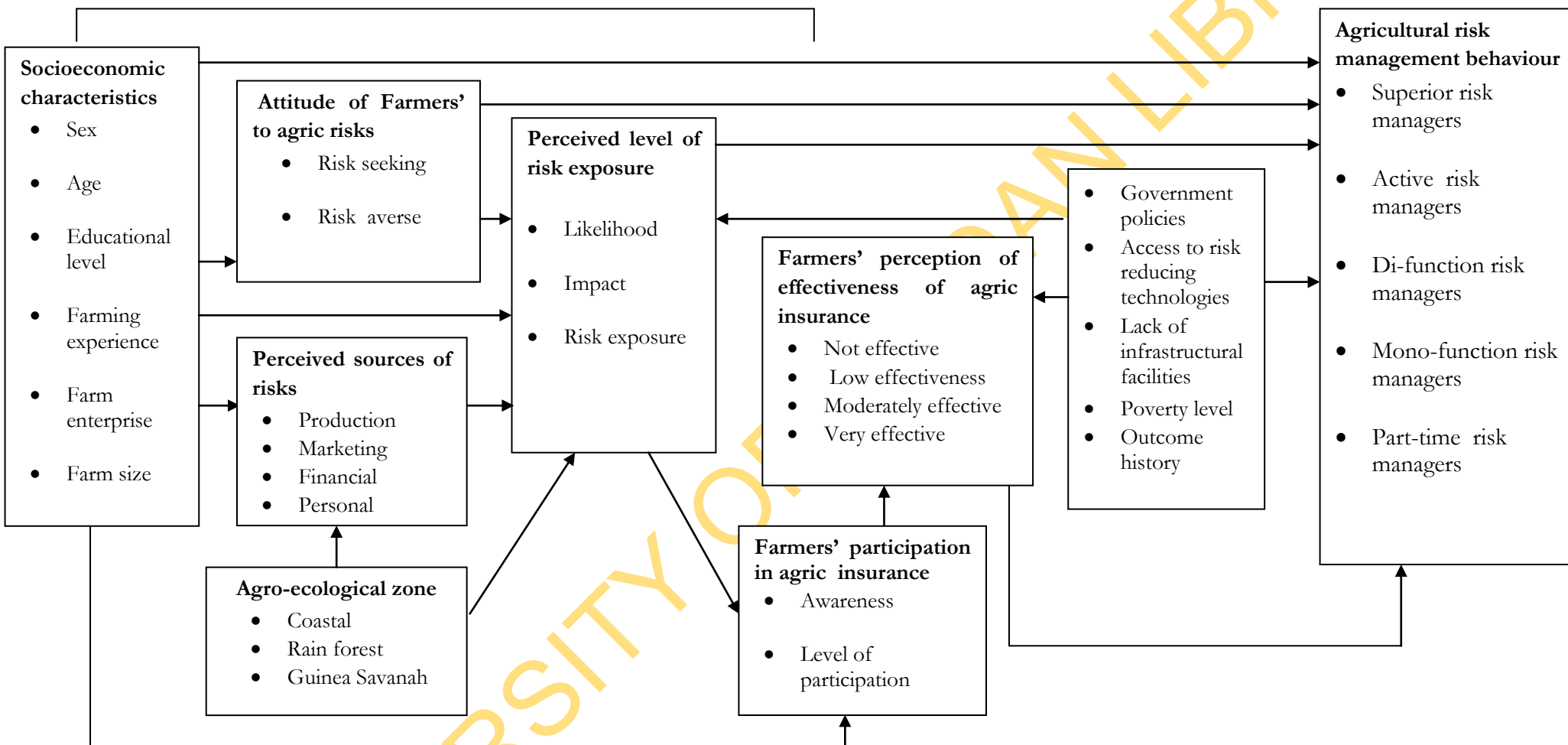


Figure 4: Conceptual Framework for Determinants of Agricultural Risk Management Behaviour of Crop Farmers in Nigeria

CHAPTER FOUR

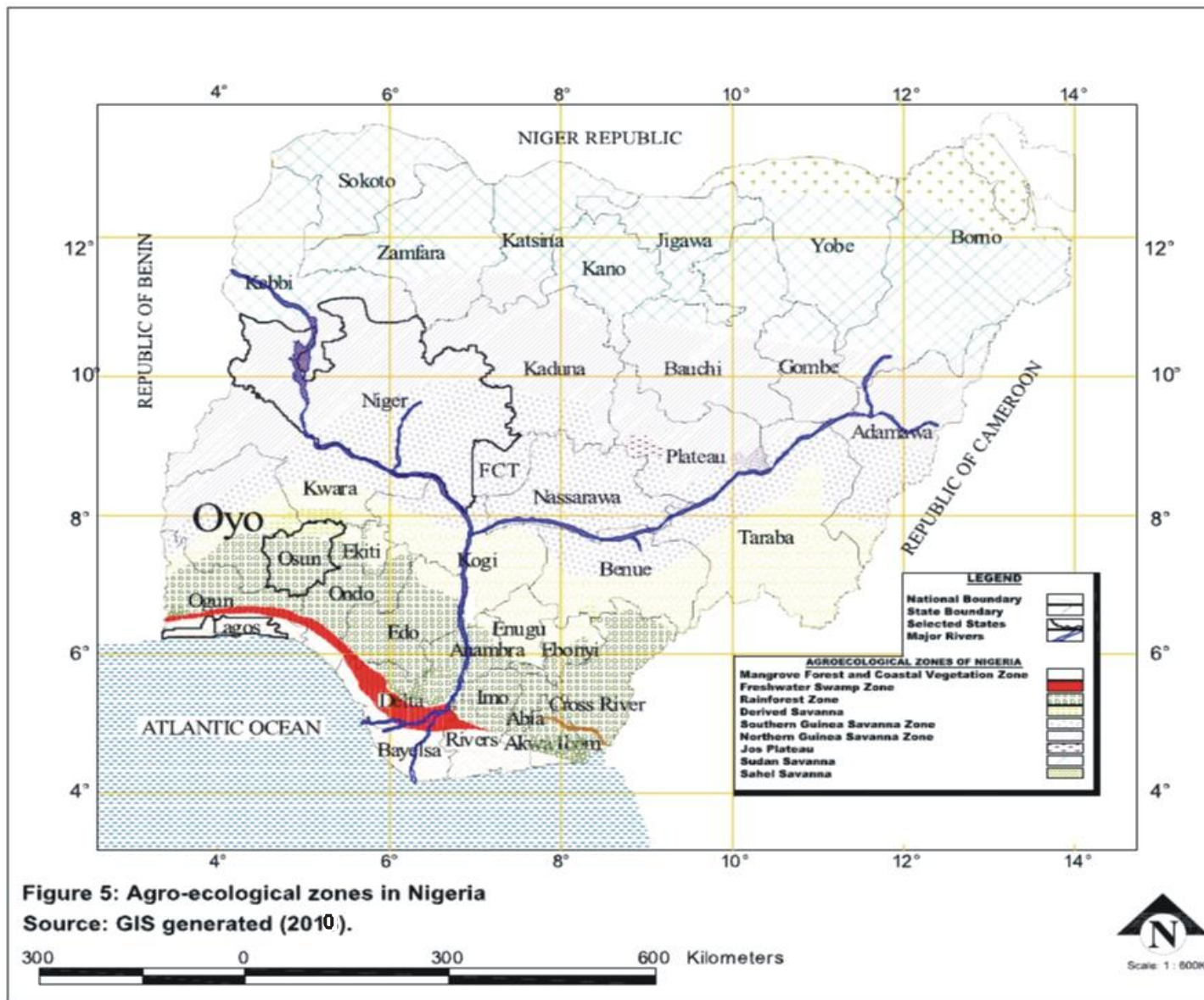
METHODOLOGY

4.1 Study area

This study was carried out in Nigeria. The country lies between latitudes 4° and 14° north of the equator and longitudes 3° and 15° east of Greenwich and it is bordered on the west by the Republic of Benin, on the north by Niger, on the east by Chad and Cameroon and on the south by the Atlantic Ocean. The Federal Republic of Nigeria has a total area of 923,770 km² (Land area: 910,770 km²; Water area: 13,000 km²) and is occupied by about 140 million people (NPC, 2006). Nigeria is blessed with mineral, physical, biological and energy resources (renewable and non renewable) such as: forests, crude oil, natural gas, solid minerals, as well as marine and aquatic resources.

The major industries are agriculture, oil (upstream and downstream), iron and steel processing, plastics, textiles, and pharmaceuticals. Out of all the major industries, agriculture serves as the largest employer of labour; while dominating the country's real sector by 41% (CBN, 2004). Although, agricultural landholdings are generally small and scattered, the primary policy of agriculture in Nigeria is to make the country self-sufficient in its food and fibre requirement. Major agricultural enterprises found in the country include: crop farming, poultry production and livestock.

The country is divided in to nine major agro-ecological zones (Oyenuga, 1967): (i) mangrove forest and coastal vegetation, (ii) freshwater swamp communities, (iii) rainforest zone, (iv) derived savanna, (v) southern guinea savanna zone, (vi) northern guinea savanna zone, (vii) jos plateau, (viii) sudan savanna, and (ix) sahel savanna.



4.2 Population of the study

This study focussed on crop farmers who had at least five years farming experience, as it is expected that this category of farmers will have experience in agricultural risk management.

4.3 Sampling procedure and sample size

Multistage random sampling procedure was used for the study. Thirty-five percent of the nine agro-ecological zones in the country (mangrove forest and coastal vegetation, freshwater swamp forest, rainforest, derived savannah, southern guinea savannah, northern guinea savannah, jos plateau, sudan savannah and sahel savannah) were randomly selected. This gave; mangrove forest and coastal zone, rainforest zone and southern guinea savannah zone. Ten percent of the states in each of the zones (coastal- rainforest- and southern guinea savannah- were then randomly sampled to give Lagos (coastal), Osun (rainforest) and Niger (southern guinea savanna). Thereafter, 10% of the local governments in the selected states were randomly chosen to give: Badagry and Ojo (Lagos); Boripe, Osogbo and Ede south (Osun); Bosso, Shiroro and Paikoro (Niger). Two communities were randomly selected from each of the local government to give: Topo and Ajara (Badagry); Ajangbadi and Igbede (Ojo) in Lagos. In Osun state, Egbeda and Aagba (Boripe); Ajenisua and Owode (Osogbo); Sekona and Loogun (Ede south) were randomly selected. In Niger state Maikunkele and Beji (Bosso); Kuta and Shiroro (Shiroro); Kafinkoro and Adunnu (Kafinkoro) were randomly sampled. Fifteen percent of the crop farmers (registered with the Agricultural Development Project) in each of the selected community were randomly selected to arrive at a total of 323 farmers. Out of the three hundred and twenty three questionnaires administered, a response rate of 96% was achieved with three hundred and ten (310) questionnaires retrieved.

Table 1: Table showing sampling procedure and sample size

35% of 9 agro-ecological zones	10% of states in zones	10% of local government areas in State	2 communities in each local government area	Farmers population in sampled communities	15% of farmers
Mangrove and coastal zone	Lagos	Badagry Ojo	Topo Ajara Ajangbadi Igbede	406	61
Rainforest zone	Osun	Boripe Osogbo Ede south	Egbeda Aagba Ajenisua Owode Sekona Loogun	734	110
Southern guinea savannah zone	Niger	Bosso Shiroro Paikoro	Maikunkele Beji Kuta Shiroro Kaffinkoro Adunnu	1013	152
					323

4.4 Research design

This study was designed to generate basic knowledge and identify variables associated with agricultural risks in terms of farmers' sources of risks, level of exposure, attitude towards risks, risk responses and risk management behavior using the survey method.

4.5 Data collection procedure

Five focus group discussions- FGDs (One FGD in Lagos, two FGDs in Osun and two FGDs in Niger states) were conducted to generate a deeper understanding of farmers' risks perceptions and responses. An interview schedule was also developed to gather information on farmers' socioeconomic characteristics and information on agricultural risk management. Publications such as journals and books as well as web content also provided complementary data. Trained enumerators were employed for data collection.

4.6 Validity and reliability of instrument

Face and construct validity of the instrument was conducted by experts in the fields of Agricultural Extension, Economics and Accounting. The overall reliability of the instrument was determined through split-half method and a reliability coefficient of 0.86 was obtained. An internal reliability of 0.77 and 0.81 were obtained for the agricultural risk management scale and attitude towards agricultural risk scale.

4.7 Measurement of variables

4.7.1 Dependent variable

The dependent variable of this study is farmers' agricultural risk management behaviour. This refers to farmers' level of risk management and is reflected in behavioural types. In measuring farmers' level of agricultural risk management, strategies were generated based on the production, marketing, financial and social sources of risks. Respondents were asked to tick (from a list) the risk management strategies they utilise. A total of 42 strategies from the four sources of agricultural risks (production- 11 strategies; marketing- 8 strategies; financial- 13 strategies and social- 8 strategies) were presented to respondents. The frequency of utilization of these strategies was scored as follows: Utilise all the time = 3, Utilise sometimes/when need be = 2, Utilise rarely = 1, Never utilise = 0. Based on the scores obtained by respondents, the minimum score obtained was zero, while the maximum was 126. Using the mean, respondents were grouped into high and low categories of risk management. Respondents' raw scores in each of the four categories were also used to group them into five groups of risk management behaviour:

1. Superior risk managers; these are farmers who utilize at least fifty percent of the risk management strategies under each of the four categories of risk management.
2. Active risk managers; these refer to farmers who utilize at least fifty percent of the risk management strategies under three of the four categories of risk management
3. Di-function managers; these are farmers who utilize at least fifty percent of the risk management strategies under two of the four categories of risk management
4. Mono-function risk managers; these refer to farmers who utilize at least fifty percent of the risk management strategies under one of the four categories of risk management. This set of risk managers can be production, marketing, financial or social risk managers depending on their area of core competence.
5. Part-time risk managers; these are farmers who utilize less than fifty percent of the risk management strategies under each of the four categories of risk management.

4.7.2` Independent variables

4.7.2.1 Socioeconomic characteristics of respondents:

1. **Age:** actual age in years.
2. **Sex:** male or female.
3. **Marital Status:** single; married; divorced or widowed.
4. **Religion:** Islam; Christianity; Traditional.
5. **Educational Level:** respondents were asked to tick their last completed level of education from the following list: No formal education; Primary school; Secondary school; N.C.E, O.N.D; H.N.D, B.Sc; Postgraduate;
6. **Credit sources:** Friends/family; Cooperatives; Private moneylenders; Commercial Banks; NACRDB; Microfinance banks; Others (specify). Respondents also ranked their credit source in order of importance.
7. **Farming experience;** in actual years.
8. **Membership of organization:** respondents were asked to indicate whether they belong to any organization, the number of such organizations, the positions they hold in the organization and their level of participation in their organizations activities.
9. **Involvement in off farm occupation;** respondents were asked to indicate if farming was their only occupation or not
10. **Farm Enterprise:** major crop farmed; other crops cultivated; other agricultural enterprises.
11. **Farm ownership:** Sole proprietorship; Company; Partnership.
12. **Labour sourcing:** Friends/Family; Partnerships/Cooperatives; Labourers.

13. **Labour availability:** Always available; Sometimes available; Rarely available; Never available.
14. **Level of Production:** farm area cropped.
15. **Marketing channel:** This refers to the outlet farmers' use in disposing their farm produce. Traders/ Middlemen; Processing industry; Directly to individuals/ household (Consumers)
16. **Market accessibility:** Highly accessible; Moderately Accessible; Not Accessible.
17. **Source(s) of Information:** other farmers/friends/relatives; Extension/Development agents; Print media; Electronic Media; Professionals. Respondents also ranked the source(s) in order of importance.

4.7.2.2 Farmers' perceived types of agricultural risks: A list of agricultural risks types based on the four categories of risk sources was administered and respondents were asked to tick those applicable to them.

4.7.2.3 Perceived level of risk exposure:

Level of risk exposure = Likelihood of occurrence × Impact of risk

Likelihood of occurrence; 1= Never, 2= Unlikely, 3= Possible, 4= Likely, 5= Very likely

Impact of risk; perceived average economic loss from agricultural risks;

1= 0%-20%, 2= 21%-40%, 3= 41%- 60%, 4= 61%- 80%, 5= 81%-100% of produce

4.7.2.4 Attitude towards agricultural risks: respondents' attitude towards risk was measured using a 5 point attitudinal scale (Strongly agree, Agree, Undecided, Disagree and Strongly disagree). Positive questions attracted a score of 5 to 1, while negative questions were from 1 to 5. Each respondent total score was computed. Highest score was 105, lowest score was 21. Based on the mean (x), respondents were grouped into two categories (Risk seeking- adventurer and risk averse- avoider). The lower the scores, the more risk averse the farmer is.

4.7.2.5 Effectiveness of agricultural insurance in managing risks

This was done using six criteria namely; farmers' level of participation in agricultural insurance schemes, farmers' level of satisfaction, efficiency of crop insurance, inhibiting factors and motivating factors

1. **Farmers' level of participation in agricultural insurance schemes;** Respondents were asked to indicate if they were aware of NAIC agricultural insurance scheme, if they have ever purchased agricultural insurance, the frequency and premium paid.

2. **Farmers level of satisfaction;** Respondents (who purchased agricultural insurance) indicated their level of satisfaction with NAIC procedures.
3. **Effectiveness of crop insurance:** Respondents who purchase crop insurance were asked to indicate how efficient it is in managing agricultural risks. Insignificant; Low significant; Moderately significant; Very significant.
4. **Inhibiting factors;** respondents ticked from a list, the factors that inhibit them from patronizing NAIC.
5. **Motivating factors;** respondents ticked from a list factors that can motivate them/sustain interest to purchase agricultural insurance.

4.8 Analysis of objectives and hypotheses of the study

An analysis of objectives and hypotheses of the study was carried out as shown in Table 2. The data requirement and analytical tools are also indicated.

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Table 2a: Analysis of objectives

Objectives	Meaning	Data Requirement	A priori-expected signs	Analytical tool
1. Identify the types of agricultural risks as perceived by crop farmers in the study area	To find out the types of agricultural risks faced by crop farmers	Risks faced Ranking of risks		Frequency, Percentage Mean
2. Determine crop farmers' perception of their level of risk exposure.	To find out the level of vulnerability of crop farmers to agricultural risks	Likelihood of occurrence of identified risks Impact of identified risks Level of risk exposure Ranking of risks	+ve	Mean
3. Describe the attitude of crop farmers towards agricultural risks.	To find out the disposition of crop farmers towards agricultural risks	Responses to attitudinal statements	-ve	Mean
4. Describe the risk management strategies utilised by crop farmers in the study area.	To find out the risk management strategies that crop farmers use	Risk management strategies used		Mean
5. Find out crop farmers' perception of the effectiveness of crop insurance	To find out farmers view about the efficiency of crop insurance in managing risks	Level of efficiency of crop insurance	+ve	Mean
6. Determine crop farmers' level of agricultural risk management.	To find out farmers level of agricultural risk management	Extent of utilization of agricultural risk management strategies	-ve	Mean
7. Analyze factors that determine the risk management behaviour of crop farmers.	To find out the factors that influence the risk management behavior of farmers	Farmers personal characteristics Level of risk exposure Attitude to risk Farmers risk management behaviour		Multinomial Logit regression

Table 2b: Analysis of hypotheses

Hypothesis	Meaning	Data Requirement	A priori-expected signs	Analytical tool
1 Test of relationship between selected socioeconomic characteristics of crop farmers and their level of risk management.	To find out the extent to which the farmers socioeconomic variables influence their level of risk management	Socioeconomic variables Level of risk management		Chi-square PPMC
2 Test of relationship between crop farmers' perceived level of risk exposure and their level of risk management.	To find out the extent to which the farmers level of risk exposure influence their level of risk management	Level of risk exposure Level of risk management	+ve	PPMC
3. Test of difference in crop farmers' perceived level of risk exposure across the three agro-ecological zones.	To find out the difference that exists in crop farmers' level of risk exposure across the agro-ecological zones in the study area	Level of risk exposure across zones		ANOVA
4. Test of relationship between crop farmers' attitude towards agricultural risks and their level of risk management.	To find out the extent to which farmers' attitude towards agricultural risks influence their level of risk management	Attitudinal scores	-ve	PPMC
5. Test of difference in crop farmers' attitude towards agricultural risks across the three agro- ecological zones.	To find out the difference that exists in crop farmers' attitude towards agricultural risks across the agro-ecological zones	Attitudinal scores across the three agro-ecological zones		ANOVA
6. Test of difference in crop farmers' level of risk management across the three agro-ecological zones.	To find out the difference that exists in crop farmers' level of agricultural risk management across the agro-ecological zones level	level of risk management across the three agro-ecological zones		ANOVA

4.9 Data analysis

Descriptive statistics used include; frequencies, percentages, means, column charts and pie charts. Inferential statistics was applied as follows:

Table 3: Analysis of data

Hypothesis	Statistical tools used
1	PPMC (variables at interval level) Chi-square (variables at nominal level)
2	PPMC
3	ANOVA
4	PPMC
5	ANOVA
6	ANOVA

Multinomial logistic regression was used to analyse factors that determine crop farmers' agricultural risk management behaviour. The part-time group was used as the reference category. Hypothesised variables in the model were; age, marital status, formal education, farming experience, farm size, major source of information, membership of organisation, attitude to risks, risk exposure level and agro- ecological zone.

CHAPTER FIVE

RESULTS AND DISCUSSION

This chapter presents the results, interpretation and discussion of the data collected. The findings of the study are reported under nine sections:

1. Socioeconomic characteristics of crop farmers
2. Farmers perceived types of agricultural risks
3. Farmers perceived level of risk exposure
4. Attitude towards agricultural risks
5. Farmers' use of agricultural risk management strategies
6. Effectiveness of agricultural insurance in managing risks
7. Farmers' level of risk management
8. Determinants of agricultural risk management behaviour of crop farmers
9. Testing of Hypotheses

5.1: Socioeconomic characteristics of crop farmers

This section presents the socioeconomic characteristics of crop farmers. The characteristics are sex, marital status, religion, age, educational level, farming experience, farm size, major crops cultivated, secondary farm enterprises, organizational membership, off farm occupation, farm ownership, labour availability, labour sourcing, marketing channel and market accessibility.

Sex: Figure 6 shows that 90.7% were males, while 9.3% were females. The distribution of respondents indicates that 94.8%, 93.1% and 87.3% of the respondents in coastal, rainforest and guinea savannah zones respectively were males. This implies that crop farming is a male dominated occupation in Nigeria. According to Hassan and Nhemachena (2008), males and females differ because of the differences in access to assets and decision making process. For instance, as males usually exert more influence over the decision making process than females (Hoag, Keske and Goldbach, 2011), majority of the respondents should display authority and control in taking major decisions on farming practices, thus stimulating a higher level of risk management. Also because males are usually more active and agile than females, respondents' ability to utilize risk management tools should be higher implying a higher level of agricultural risk management. However, because women show a slightly higher aversion to risk than men (Hoag, Keske and Goldbach, 2011), respondents' level of risk aversion may be lower than what it could have been if a higher proportion of the crop farmers were females.

Previous studies such as; Otitolaye *et al* (2009), Raufu (2010), Odoemenem and Adebisi (2011), Ogunniyi *et al* (2011) agreed on male dominance in agriculture in Nigeria.

Marital status: As indicated in Figure 7, married respondents' constituted 89.7% of the total respondents in the study area. With more dependants to feed, crop farmers in the study area are expected to be risk averse as Kisaka,-Iwayo *et al* (2005) observed that risk aversion is higher among farmers having more dependants. This higher level of risk aversion may be as a result of family commitments and responsibilities in marriage. The high level of risk aversion is expected to influence level of risk management positively. Marital status can also influence farmers' perception of agricultural risk because with more dependants to cater for, married respondents usually have a higher perception of agricultural risks. Egondi *et al* (2013) found out that married people in one of their study area had a higher perception of health risks. Married respondents dependants/children may also serve as a reliable source of labour, especially since most of the respondents rely on labour from friends/family (Figure 14). Sourcing of labour from friends/family is a form of risk management due to the accessibility and good interpersonal relationship which usually exist between friends and family.

Religion: Figure 8 shows that more than two thirds (73.8%) of the crop farmers were Muslims, 25.2% were Christians, while 1.0 % were traditionalists. Religion has the potential to affect world views; hence it may have effect on respondents' attitude towards risk. Moreover, Nwankwo *et al* (2009) asserted that influences from religion cannot be underestimated in the adoption decision. For instance, religious considerations may determine the adoption or utilisation of some risk management strategies. For example, if farmers believe that loss in yield due to unfavourable weather conditions is from God, they may be unwilling to utilise strategies to reduce the risk. Furthermore, ethical considerations may also affect the use of crop insurance by farmers.

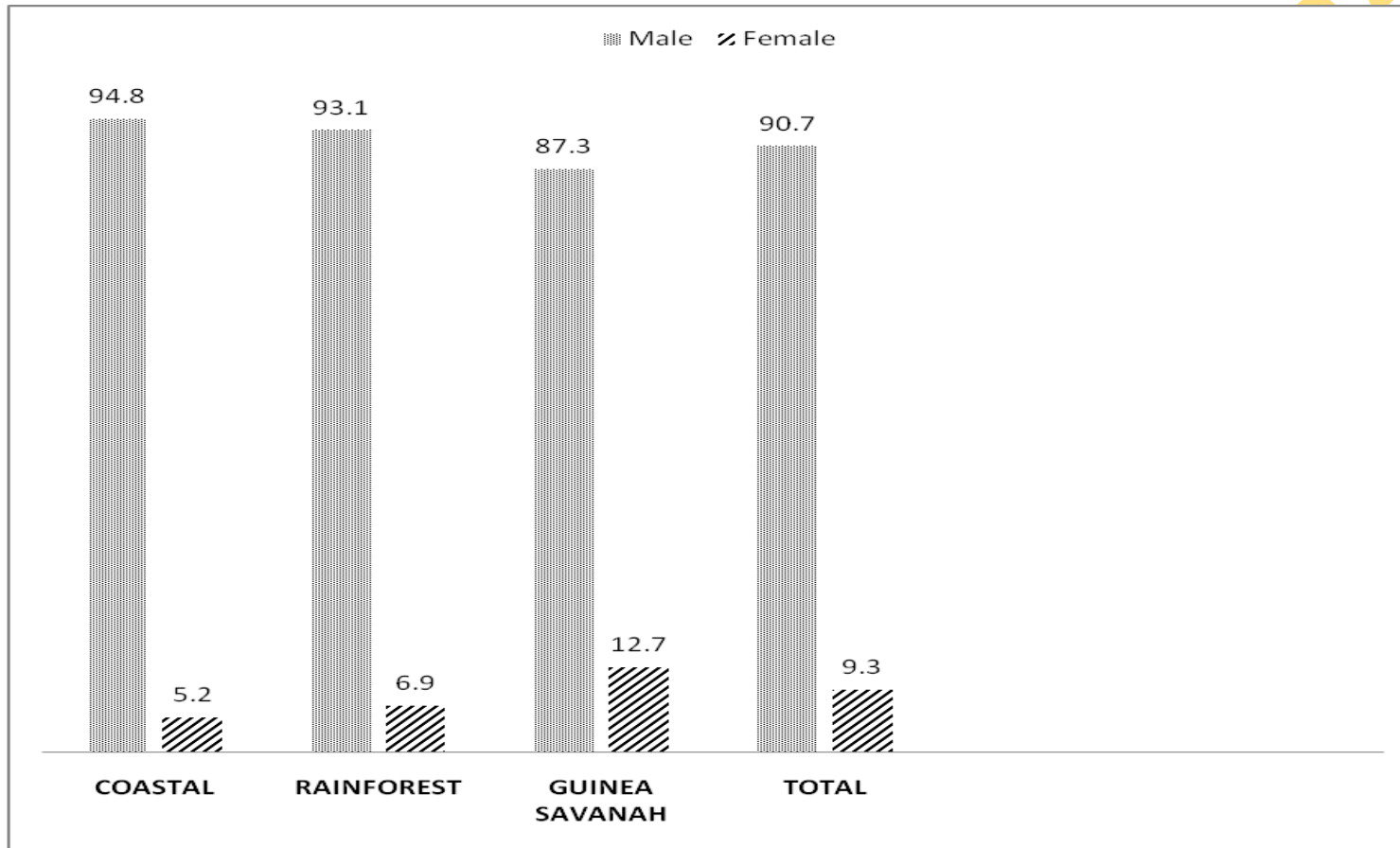


Figure 6: Sex distribution of respondents

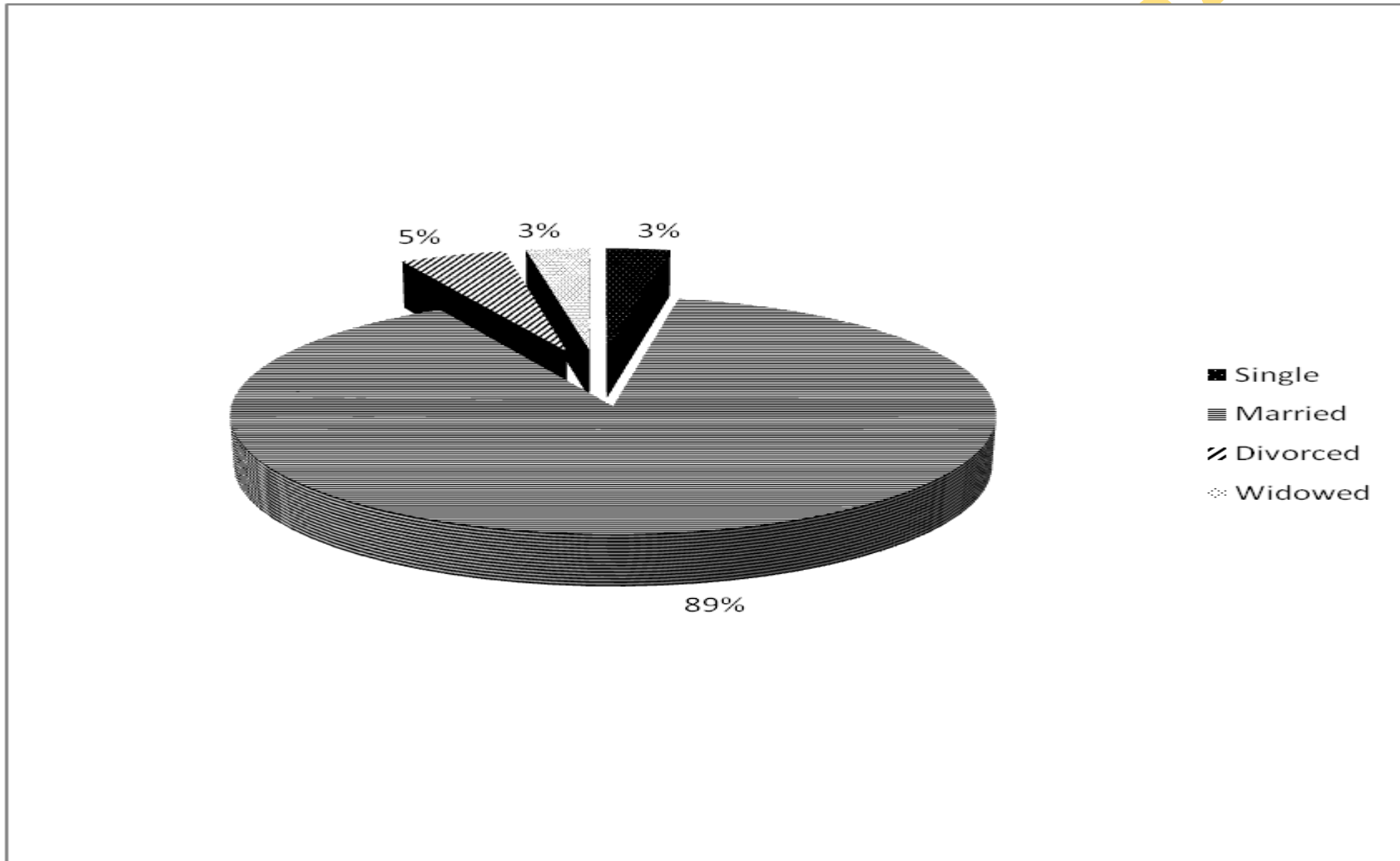


Figure 7: Distribution of respondents according to marital status

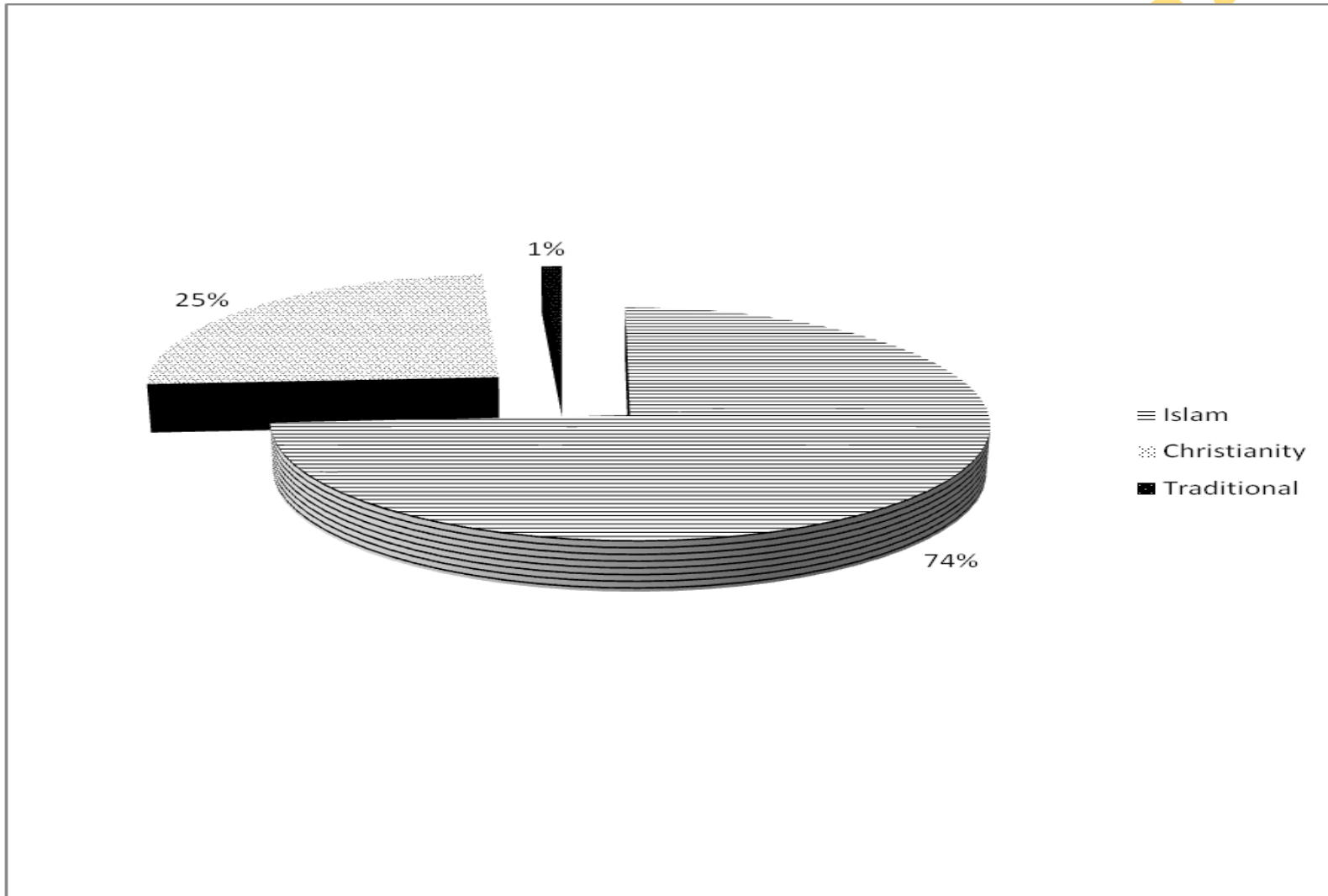


Figure 8: Distribution of respondents according to religion

Age: Age distribution of the respondents as presented in Table 4 reveals that about 2.3% of the respondents were less than thirty years. Also 35.5% were between 31 to 50 years, while majority (60.2%) were above 50 years. The mean age was 53.2 ± 10.5 years and this implies that crop farmers in the study area are gradually moving beyond their active and productive age. This confirms the observation of Omotayo (2010) that one of the major problems of agricultural development in Nigeria is the ageing farm population, while Eluhaiwe (2008) asserted that the agricultural labour force in Nigeria is fast declining. Mohiuddin *et al* (2009) also observed that young farmers are more agile and can work more than old farmers due to the high level of physical energy needed in agricultural production. Majority of the respondents are also expected to be risk averse as Ghadim and Pannell (1999) affirmed that age is positively correlated with risk aversion. This high level of risk aversion is expected to influence respondents' level of risk management positively. Moreover, age is associated with more experience, hence majority of the farmers are expected to have a high perception of the occurrence and impact of agricultural risks. According to Bonabana-Wabbi (2002) in Adeola (2012), older farmers are likely to perceive the environmental hazards of pesticides than young due to accumulated knowledge and experience of farming system. However, Lucas and Pabuayon (2011) observed that age has negative effects on farmers risk perception, while, Nadhomi *et al* (2013), concluded that age of household head was negatively related with adoption of soil and water conservation practice (a risk management tool used to mitigate risk of erosion).

Educational Level: Table 4 also reveals a disparity in the educational level of respondents across the zones as 81.1%, 63.7% and 54.0% of the respondents in coastal, rainforest and guinea savannah zones respectively affirmed that they had one form of formal education or the other. Considering the three zones, farmers in the coastal zone appear to have a higher level of formal education when compared with those from the other two zones. This high value may be as a result of the coastal nature of the zone. Adelekan (2009) asserted that coastal towns are often the most developed of Africa's urban centres. Thus by implication, they may have a high concentration of educational facilities. This high literacy level is expected to have a positive influence on crop farmers' knowledge of risk management tools as they are able to understand how to reduce or avoid risks. In a study by Egondi *et al* (2013), individuals with at least primary level education perceived higher levels of air pollution than those without primary level education. Education also increases the ability to source information from a variety of channels like print media. According to Thomas *et al*

(1990), education assists people receive, decode and understand information; hence they are able to make better decisions. Breukers *et al* (2009) also observed that higher level of education influences the level of understanding of a risk and this may indicate a higher knowledge of risk management tools to combat the risk. Crop farmers in the guinea savannah zone recorded the lowest rate of literacy levels when compared with the other two zones. Low level of formal education inhibits communication flow between information sources and farmers (Olujide & Oladele, 2011). It also limits farmers' ability to work efficiently as their capacities in adopting new production technologies that may help to reduce risks is limited. However, Wissink (2013) found out that higher education increases the willingness to take risks, while Mishra and Goodwin (2005); Acquah and Dadzie (2012); Roslan *et al* (2012) asserted that higher education leads to less risk aversion. Lower levels of risk aversion or high level of willingness to take risks may impact negatively on the use of risk management tools.

Farming experience: Concerning crop farmers farming experience, 7.1% of the respondents had between five to ten years experience, while 53.9% had between 11 to 30 years experience (Table 4). More than one third of crop farmers in the three zones (coastal – 36.2%, rainforest- 41.1%, guinea savannah- 38.6%) had more than thirty years farming experience. The mean farming experience of the respondents was 28.3 ± 12.1 years. As observed by Oladele (2008), experience contributes to farmers' ability to improve on their farm activities. Farmers with higher farming experience being seasoned farmers are usually exposed to a variety of risky situations on farms. They therefore have a higher level of understanding of risks and ways of reducing their risk exposure level. The high mean value should influence farmers' level of risk management positively.

Farm size: Table 4 indicates that in terms of farm size, 55.2 % of the respondents did not have more than 2 hectares. About thirty six percent of the crop farmers had between 2.1 and 5 hectares, while less than ten percent (9.3 %) had more than 5 hectares. The general mean was 3.4 hectares. This shows that majority of crop farmers in the study area operate at a subsistence level. The subsistence level of operation may indicate a low income status among the respondents and this is likely to have a positive influence on risk management. According to Ding *et al* (2010), income is positively correlated with farmers' attitude towards risks, while Wissink (2013) and Flaten *et al* (2005) concluded that larger farm size increases the willingness to take risk (lower risk aversion). Breukers *et al* (2009) also acknowledged that excess of resources leads to relaxation of controls in farming operations thus leading to a high

risk seeking behaviour. Hence, farmers with lesser income are usually more risk averse than wealthier ones (Dadzie & Acquah, 2012). This study confirms the observation of Adesoji *et al* (2006); Eyo and Asuquo, (2011); Saka *et al* (2011) that most farmers in the country operate on a small scale level. Furthermore, apart from the lower level of risk aversion usually associated with larger farm sizes, Teklewold and Kohlin (2010) opined that increased transaction costs of implementing risk management strategy for larger farm sizes may deter a farmer from utilising a risk management strategy. Majority of the respondents are also expected to have a greater perception of agricultural risks as Synder (2004) observed that lower income (which may be inferred from lower farm sizes), leads to a greater perception of risk.

Major crops cultivated: More than one third (36.5%) of the crop farmers cultivated cereals as their major crop as shown in Table 4. Legumes were planted as a major crop by only 5.5% of the respondents and this was only in the guinea savannah zone. Twenty seven percent of the crop farmers, had root and tuber as the major crop they cultivate and 20% of them cultivate fruit and vegetables. Thirteen percent plant cash crops such as cocoa as their major crop, and more than 90% of this group were in the rainforest zone. This implies that majority of cash crop farmers in the country are in the rainforest zone. Thus, farmers in the zone are expected to have a higher risk seeking attitude and a lower level of risk management due to the network of the type of crops predominant in the zone

Secondary farm enterprises: Table 4 shows that 12.6 % of the crop farmers rear cattle, while 19.7% and 33.9% rear sheep and goats respectively. Across the zones, no respondent in the coastal zone kept cattle, 1.7% of the respondents' reared sheep, while 5.2% kept goats. . However, 52.2 % and 72.6% of respondents in rainforest and guinea savannah respectively kept either sheep or goat or both. Thirty six percent of the respondents kept poultry, while only 2.3 % of them operated a fish farm as their secondary farm activity. Crop farmers' involvement in livestock production is a form of on farm diversification and this is an important tool in agricultural risk management. The high level of on farm diversification should influence farmers' level of risk management positively.

Table 4: Socioeconomic Characteristics of Crop Farmers

Variable Description	Coastal zone (N=58)		Rainforest (N=102)		Guinea Savanah (N=150)		Total (N=310)	
	Freq	%	Freq	%	Freq	%	Freq	%
Age								
20-30	0	0	4	3.9	3	2	7	2.3
31-40	3	5.2	11	10.8	21	14	35	11.3
41-50	15	25.9	15	14.7	45	30	75	24.2
51-60	28	48.3	27	26.5	64	42.7	119	38.3
60-70	10	17.2	35	34.3	15	10	60	19.4
Above 70	2	3.4	10	9.8	2	1.3	14	4.5
Mean	53.1		55.3		51.2		53.2 (10.5)	
Formal Educational Level								
No formal education	11	18.9	37	36.3	69	46	117	37.7
Primary	27	46.6	40	39.2	61	40.7	128	41.3
Secondary	17	29.3	21	20.6	19	12.7	57	18.4
NCE/OND	1	1.7	2	2	1	0.6	4	1.3
HND/B.Sc	2	3.5	2	2	0	0	4	1.3
Farming experience								
5 - 10 years	0	8.6	10	9.8	7	4.7	17	5.5
11 - 20 years	5	25.9	25	24.5	36	24	66	21.3
21 - 30 years	5	29.3	25	24.5	49	32.7	79	25.5
31 - 40 years	18	34.5	19	18.6	47	31.3	84	27.1
Above 40 years	30	1.7	23	22.5	11	7.3	64	20.6
Mean	25.9		30.3		27.9		28.3	
Farm size								
0.1 - 2 ha	55	94.8	60	58.8	56	37.3	171	55.2
2.1 - 5 ha	3	5.2	34	33.3	73	48.7	110	35.5
Above 5 ha	0	0.0	8	7.9	21	14.0	29	9.3
Mean	1.5		3.3		5.4		3.4	
Major crop cultivated;								
Cereals	20	34.4	35	34.3	59	39.4	113	36.5
Legumes	0	0.0	0	0.0	17	11.3	17	5.5
Roots and Tubers	16	27.7	25	24.5	45	30.0	86	27.7
Cash crops	4	6.9	35	34.2	0	0.0	39	12.6
Fruits and vegetables	18	31.0	7	12.0	29	19.3	63	20.3
Secondary Farm enterprises*								
Plus Cattle	0	0	7	15.7	32	21.3	39	12.6
Plus Sheep	1	1.7	10	9.9	50	33.3	61	19.7
Plus Goat	3	5.2	43	42.3	59	39.3	105	33.9
Plus Poultry	34	6.9	35	34.3	44	29.3	113	36.5
Plus Fishery	3	5.2	3	2.9	1	0.7	7	2.3

Source: Field Survey, 2011. *Multiple responses

Membership of organization: Figure 9 shows that in terms of membership of organizations, less than one-sixth of crop farmers in the three agro-ecological zones did not belong to any organization. More than half of the respondents in the three zones (coastal – 51.7%, rainforest- 64.7% and guinea savannah- 64.7%) belonged to only one organization. In coastal zone, only 32.8% affirmed that they were members of two or more organizations, while in rainforest and Guinea savannah zones, 19.6% and 20.6% respectively belonged to more than one organization. Moreover, one fifth (20.6%) of the respondents as shown in Figure 10 affirmed that they were either leaders or executives in their organizations. This shows that majority of crop farmers in Nigeria are inclined towards social networks and this is likely to have positive effects on their level of risk management. Membership of farmers associations creates an avenue for farmers to reduce their risks (Shehu *et al*, 2010). Aye and Oji (2007) also observed that membership of a solidarity group enhances farmers' access to credit and other production inputs such as fertilizer, chemicals and improved seeds. They are also able to share information with one another thus improving their level of risk management. According to Tekleword and Kohlin (2010), membership of organization is a form of social capital, which also acts as a forum for sharing experience and exchanging information about market behaviour.

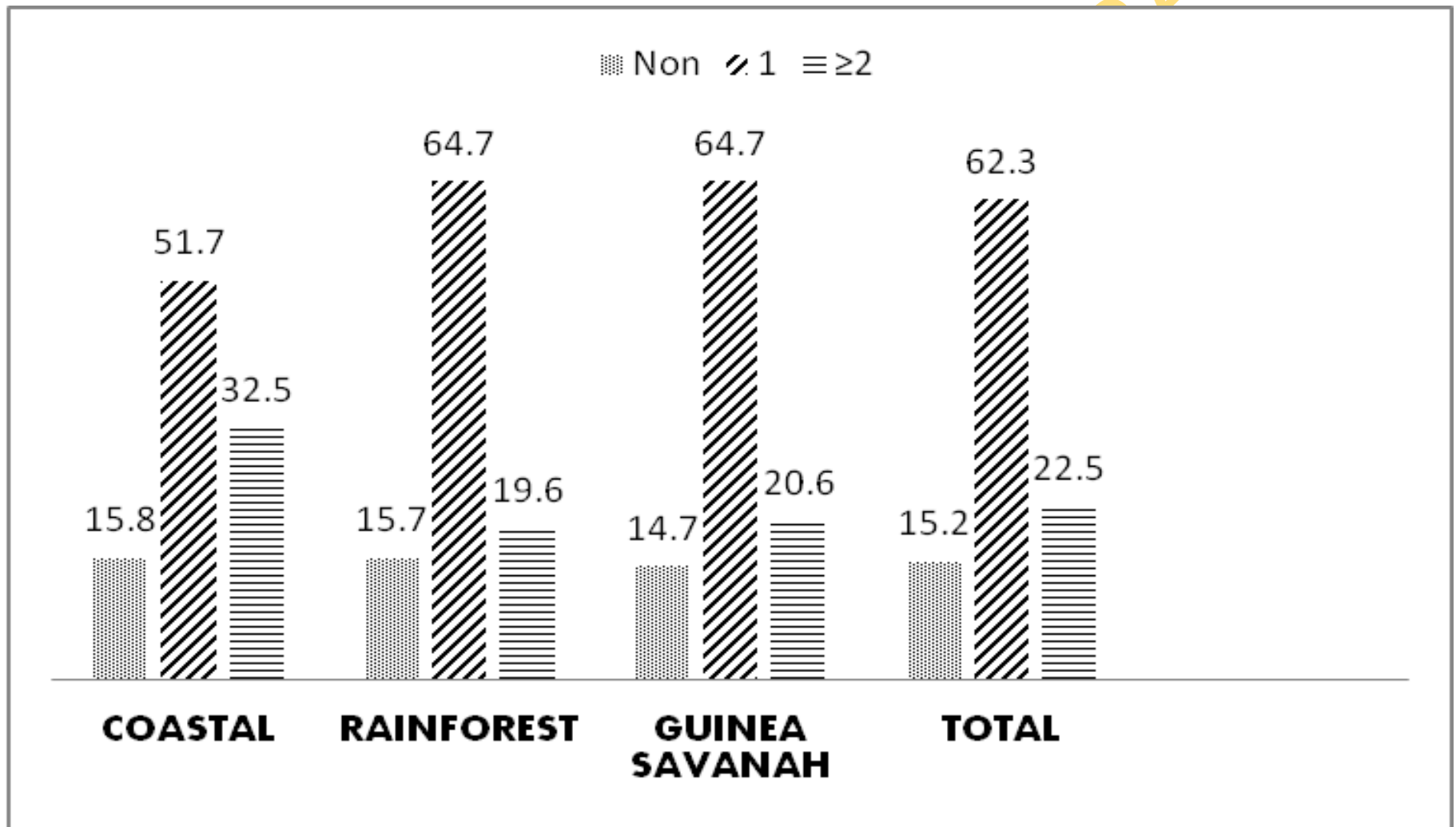


Figure 9: Respondents' membership of organisation

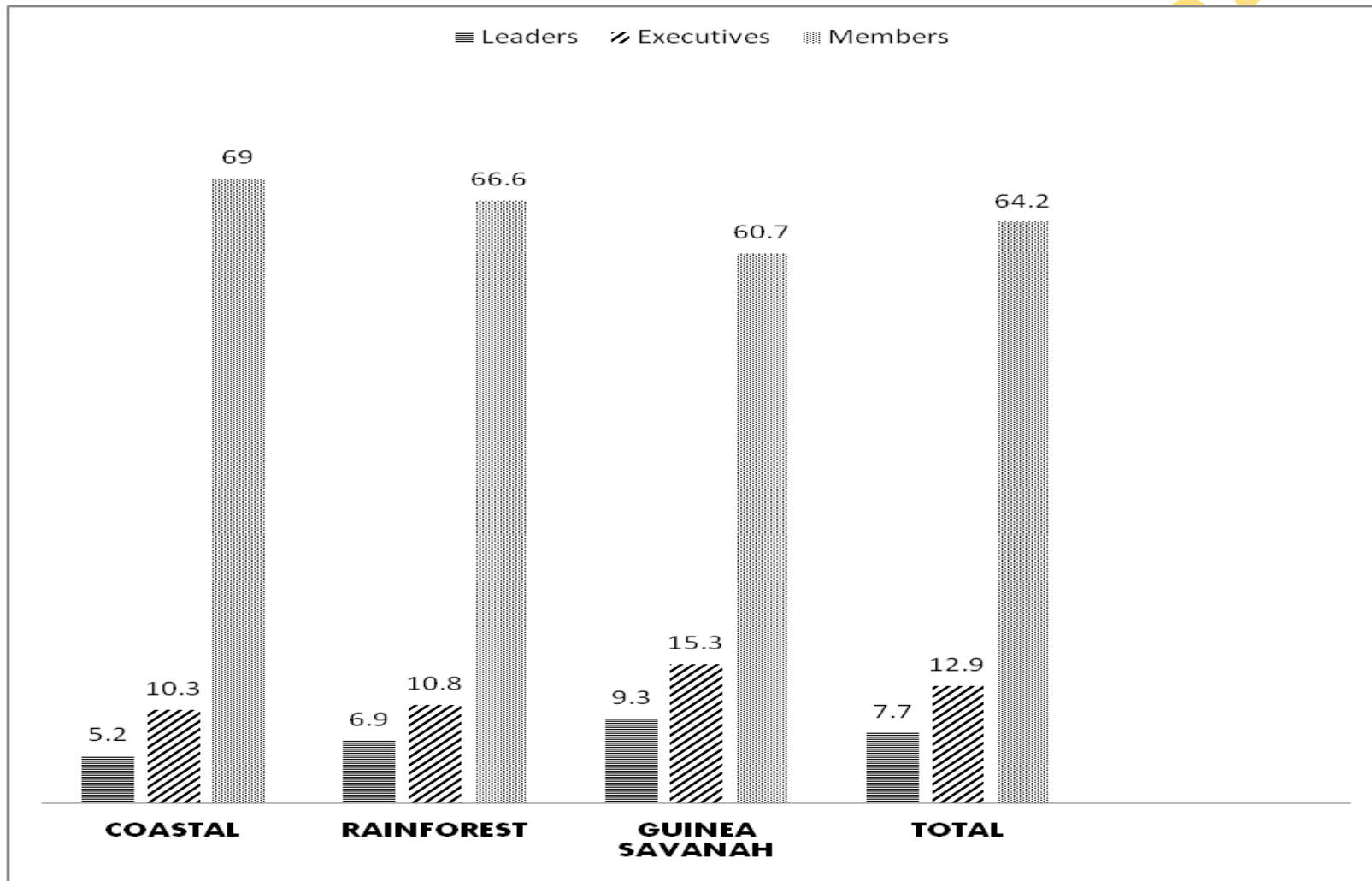


Figure 10: Respondents' level of participation in organizational activities

Off farm occupation: According to Babatunde (2008), farmers get income from both on-farm and off-farm activities. As revealed in Figure 11, majority of the respondents (67.1) indicated that farming was their only occupation. The presence of other sources of income enhances the risk bearing ability of farmers (Ayinde, 2008) and this reduces their level of risk management. Also according to Adenegan *et al* (2013), off farm labour results in farm inefficiency. Hence, since majority of the respondents are full time farmers, they should have a higher level of agricultural risk management. In a related study by Teweldemedhin and Kafidii (2009), 71.4% of the commercial farmers had off farm income.

Farm ownership: Majority (97.7%) of the crop farmers affirmed that in terms of farm ownership, their farms were being operated under a sole proprietorship or was family owned (Fig 12). Only 2.3% indicated that their farms operated under a partnership arrangement. None of the farms sampled was being operated under a company name. This implies that some unique benefits such as loan acquisition from formal institutions achieved by farms operated as a legal entity would not be enjoyed by most of the respondents. Farm ownership type may affect the supply or availability of labour, as most corporate entities will usually have a constant supply of labour. The predominance of family/sole proprietorship owned farms among the respondents may indicate that labour may not be readily available at all time.

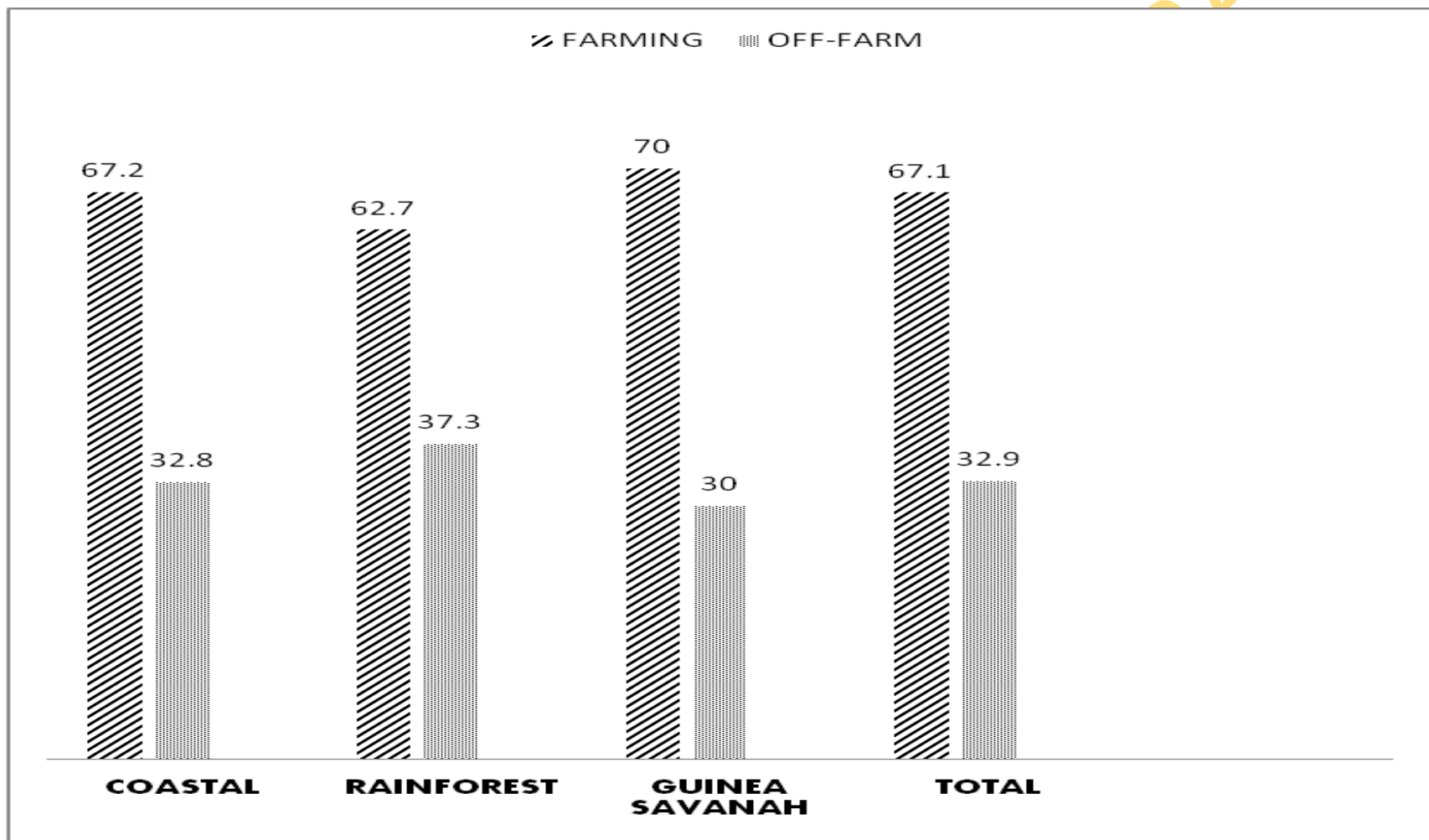


Figure 11: Respondents' off-farm occupation

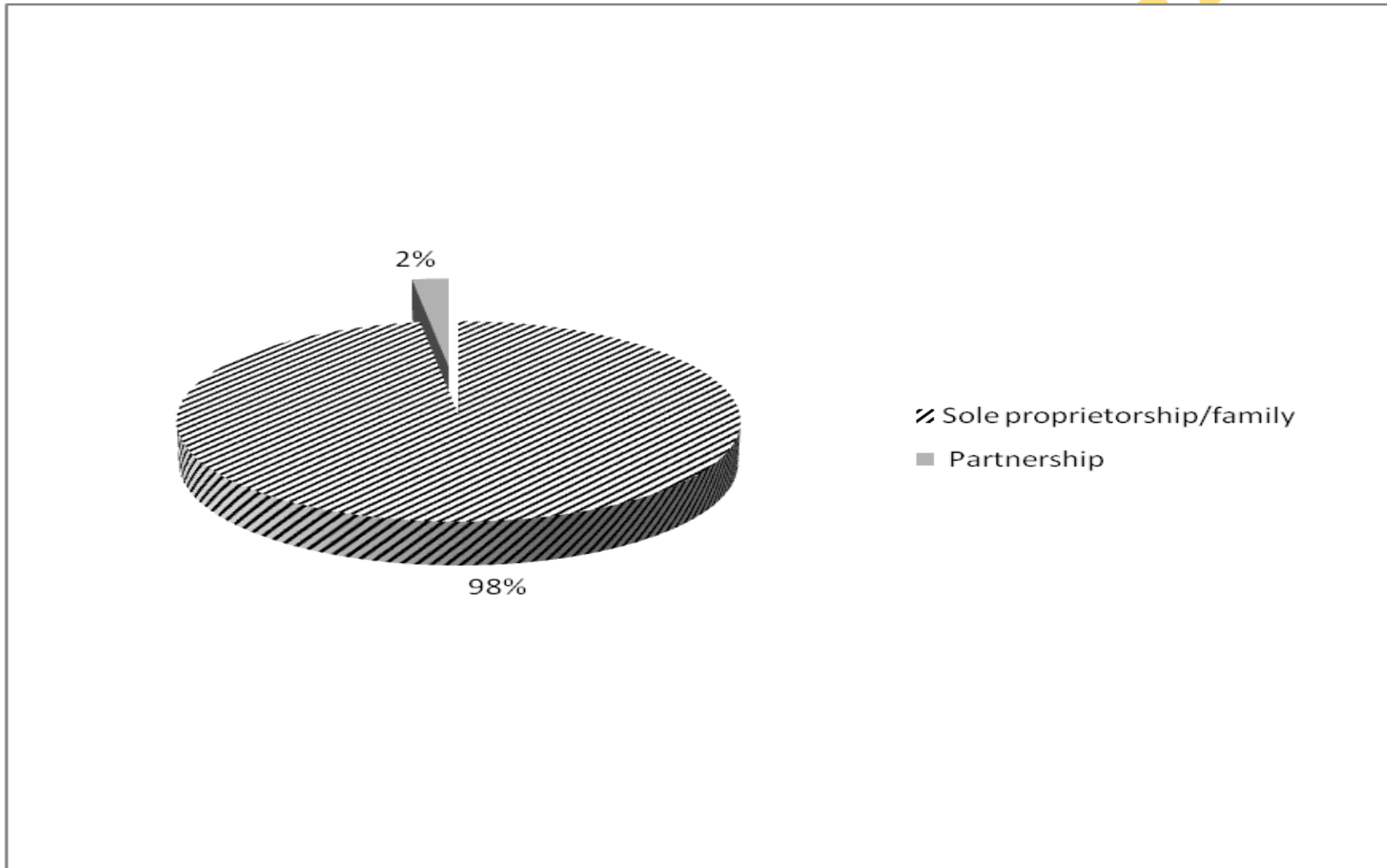


Figure 12: Farm ownership structure

Labour availability: Access to farm labour is an important element in agricultural production as inability to hire labour when necessary will limit farm yields. Figure 13 shows that 64.2 % affirm that farm labour was readily available. Thirty percent of the respondents observed that farm labour was sometimes available when it is needed, while only about 7.1 % affirmed that it is either rarely available or not available when it is needed. This means that more than one-third (36.8%) of the respondents may sometimes, rarely or never have farm labour when needed. This may be an indication of the farmers' involvement in off farm occupation (32.9% in figure 11), as observed by Mishra and Goodwin (2004) involvement in off farm occupation usually decreases farm efficiency. Lack of labour affects farming activities negatively. For instance, shortage of labour (a type of social risk) leads to increasing cost of labour and this further exposes farmers to financial risks.

Labour sourcing: Majority of the respondents (76.5) use family and friends as their major source of farm labour, while only 16.5 % hire labourers (Figure 14). Heavy reliance on hired labour increases total production costs (Okwoche *et al*, 2012). The reliance on family and friend for farm labour suggests that there will be a harmonious working relationship (which usually coexists between family and friends) and this improves level of risk management. Ojo (2005) also found that labour in agricultural production is usually dominated by family labour.

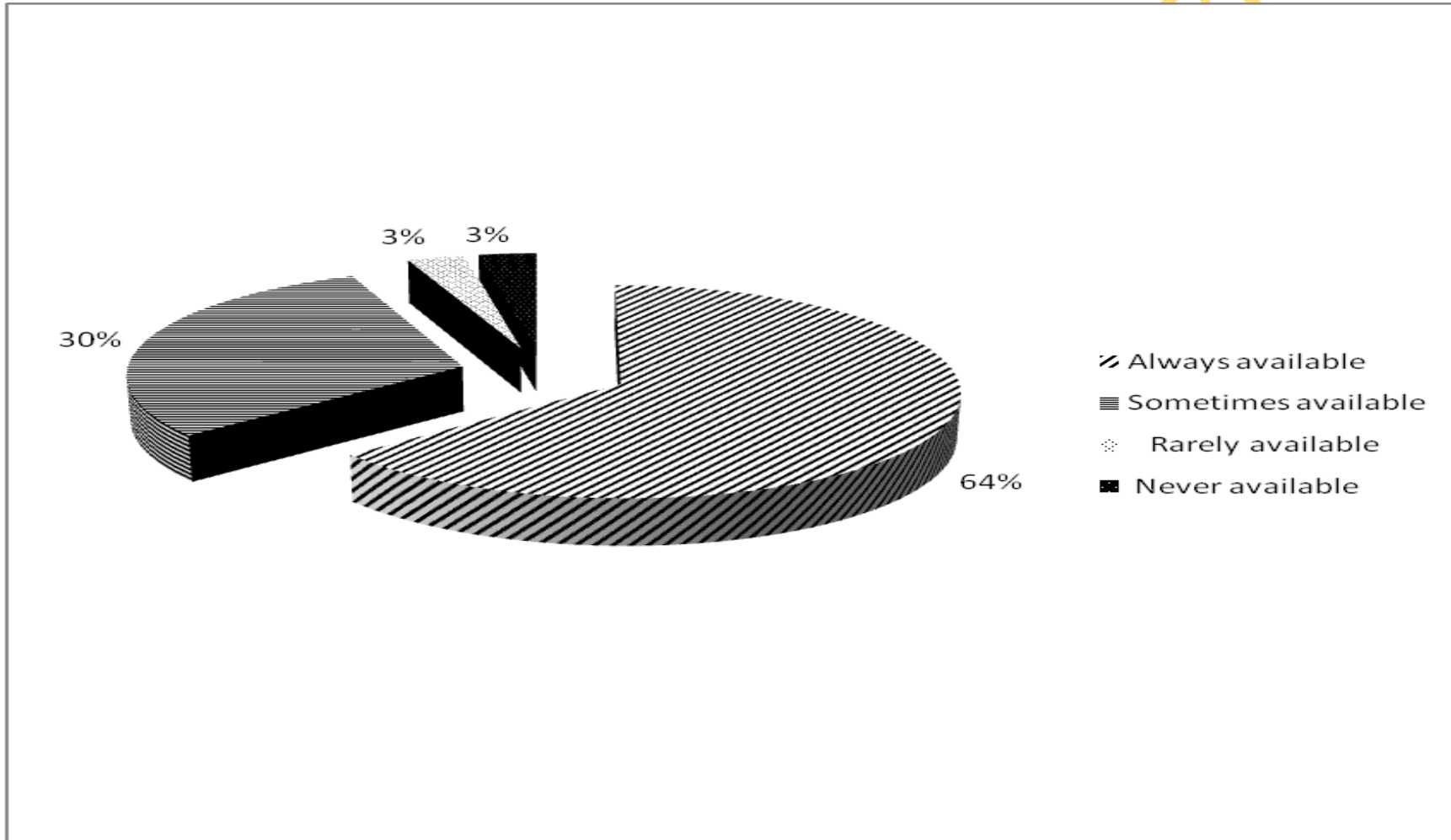


Figure 13: Labour availability among respondents

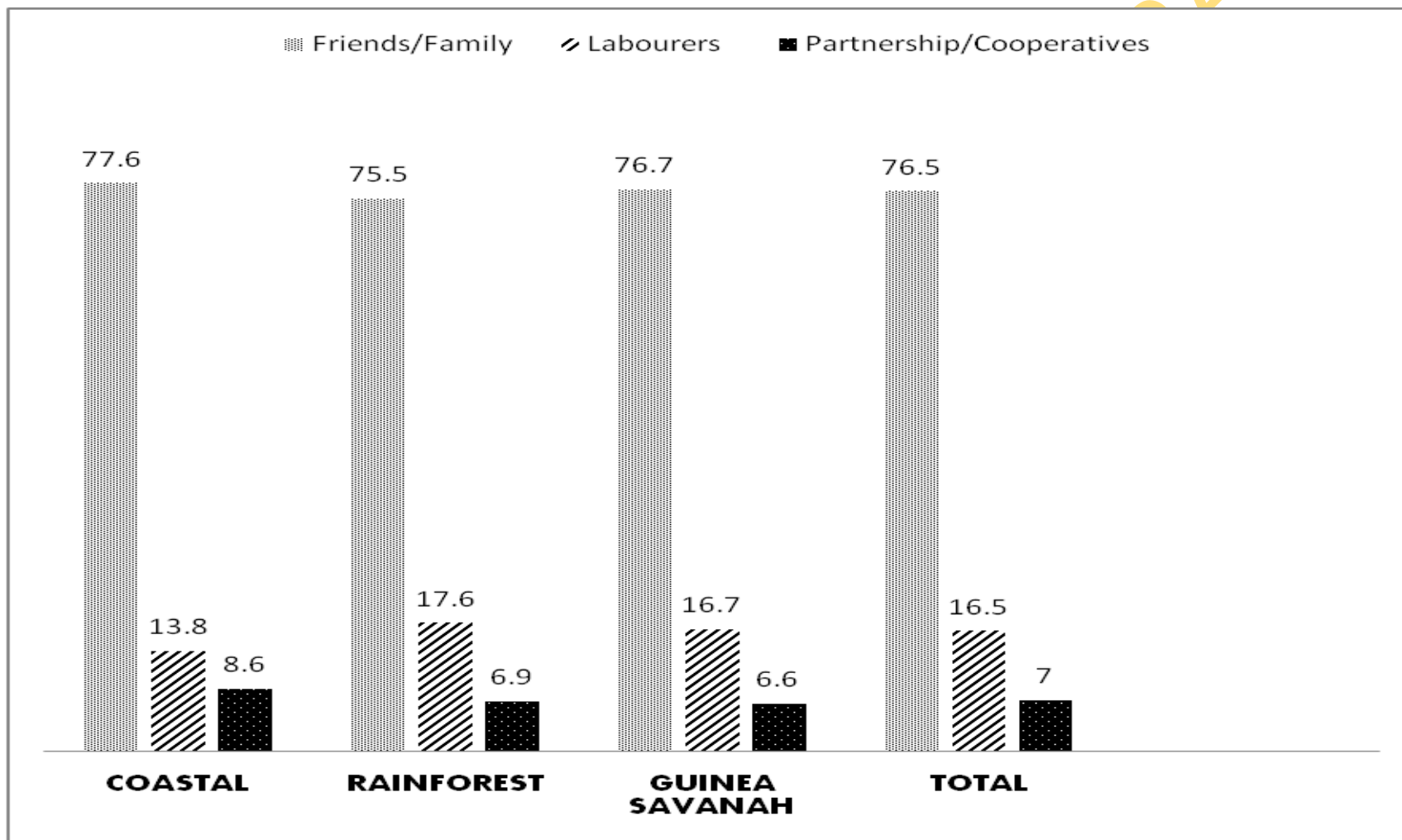


Figure 14: Major source of labour

Marketing channel: As revealed in Figure 15, most of the respondents (82.3%) use middlemen as their major marketing channel. Less than 6% use processing industry, while about 12.2% affirmed that their major marketing outlet is through direct sales to consumers or individuals. Heavy reliance on middlemen may erode a larger percentage of farmers' profit thus reducing cash-flow. It also lowers the bargaining power of farmers and increases the probability of reduced sales due to relationship strain between farmers and middlemen and this increases farmers' level of marketing risk exposure. As observed by Nwankwo *et al* (2009), marketing problems and activities of organized middlemen may limit farmers' income. Farmers choice of marketing channel is often a function of the delay which occurs between when farm produce are sold and when payment are made through the marketing channel (Ogunleye and Oladeji, 2007). This delay is an indication of risk and the shorter the delay, the lower the risk and the higher the chance that farmers will prefer the particular channel over others.

Market accessibility: Figure 16 shows that market was highly accessible to 69.1 % of the respondents. Thirty percent observed that it was moderately accessible, while 0.6% affirmed that it was rarely accessible. This finding may indicate that respondents utilise marketing risk management strategies that ensure that farm products are sold. Supply of farm products to several markets is a risk mitigating strategy (Okereke, 2012). Moreover, good market access also stimulates farmers to improve on their risk management capacities so as to increase their yield (Wissink, 2013).

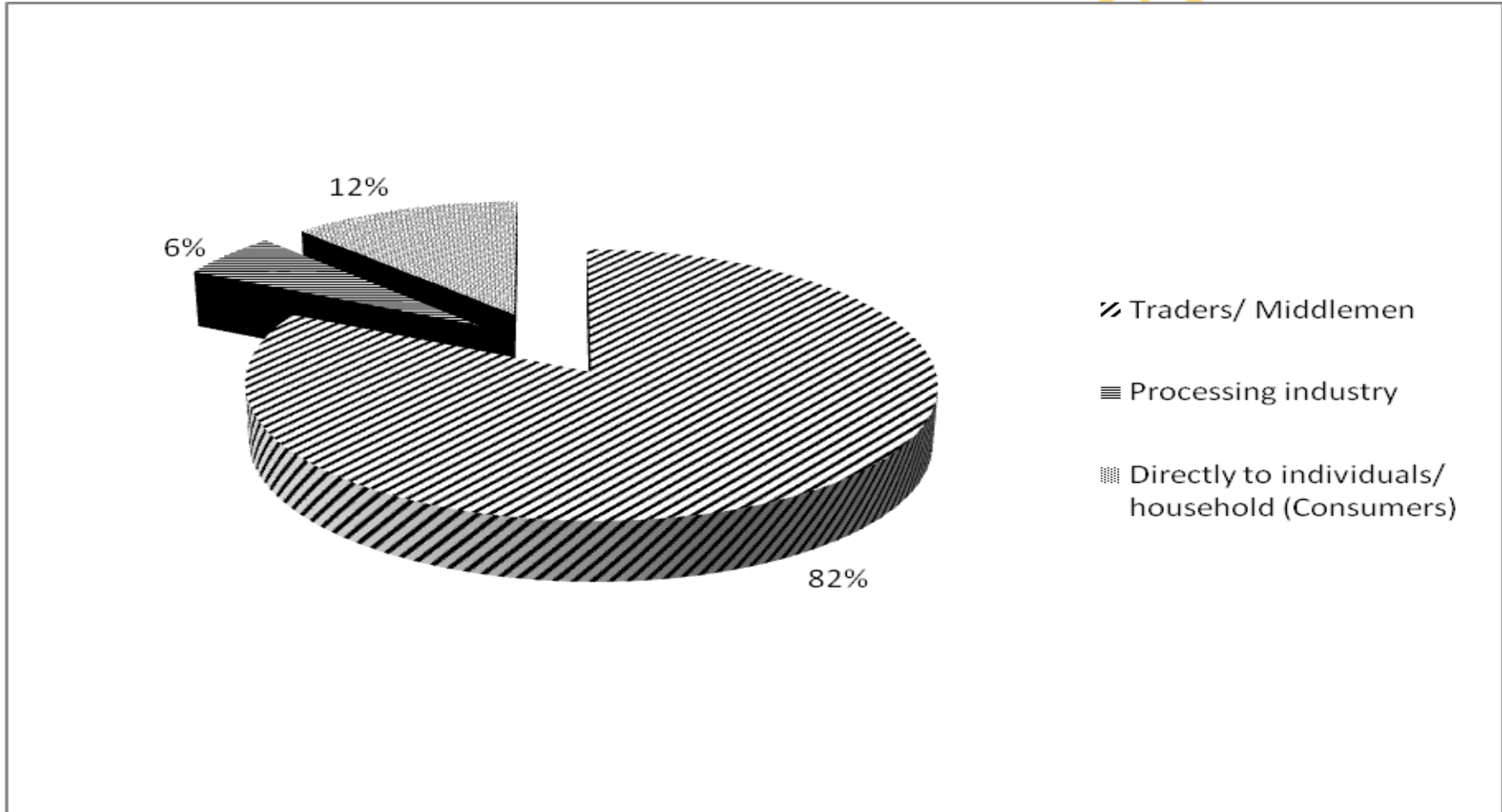


Figure 15: Major marketing channel

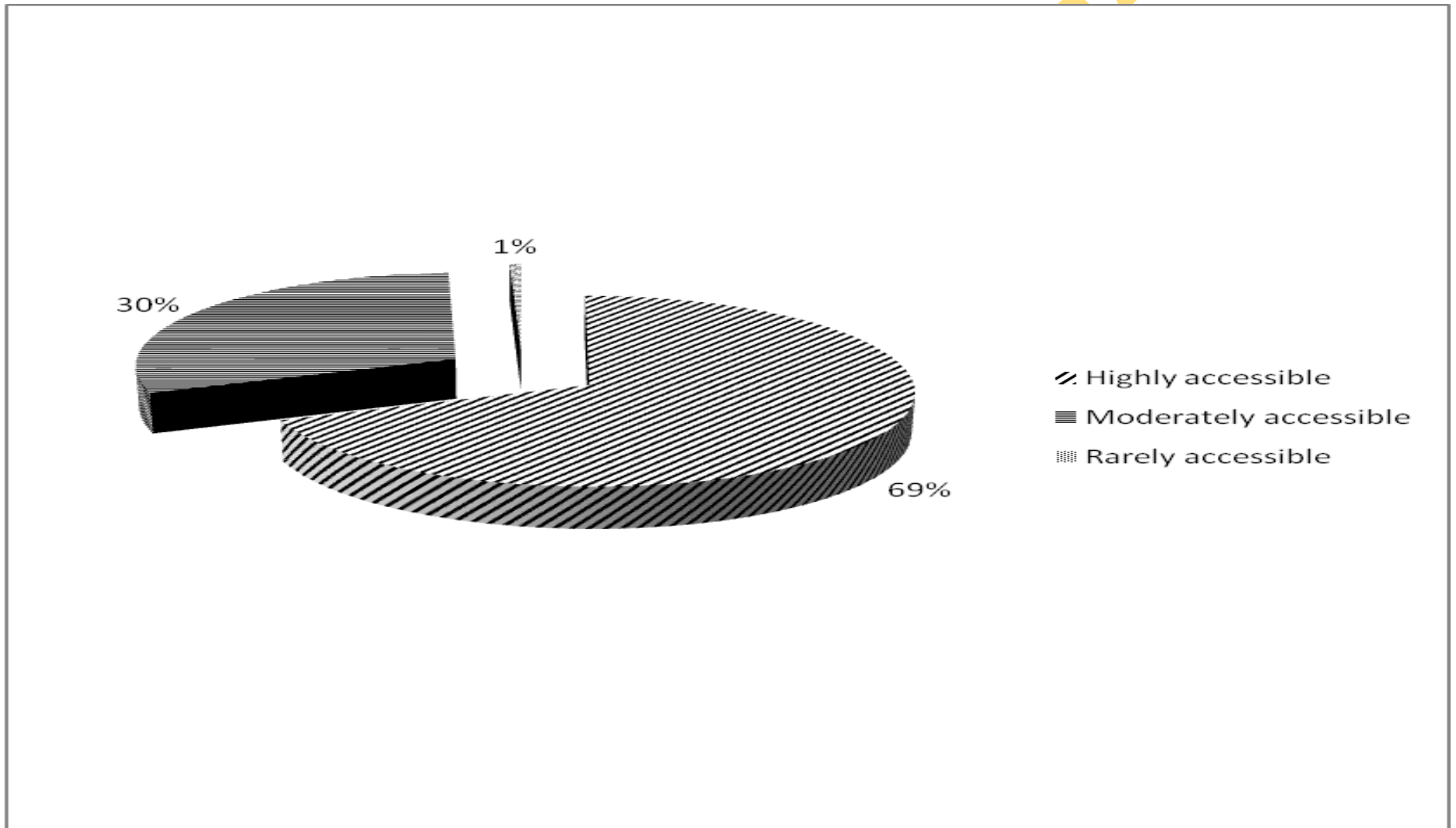


Figure 16: Market accessibility

Section 5.1.2: Credit and information sources of crop farmers

Credit sources: As indicated in Table 5, personal savings, cooperatives and friends/family were ranked as the first, second and third most important sources of credit by the respondents. Only 4.8% of the respondents affirmed that they sourced credit from Nigerian Agricultural Cooperative and Rural Development Bank (now Bank of Agriculture). This implies that the use of insurance as a risk management tool may be unpopular among the respondents as bank of agriculture makes the purchase of insurance a necessary criterion for obtaining loans. Sources such as microfinance banks, commercial banks and private money lenders were not also popular among the respondents. Infact less than 7% of the crop farmers obtained loan from each of the three sources of credit. According to Gana *et al* (2009), problems encountered by farmers during loan acquisition such as the need for guarantors and collaterals by bank of agriculture as well as the interest charges by commercial banks affect their use. Also, Udoh (2005) observed that formal credit sources have scared many crop farmers due to hindrances surrounding their usage. This study confirms the findings of Ayinde (2008); Adebayo and Adeola (2008); Okwoche *et al* (2012) that informal credit sources are more popular among farmers. Availability of credit is positively related with farmers' perception of risk (Lucas and Pabuayon, 2011). Every activity in agricultural production is influenced by the size and application of funds (Okereke, 2012). As such, access to credit enhances the liquidity of farmers and this enables them afford risk reducing strategies such as improved seedlings.

Sources of Information: According to Nwankwo *et al* (2009), farmers seek information from various sources in order to reduce risk and uncertainty. As shown in Table 5, crop farmers in the study area ranked friends/family as their most important source of information on agricultural risk management. This was followed by extension agents, electronic media and print media respectively. This means that the basic source of information on agricultural risk management is through friends/family members. The implication is that for any agricultural risk management programme to be successful in the study area much emphasis should be placed on dissemination of information through fellow crop farmers. The high ranking of friends/family corroborates the findings of Nwankwo *et al* (2009) that relevant and reliable information from close relatives is regarded as more authentic than information from outside sources. Banmeke and Omoregbee (2009) also observed that friends and family was an important source of information in their study.

Table 5: Credit and sources of information of crop farmers

Variable	Coastal			Rainforest			Guinea Savanah			Total		
	Freq	Mean	Rank	Freq	Mean	R	Freq	Mean	R	Freq	Mean	R
Credit source*												
Savings	58	2.50	2nd	101	2.54	1st	147	2.53	2nd	306	2.53	1st
Friends/family	49	1.87	3rd	91	2.23	3rd	131	1.97	3rd	271	2.02	3rd
Cooperatives	34	2.74	1st	43	2.28	2nd	129	2.55	1st	206	2.52	2nd
NACRDB	2	1.50	4th	3	1.67	4th	10	1.90	4th	15	1.69	4th
Microfinance banks	3	1.33	5th	4	1.25	6th	6	1.83	5th	13	1.47	5th
Commercial Banks	1	1.00	7th	1	1.00	7th	3	1.33	7th	5	1.11	7th
Moneylenders	3	1.00	6th	4	1.25	5th	14	1.64	6th	21	1.30	6th
Sources of information *												
Family/ friends	50	2.53	1st	93	2.20	1st	136	2.21	1st	279	2.31	1st
Extension agents	34	2.20	2nd	60	2.19	2nd	101	2.01	2nd	195	2.13	2nd
Print media	25	1.08	4th	16	1.88	4th	33	1.97	4th	74	1.64	4th
Electronics	37	1.68	3rd	54	2.09	3rd	86	2.04	3rd	176	1.94	3rd

Source: Field Survey, 2011. *Multiple responses

Section 5.2: Farmers perceived types of agricultural risks

Production risks: Table 6 reveals that in the coastal zone, almost all the respondents (96.6%) indicated that flood was a risk to them. The incidence of pests and diseases was also indicated by majority (93.1) of the crop farmers. However only one quarter (25.9%) affirmed that drought was a source of risk. The coastal nature of the zone may be responsible for the high ranking of flood in the zone, as Adeoti *et al* (2010) observed that flooding is a key problem in the coastal areas. Majority of the respondents in the rainforest zone also indicated flood (86.3%) and pests and diseases (90.2%) as major risks in the zone. In the guinea savannah zone, almost all respondents (96.0%) also indicated that drought was a type of risk experienced and this may be linked to the vegetation of the zone. According to Etuonovbe (2011), Nigeria's climate is characterised by strong latitudinal zones which becomes progressively drier as one moves northwards from the coast. However the use of low quality seedling by almost half of the respondents (49.0%) indicates that much still needs to be done on farmers' awareness and access to high quality seedlings.

Marketing risks; across the zones, majority of the sampled crop farmers (82.8% in coastal; 89.2% in rainforest and 84.7% in guinea savannah) indicated that volatility in output price was a type of risk. As observed by Boehlje and Brent (2007), output price volatility has increased in recent years. Many respondents also rated volatility in input price (84.5% in coastal; 86.3% in rainforest and 80.7% in guinea savannah) and market failure (82.8% in coastal; 87.5 % in rainforest and 77.3% in guinea savannah) as types of risks. Market failure occurs when farmers are not able to dispose their products (Salimonu & Falusi, 2009). Market failure as well as volatility in input and output prices significantly affects farm income. According to Druilhe and Barreiro-Hurlé (2012), failures in agricultural input markets are common in developing countries and are a major constraint to productivity growth, while Sharma and Kumar (2001) affirmed that price instability has macroeconomic implications. Furthermore, more than half of the respondents (62.9%) acknowledged that loss of bargaining power (in selling output) was also a type of risk they encounter. This implies that much of farm income may be eroded due to lack of adequate negotiation skills, although farmers may also deliberately agree to customers price due to lack of adequate post-harvest facilities. Small scale farmers require improved bargaining power to enhance their productivity (Okwoche *et al*, 2012).

Financial risks: Inadequate cash flow was a type of risks to most of the respondents (94.2%) as shown in Table 6. More than three-quarters (88.4%) of the crop farmers also affirmed that

access to credit was a concern in terms of risk. However less than half of the respondents (49.7%) acknowledged that changes in interest rate was a type of risk and this implies that majority of the crop farmers do not patronize credit sources that are interest based.

Social risks: More than three-quarters of the sampled respondents indicated that variability in labour costs (84.5% in coastal; 91.2% in rainforest and 79.3% in guinea savannah); lack of labour (84.5% in coastal; 89.2% in rainforest and 64.7% in guinea savannah) and ill-health of farmer/farm employee (86.2% in coastal; 93.1% in rainforest and 87.3% in guinea savannah) were types of risks they face. According to Ulimwengu (2009), health impediments affect farmers' agricultural efficiency negatively. This may be through loss of labour, productive adults' knowledge, and assets to cope with illness (World Bank, 2007). Concerning the incidence of fire outbreaks, a larger percentage of farmers (90.0%) in the guinea savannah zone rated it as a type of risk and this may be due to the dry nature of the zone.

Furthermore, using the ranking in Table 6, the major types of risks in the study area were; inadequate cash flow (94.2%), occurrence of pests and diseases (91.3%), sickness/ill health of farmer and labourers (89.0%), lack of access to credit (88.4%), volatility in output price (85.8%) and variability in labour costs (84.2%).

Table 6: Farmers' distribution on sources and types of agricultural risks

	COASTAL		RAINFOREST		GUINEA SAV.		TOTAL		RANK
	Freq	%	Freq	%	Freq	%	Freq	%	
Production risks									
Drought	15	25.9	83	81.4	144	96.0	242	78.1	12th
Excessive rainfall/flood	56	96.6	88	86.3	116	77.3	260	83.9	7th
Pests and Diseases	54	93.1	92	90.2	137	91.3	283	91.3	2nd
Shortfall in production	40	69.0	87	85.3	132	88.0	259	83.5	8th
Limited knowledge about usage of chemicals	37	63.8	85	83.3	129	86.0	251	81.0	10th
Rainfall fluctuations	33	56.9	74	72.5	112	74.7	219	70.6	15th
Low quality seedlings	27	46.6	52	51.0	73	48.7	152	49.0	27th
Marketing risks									
Volatility in inputs costs	49	84.5	88	86.3	121	80.7	258	83.2	9th
Volatility in output price	48	82.8	91	89.2	127	84.9	266	85.8	5th
Market failure	41	70.7	73	71.6	104	69.3	218	70.3	16th
Inaccessibility to markets	35	60.3	57	55.9	87	58.0	179	57.7	24th
Consumer Preference	33	56.9	58	56.9	90	60.0	181	58.4	23rd
Loss of bargaining power	35	60.3	64	62.7	96	64.0	195	62.9	22nd
Inefficient storage/Perishability	42	72.4	74	72.6	101	71.3	217	70.0	17th
Avialability of transport facilities	39	67.2	68	66.7	99	66.0	206	66.5	19th
Variability in transport costs	37	63.8	70	68.6	103	68.7	210	67.7	18th
Financial risks									
Access to credit	53	91.4	89	87.3	132	88.0	274	88.4	4th
Inadequate cash flow	56	96.6	97	95.1	139	92.7	292	94.2	1st
Default risk	37	63.8	61	59.8	104	69.3	202	65.2	21th
Changes in interest rate	26	44.8	57	55.9	71	47.3	154	49.7	27th
Social risks									
Lack of labour	49	84.5	91	89.2	97	64.7	237	76.5	13th
Variability in labour costs	49	84.5	93	91.2	119	79.3	261	84.2	6th
Damage to equipment	43	74.1	73	71.6	107	71.3	223	71.9	14th
Sickness/ill health of farmer/labourer	50	86.2	95	93.1	131	87.3	276	89.0	3rd
War/Conflict	37	63.8	66	64.7	102	68.0	205	66.1	20th
Theft	33	56.9	57	55.9	84	56.0	174	56.1	25th
Fire outbreaks	39	67.2	72	70.6	135	90.0	246	79.4	11th
Contracting risk	36	62.1	55	53.9	74	49.3	165	53.2	26th

Source: Field Survey, 2011

Section 5.3: Farmers perceived level of risk exposure

Farmers perceived level of risk exposure is a function of the probability of occurrence of risks and the ability of the risks to disrupt business significantly. According to Zinn (2009), level of risk exposure is the product of likelihood of identified risks to occur and consequence (impact) of the identified risks. Likelihood refers to the probability of the risk occurring, while consequence/impact refers to the severity or potential loss expected.

5.3.1 Likelihood of occurrence of agricultural risks:

Likelihood of occurrence of agricultural risks refers to the probability of risks occurring. It is the chance that a potential or exposure event will occur. Table 8 indicates that among the farmers, financial risks were ranked first in terms of likelihood of occurrence of agricultural risks. As shown in Table 7, respondents ranked access to credit and inadequate cash flow as their most critical financial risks. Lack of credit is a key problem in agricultural production (Ogunniyi *et al* 2011) and it often leads to inadequate cash flow/shortage in working capital. As observed in Table 7, respondents in the guinea savannah zone were the most prone to the two financial risks. During the Focus Group Discussion (FGD), crop farmers in that zone stated that;

“access to credit is a major problem of agricultural production, which occurs every time and affects their level of production adversely”.

Across the zones, crop farmers in the rainforest zone(13.79) were the least vulnerable to financial risks. This may be a reflection of the type of crops grown by farmers as the zone had the highest number of cash crop farmers as shown in Table 4.

As observed in Table 8, production risks were perceived to be the second most important source of agricultural risks in terms of likelihood of occurrence by the respondents. This may be due to the fact that most agricultural production risks are dependent on nature or biological processes. Respondents in the three zones ranked issues related to rainfall (flood and fluctuations in rainfall pattern) as well as occurrence of pests and diseases as their major production risks. The mean value in Table 7 shows that the degree of likelihood for the occurrence of flood was greater in the coastal zone than in the other two zones. This means that crop farmers in the coastal zone are the most prone to floods. According to Adeoti *et al* (2010), one of the key environmental problems of coastal areas is flooding. During the FGD, farmers in the zone also explained that flood usually occurs every year.

Flood usually occurs every year; the time is just what we cannot predict perfectly as sometimes it comes earlier than expected.

The likelihood of occurrence of pests and diseases was also ranked high and this corroborates the findings of Okuneye (2002) that there is a high incidence of pests and diseases in the country. Apart from incidence of pests and diseases, farmers in the guinea savannah zone had higher rates of occurrence of drought. According to Obioha (2007), drought induced desertification is regarded as the most pressing environmental problem in the dry-land part of Nigeria. Generally, in terms of likelihood of production risks across the zones, crop farmers in the rainforest zone were the least vulnerable (89.34), while those in the guinea savannah zone were the most vulnerable (91.31). This implies that farmers in the guinea savannah zone face more agricultural production risks than the other two zones.

Respondents ranked marketing risks as their third source of agricultural risks in terms of likelihood of occurrence as shown in Table 8. The key marketing risks as shown in Table 7 were fluctuations in inputs costs and output prices, and perishability of farm produce. According to Odoemenem and Adebisi (2011) availability of major farm inputs at the appropriate time and affordable price is a problem in the country, while Ikpi and Mordi (2006) also observed that inadequacies in the supply and delivery of farm inputs as well as poor post-harvest facilities (leading to increased post harvest losses) hinder significant breakthrough in agricultural production. Respondents however had lower levels of likelihood means for lack of transport facilities, and harvests not meeting customers' standard (consumer preference). As explained during the FGD, crop farmers observed thus:

about consumer preference, it does happen but not on all our harvests. When some of the harvests do not meet our buyers' expectations, they complain and try to bring the price down. Another time they have a domineering power on price is when there is market failure or when your products are highly perishable. At that time you don't have option, you are willing to push your harvests as soon as possible so as to prevent loss.

Across the zones, the order of vulnerability to marketing risks was from coastal (28.03) to rainforest zone (28.05) and it was highest in guinea savannah zone (28.35). This order indicates that as we move towards the savannah part of the country agricultural marketing risks increase.

Social risks were ranked fourth in terms of likelihood of occurrence of agricultural risks as revealed in Table 8. As shown in Table 7, ill health, low access to labour and increasing labour costs were the key social risks among farmers. The mean age of the farmers' (53.2 years) may be responsible for the high occurrence of ill health since farming is physically demanding. The increasing rate of youth migration to urban centres for off farm occupation has also affected labour availability, thereby increasing wage rate. According to crop farmers in the rainforest zone:

“the choice of farming as a job is no longer attractive to our youths, we the aged ones are left to farm. How much work can we do at this age? Imagine i am above 60 years can you compare me with a 20 or 30 year old man? Of course the energy is almost gone”.

In terms of labour costs, crop farmers in the coastal zone observed thus:

“we usually source labour from republic of Benin, and their price is usually very high”.

The likelihood of occurrence of social risks was highest in the rainforest zone (24.16). Respondents in the guinea savannah zone however had higher rate for the occurrence of fire outbreaks. This may be due to the nature of vegetation in the zone as Afolayan (1978) observed that annual burning (fire outbreaks) occurs in most tropical savannah grasslands.

Generally across the zones, in terms of likelihood of occurrence of agricultural risks, the rainforest zone (89.34) was the least vulnerable, while the guinea savannah zone (91.31) had the highest level of vulnerability.

Table 7: Means of respondents' likelihood of occurrence of agricultural Risks

	COASTAL	RAINFOREST	GUINEA SAV	TOTAL
Production risks				
Drought	2.58	3.10	4.01	3.23
Excessive rainfall/flood	4.51	3.80	3.53	3.95
Pests and Diseases	4.34	4.15	4.20	4.23
Shortfall in production e.g. Reduction in soil fertility	3.05	3.03	3.17	3.08
Limited knowledge about usage of chemicals/fertilizers	2.76	2.93	3.11	2.93
Rainfall fluctuations	3.10	3.14	3.02	3.09
Low quality seedlings	3.05	3.19	3.23	3.16
Production Total	23.39	23.34	24.27	23.67
Price/marketing risks				
Volatility in inputs costs	3.69	3.80	3.87	3.79
Volatility in output price	3.60	3.62	3.73	3.65
Market failure	3.07	3.15	3.21	3.14
Inaccessibility to markets	2.98	2.81	2.90	2.90
Consumer Preference	2.88	2.77	2.56	2.74
Loss of bargaining power	3.06	3.15	3.19	3.13
Inefficient storage/Perishability	3.44	3.32	3.38	3.38
Availability of transport facilities	2.18	2.39	2.44	2.34
Variability in transport costs	3.13	3.04	3.07	3.08
Marketing Total	28.03	28.05	28.35	28.14
Financial risks				
Access to credit	4.30	4.03	4.40	4.24
Inadequate cash flow	4.14	3.98	4.27	4.13
Default risk	3.20	3.01	3.48	3.23
Changes in interest rate	2.86	2.77	2.72	2.78
Financial Total	14.50	13.79	14.87	14.39
Social/human risks				
Lack of labour	3.62	3.71	3.21	3.51
Variability in labour costs	3.41	3.47	3.19	3.36
Damage to equipment	3.00	3.08	3.06	3.05
Sickness/ill health of farmer/labourer	3.44	3.52	3.32	3.43
War/Conflict	2.59	2.52	2.63	2.58
Theft	2.86	2.77	2.81	2.81
Fire outbreaks	1.98	2.43	3.15	2.52
Contracting risk	2.70	2.66	2.45	2.60
Social Total	23.60	24.16	23.82	23.86
Total	89.52	89.34	91.31	90.06

Source: Field Survey, 2011.

Table 8: Ranking of risk sources in terms of likelihood of occurrence

	Production	Marketing	Financial	Social
Likelihood Means	23.67	28.14	14.39	23.86
Risk number	7	9	4	8
Standard scores(Mean)	3.38	3.13	3.59	2.98
Rank	2nd	3rd	1st	4th

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5.3.2 Impact of risk

Impact of agricultural risks refers to the consequences that result from an event/risk. It indicates the severity, potential loss or perceived average economic loss that could arise from the risk. Respondents ranked production risks as having the most severe impact on their production as revealed in Table 10. Generally across the zones, Table 9 shows that the major production risks with severe impacts were flooding (4.02), drought (3.83) as well as pests and diseases (3.58). Flooding is a major issue for farmers as Olorunfemi (2011) observed that it is the most widespread of all environmental hazards and is capable of causing huge annual losses. For instance, the 2012 flood which occurred in several parts of Nigeria affected about 7.7 million people and destroyed several thousands of farmland. According to crop farmers in the coastal zone during the FGD:

“flood impact is usually total loss, however what we do is to move upland in the rainy season, because flooding does not usually occur upland. During dry periods, we can then farm in the lowlands but sometimes flood comes earlier than we expect for example in 2009”.

Concerning drought, the impact was greater in guinea savannah zone than the other two zones as the zone lies in the sub Saharan part of the country. As observed by Ajayi and Olufayo (2007) the magnitude of drought increases towards the northern part of the country. In terms of severity of impact of production risks, as seen in Table 9, guinea savannah zone (20.13) was the most vulnerable, followed by rainforest zone (19.62) and then coastal zone (19.45).

Marketing risks were ranked second by respondents in terms of impact as shown in Table 10. The key marketing risks with severe impacts as revealed in Table 9 include: market failure (3.38), inaccessibility to markets (3.15), volatility in output prices (2.99) and input costs (2.84) as well as perishability of farm produce. In relation to post harvest loss, Atser (2010) observed that post-harvest loss could be as much as one third of farmers' production. Considering the impact of marketing risks, the crop farmers in the guinea savannah (25.54) were the most vulnerable.

Social/human risks were ranked third in terms of impact of agricultural risks on production as seen in Table 10. The major social risks in Table 9 were; fire outbreaks, ill-health of farmer/labourer, variability in labour costs and lack of labour. The impact of fire outbreaks was greater in the guinea savannah zone. As observed by Obioha (2007), drought

related degradation such as forest fire has had more and far reaching negative impact on the environment compared with other agents of land degradation. According to respondents in the zone;

“when fire breaks out on farmland, the impact is much, depending on the size of your farmland that it affects. We however do fire tracing to reduce its effect”.

Labour is also a major resource in agricultural production, hence its shortage reduces production. It becomes more important in developing countries like Nigeria where mechanization is only common in large commercial farms. During the FGD, crop farmers (in the coastal zone) commented on the issue of labour availability and contracting risks (which often leads to shortage of labour):

“when our labourers default, we become short of labour. Even when you go beyond your limit to make them comfortable while doing your work, they can still default and this ultimately affects our production and income negatively”.

Okuneye (2002) also observed that the result of young men leaving farming is that it reduces labour availability, productivity and production thereby increasing costs of food production. The rainforest zone (22.03) was the most vulnerable to social risks.

In terms of financial risks which were ranked fourth as revealed in Table 10, crop farmers observed that lack of access to credit (3.42) and inadequate cash flow (3.15) had more significant impacts than default risk (2.05) or changes in interest (1.87). Low credit results in low efficiency, thereby affecting utilization of resources at farmers' disposal (Ibrahim *et al*, 2009). Table 9 shows that the order of vulnerability to impact of financial risks was: rainforest (10.15) to coastal (10.62) to guinea savannah (10.72). Crop farmers in the guinea savannah zone observed during FGD;

“access to credit is a major issue hindering agricultural production. I have joined a number of cooperatives so as to have access to credit”.

Generally across the zones, in terms of impact of agricultural risks on respondents, the guinea savannah zone (78.02) was the most vulnerable followed by the coastal (77.09) and lastly the rainforest zone (76.47).

Table 9: Means of respondents' impact of agricultural risks

	COASTAL	RAINFOREST	GUINEA SAV	TOTAL
Production risks				
Drought	3.71	3.79	3.93	3.83
Excessive rainfall/flood	4.08	3.98	4.00	4.02
Pests and Diseases	3.66	3.57	3.52	3.58
Shortfall in production e.g. Reduction in soil fertility	1.87	1.80	1.96	1.88
Limited knowledge about usage of chemicals/fertilizers	1.98	2.06	2.23	2.10
Rainfall fluctuations	1.96	2.12	2.14	2.07
Low quality seedlings	2.19	2.30	2.35	2.28
Production Total	19.45	19.62	20.13	19.76
Price/marketing risks				
Volatility in input costs	2.85	2.79	2.88	2.84
Volatility in output price	2.99	2.92	3.06	2.99
Market failure	3.37	3.35	3.43	3.38
Inaccessibility to markets	3.13	3.18	3.15	3.15
Consumer Preference	2.75	2.60	2.78	2.71
Loss of bargaining power	2.43	2.53	2.61	2.53
Inefficient storage/Perishability	2.88	2.65	2.73	2.76
Availability of transport facilities	2.19	2.25	2.33	2.26
Variability in transport costs	2.49	2.40	2.56	2.48
Marketing Total	25.08	24.67	25.54	25.09
Financial risks				
Access to credit	3.41	3.29	3.57	3.42
Inadequate cash flow	3.17	3.01	3.28	3.15
Default risk	2.05	1.99	2.11	2.05
Changes in interest rate	1.99	1.86	1.76	1.87
Financial Total	10.62	10.15	10.72	10.50
Social/human risks				
Lack of labour	3.02	3.11	2.51	2.92
Variability in labour costs	2.70	2.89	2.56	2.73
Damage to equipment	2.51	2.26	2.44	2.41
Sickness/ill health of farmer/labourer	3.14	3.27	3.04	3.16
War/Conflict	2.76	2.69	2.70	2.72
Theft	2.46	2.25	2.35	2.35
Fire outbreaks	3.20	3.39	3.81	3.47
Contracting risk	2.15	2.17	2.22	2.18
Social Total	21.94	22.03	21.63	21.94
Total	77.09	76.47	78.02	77.29

Source: Field Survey, 2011.

Table 10: Ranking of risk sources in terms of impact of agricultural risks

	Production	Marketing	Financial	Social
Impact Means	19.76	25.09	10.50	21.94
Risk number	7	9	4	8
Standard scores (Mean)	2.82	2.79	2.63	2.75
Rank	1st	2nd	4th	3rd

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5.3.3 Level of agricultural risk exposure

Farmers' level of risk exposure refers to the likelihood of identified risks to occur and the perceived impact (magnitude of loss) of identified risks. As seen in Table 12, respondents ranked production risks as the most important source of agricultural risks. Luke (2011) observed that production risk is very serious with respect to farming operations, while Difalco and Chavas (2009) asserted that production risk is a typical feature of agriculture. Across the zones, Table 11 reveals that farmers in the coastal zone observed that flood was their most serious production risk. The incidences of flooding and drought have been heightened as a result of climate change. According to Ede (2011), the effect of climate change already evident in Nigeria include the problem of flooding in the coastal areas and desert encroachment in the northern part of the country. Drought was the major risk to farmers in the guinea savannah zone. Accordingly, AERC (2009) observed that drought is the single largest risk in agriculture. Frequent occurrence of drought is therefore a great hindrance to increased agricultural production. This finding corroborates that of Mshelia (2011) that farmers in the country experience more crop losses as a result of weather changing conditions (such as flood, drought and rainfall fluctuations). Crop farmers in the rainforest zone ranked incidence of pests and diseases as their key production risk. Ismaila *et al* (2010) asserted that incidence of pests and diseases are major factors affecting agricultural production in the country. Vegetable farmers as reported in Martin (1996) also ranked diseases/pests as their most important production risk. Generally across the zones the order of vulnerability to production risks was from rainforest (67.18) to coastal (67.77) and it was highest in Guinea savannah (71.86).

Financial risks were ranked second as seen in Table 12. Indeed liquidity is the life wire of any farm business as every activity in agricultural production is influenced by the size and application of funds (Okereke, 2012). Several authors have also highlighted liquidity as a major problem of farmers (Adebayo & Adeola, 2008; Eluhaiwe, 2008; Odoemenem & Adebisi, 2011; Okwoche *et al*, 2012). As shown in Table 11, respondents were more vulnerable to lack of access to credit and shortage of working capital than default risk and changes in interest rate. This may be attributed to the fact that majority of crop farmers according to Ayinde (2008); Gana *et al* (2009); Eyo and Asuquo (2011) do not patronize formal credit sources. Moreover, Combe (1997) asserted that one of the main problems for farmers in developing countries is their lack of access to finance, which acts as an obstacle for investment needed to improve the quality and quantity of their production as well as

improving their standard of living. Crop farmers in the rainforest zone (36.38) were the least exposed to financial risks. Their higher rate of off-farm diversification and cultivation of cash crops may be responsible for this. As observed by Luke, Job and Benard (2011), non-farm investment reduces household exposure to risk because of the imperfect correlation between non-farm income and farm income, while Oseni and Winters (2009) asserted that non-farm participation helped relax liquidity constraints of farmers. The guinea savannah zone (41.85) had the highest level of financial risk exposure and this may be due to their lower levels of education as Ibrahim et al (2009) affirmed that education enhances farmers' access to credit agencies. As part of an initiative to improve access to capital in agriculture, the government recently launched the Nigeria Incentive Based Risk Sharing System (NIRSAL). The fund which effectively came in to operation on March 15, 2012 has the objective of engendering an increase in formal credit inflows into agriculture, thereby increasing capacity of banks to lend, refocusing lending on integrated value chains and establishing a differentiated guarantee mechanism to share credit-related risks in the value chain (CBN, 2012). The anticipated net impact of NIRSAL is an improvement in the pricing, management and undertaking of risks in formal lending to agric-related enterprises

Marketing risks were perceived to be the third most important source of agricultural risks by the respondents as revealed in Table 12. Respondents key marketing risks as shown in Table 11 were: fluctuations in output prices (10.91) and input costs (10.76), market failure (10.61) as well as perishability of farm produce (9.31). In a study by Martin (1996), changes in product prices and input costs were the most important market risks to the cropping, vegetables and flowers farmers. According to Ikpi and Mordi (2006), inadequacies in the supply and delivery of farm inputs as well are part of the problem militating against self-sufficiency in food production in Nigeria; while Odoemenem and Adebisi (2011) also observed that poor post-harvest facilities could be as high as twenty percent of farm produce. Respondents however affirmed that lack of transport facilities, loss of bargaining power and consumer preference were not much of a problem to them. In terms of level of risk exposure to marketing risks, crop farmers in the guinea savannah zone (80.94) were more vulnerable than the other two zones. This variation across the zone may be an indication of the variation in farmers' ages, as older farmers may be more experienced in terms of marketing issues than younger farmers.

Concerning respondents' exposure to social risks; sickness/ ill health of farming household or contracting partners such as labourers (10.84), and low access to labour (10.25)

and variability in labour costs (9.17) were the major social risks as shown in Table 11. Crop farmers in the rainforest zone were the most vulnerable to occurrence of ill health/ lack of labour and they also had the highest level of risk exposure to social risks. As observed in Table 4, farmers in the zone were the oldest across the zones. The problem of aging farm population has also been identified by Adesoji and Farinde (2006); Okoedo-Okojie and Aphunu (2008); Gana *et al* (2010) amongst others. Farmers' ages would probably be responsible for the higher risk exposure to labour scarcity. Labour cost is usually a function of the demand for labour. Since majority of the farmers in the country are small scale in nature and dependent on manual labour, Takeshima *et al* (2013), affirmed that manual farming activities cost is on the rise. Furthermore, in terms of exposure to social risks, crop farmers in the guinea savannah zone (64.93) were slightly more vulnerable than their counterparts in coastal zone (64.81), while their key social risk was incidence of fire outbreaks. This is expected due to the drier nature of the zone.

The ranking in Table 11 indicates that the major agricultural risk exposure levels include; flood (15.88), occurrence of pests and diseases (15.16), lack of access to capital (14.51), inadequate cash flow (13.02), drought (12.36) and volatility in output prices (10.91).

Taking into consideration production, marketing, finance and social agricultural risks, crop farmers in the guinea savannah zone (259.58) were the most vulnerable followed by coastal zone (251.40) and lastly the rainforest zone (247.93). Thus in terms of priority, crop farmers in the guinea savannah zone require more risk management tools. This becomes more important as the zone also had the largest mean for farm size among the three zones studied. The higher risk exposure level recorded for the guinea savannah zone (which is in the northern part of Nigeria) may be attributed to the findings of Environmental Rights Action *et al* (2012) that the northern part of Nigeria is severely threatened environmentally as a result of variable and unpredictable rainfall, seasonal fires and overgrazing amongst others.

In terms of risk exposure levels, using the mean of 252.87 in Table 11 and a standard deviation of 74.83, Figure 17 shows that 18.7% of the respondents were at a low level of risk exposure. Half of the respondents (50.3%) were at a moderate level of risk exposure, while 31.0% were at a high level of risk exposure.

Table 11: Ranking of respondents' agricultural risk exposure levels

	COASTAL	RAINFOREST	GUINEA SAV	TOTAL	RANK
Production risks					
Drought	9.57	11.75	15.76	12.36	5th
Excessive rainfall/flood	18.40	15.12	14.12	15.88	1st
Pests and Diseases	15.88	14.82	14.78	15.16	2nd
Shortfall in production	5.70	5.45	6.21	5.79	25th
Limited knowledge about usage of chemicals etc	5.46	6.04	6.94	6.15	24th
Rainfall fluctuations	6.08	6.66	6.46	22nd	23rd
Low quality seedlings	6.68	7.34	7.59	7.20	19th
Production Total	67.77	67.18	71.86	68.94	
Price/marketing risks					
Volatility in inputs costs	10.52	10.60	11.15	10.76	8th
Volatility in output price	10.76	10.57	11.41	10.91	6th
Market failure	10.35	10.55	11.01	10.61	9th
Inaccessibility to markets	9.33	8.94	9.14	9.14	13th
Consumer Preference	7.92	7.20	7.12	7.41	17th
Loss of bargaining power	7.44	7.97	8.33	7.91	15th
Inefficient storage/Perishability	9.91	8.80	9.23	9.31	11th
Avialability of transport facilities	4.77	5.38	5.69	5.29	27th
Variability in transport costs	7.79	7.30	7.86	7.64	16th
Marketing Total	78.79	77.31	80.94	79.01	
Financial risks					
Access to credit	14.66	13.26	15.71	14.51	3rd
Inadequate cash flow	13.12	11.98	14.01	13.02	4th
Default risk	6.56	5.99	7.34	6.62	21st
Changes in interest rate	5.69	5.15	4.79	5.20	28th
Financial Total	40.03	36.38	41.85	39.35	
Social/human risks					
Labour availability	10.93	11.54	8.06	10.25	10th
Variability in labour costs	9.21	10.03	8.17	9.17	12th
Damage to equipment	7.53	6.96	7.47	7.34	18th
Sickness/ill health of farmer/labourer	10.80	11.51	10.09	10.84	7th
War/Conflict	7.15	6.78	7.10	7.02	20th
Theft	7.04	6.23	6.60	6.60	22nd
Fire ourbreaks	6.34	8.24	12.00	8.68	14th
Contracting risk	5.81	5.77	5.44	5.67	26th
Social Total	64.81	67.06	64.93	65.57	
Total	251.40	247.93	259.58	252.87	

Source: Field Survey, 2011.

Table 12: Ranking of risk categories in terms of agricultural risk exposure levels

	Production	Marketing	Financial	Social
Risk exposure Scores	68.94	79.01	39.35	65.57
Risk number	7	9	4	8
Standard scores (Mean)	9.85	8.78	9.84	8.20
Rank	1st	3rd	2nd	4th

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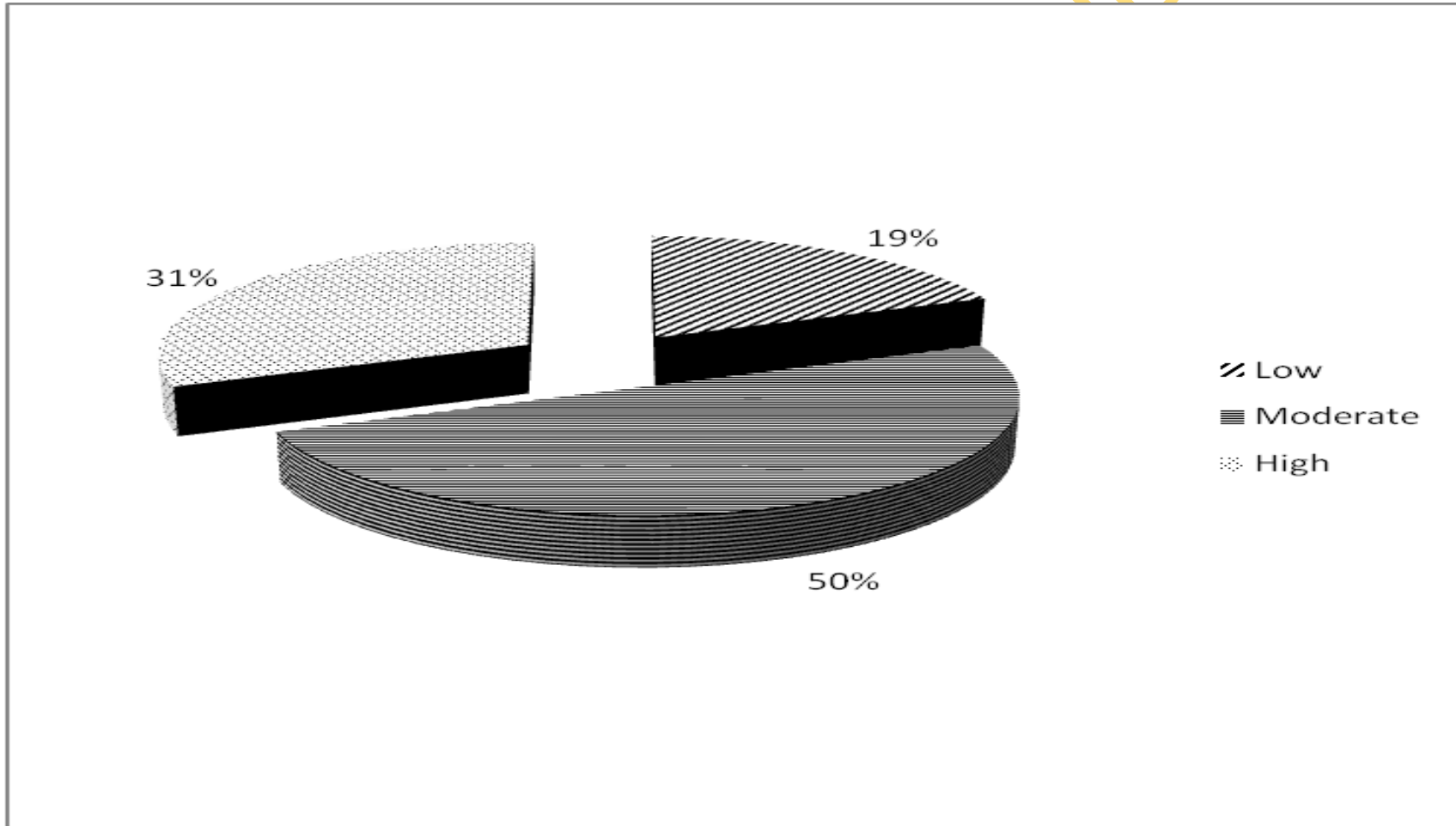


Figure 17: Risk exposure level of respondents

5.3.4 Agricultural risk exposure based on crop enterprise

Table 13 indicates that fruits and vegetable farmers were more vulnerable to production risks than other crop farmers. These farmers were also particularly more prone to flood and pests/diseases than others. As observed by Pena and Hughese (2007), vegetables are highly sensitive to environmental extremes like floods, while Bempah *et al* (2011) asserted that pesticides are widely used in fruit and vegetables because of their susceptibility to insect and diseases attack. According to Akinmusire (2011), part of the serious challenges affecting the existence of fruits and vegetables is pest attacks. Legume crop farmers were the least vulnerable to production risks. They however recorded higher rates of shortfall in production and limited knowledge on usage of chemicals.

The major marketing risks among the crop farmers were market failure, as well as volatility in output and input prices. Concerning perishability, fruits and vegetable farmers also recorded a higher level of risk exposure and this may be related to the observation of Aworh (undated) that postharvest losses of fruits and vegetables are extremely high in Nigeria.

In terms of financial risks, roots and tuber farmers were more prone to such risks. This finding corroborates the result of Onubuogu and Onyeneke (2012) that low production capital is the major constraint of root and tuber crop farmers. The low level of occurrence of inadequate cash flow among cash crop farmers may be an indication of the high net worth of cash crops and this is likely to improve the liquidity of cash crop farmers. According to Debela (2009), perennial cash crops can help relax the liquidity constraints of households.

Concerning social risks, the major social risks for cereals; roots and tubers, fruits and vegetable and cash crop farmers were; lack of labour, variability in labour costs and ill health. However the major social risks for legume farmers were fire outbreaks and lack of labour. The high ranking of fire outbreaks was because all the legume crop farmers were in the guinea savannah zone.

Table 13: Ranking of respondents' agricultural risk exposure levels based on crop enterprise

	Cereals		Roots & T		Fruits & veg		Legumes		Cash crops	
Production risks										
Drought	14.24	3rd	10.05	7th	14.66	5rd	8.78	9th	7.08	17th
Excessive rainfall/flood	20.17	1st	9.91	8th	23.40	1st	10.15	5th	16.63	1st
Pests and Diseases	15.25	2nd	13.26	4th	19.85	2nd	13.22	2nd	11.26	5th
Shortfall in production	5.97	26th	6.01	24th	5.45	26th	6.92	17th	4.71	23rd
Limited knowledge about usage of chemicals etc	5.44	27th	7.89	16th	5.05	28th	6.70	20th	6.31	19th
Rainfall fluctuations	6.02	25th	6.30	23rd	7.65	19th	4.98	26th	6.08	20th
Low quality seedlings	7.31	18th	7.54	20th	7.35	20th	5.73	23rd	6.62	18th
	74.39		60.96		83.41		56.48		58.69	
Price/marketing risks										
Volatility in inputs costs	8.50	11th	11.05	5th	13.41	6th	9.98	7th	8.64	13th
Volatility in output price	12.14	5th	10.12	6th	12.68	8th	8.06	12th	10.04	7th
Market failure	10.09	8th	9.40	11th	12.67	9th	8.66	10th	9.27	10th
Inaccessibility to markets	8.21	14th	9.91	9th	8.91	14th	7.70	13th	8.85	12th
Consumer Preference	6.23	23rd	9.69	10th	6.85	23rd	6.41	22nd	8.05	14th
Loss of bargaining power	7.71	15th	8.78	14th	8.60	15th	5.62	24th	9.02	11th
Inefficient storage/Perishability	7.76	9th	9.71	19th	10.80	10th	7.51	16th	9.56	8th
Avialability of transport facilities	4.78	28th	5.07	26th	5.06	27th	6.90	19th	4.37	26th
Variability in transport costs	7.67	16th	7.45	21st	7.31	21st	9.75	8th	9.38	9th
	73.10		81.17		86.29		70.59		77.16	
Financial risks										
Access to credit	12.75	4th	19.76	1st	13.62	4th	12.60	3rd	12.56	3rd
Inadequate cash flow	12.10	6th	16.25	2nd	13.28	7th	13.31	1st	10.96	6th
Default risk	7.08	19th	6.86	22nd	8.58	16th	4.63	27th	3.25	28th
Changes in interest rate	6.59	20th	3.88	28th	6.47	24th	3.20	28th	4.53	25th
	38.52		46.75		41.96		33.74		31.28	
Social/human risks										
Labour availability	11.36	7th	9.16	13th	10.00	11th	10.13	6th	13.78	2nd
Variability in labour costs	8.63	10th	8.59	15th	9.28	13th	8.40	11th	12.44	4th
Damage to equipment	6.34	22nd	7.78	18th	5.87	25th	6.91	18th	7.45	21st
Sickness/ill health of farmer/labourer	8.34	12th	13.36	3rd	13.50	5th	6.67	21st	7.78	15th
War/Conflict	6.10	24th	7.17	17th	7.81	18th	7.68	14th	7.09	16th
Theft	7.46	17th	5.69	25th	7.92	17th	7.53	15th	4.58	24th
Fire ourbreaks	8.21	13th	9.32	12th	9.61	12th	10.63	4th	8.27	22nd
Contracting risk	6.46	21st	4.12	27th	7.29	22nd	5.48	25th	4.01	27th
	62.89		65.18		71.29		63.43		65.39	
Total	248.90		254.06		282.95		224.24		232.52	

Source: Field Survey, 2011

5.4 Attitude towards agricultural risks

Table 14 reveals that crop farmers in the rainforest zone (53.40) were more risk seeking than the coastal zone (50.45) and guinea savannah zone (48.01). Table 15 shows that 18.7% of the respondents had scores between 21 and 42 while majority (67.4) had scores ranging from 42 to 62. Also 13.9% of the respondents had above 63. The mean value was 50.6. More than three quarter (84.2%) of the respondents had scores below the mean value (indicating a favourable attitude) and this implies that this category of respondents is risk averse. This result corroborates previous studies by Torkamani and Haji-Rahimi (2001); Binici *et al* (2003); Olarinde and Manyong (2007); Salimonu (2007); Ayinde (2008); Ajijola *et al* (2011) that majority of farmers are risk averse. However 15.8% of the respondents were risk seekers (indicating an unfavourable attitude). Risk seekers have a greater risk bearing ability and they primarily focus on higher outcome potentials (Salimonu, 2007). In a related study by Dadzie and Acquah (2012), 10.0% of the food crop farmers studied were risk seekers.

This variation across the zones in farmers' attitude towards agricultural risks may be connected with the farmers involvement in off farm occupation as Ayinde (2008) posited that the presence of other sources of income enhances the risk bearing ability of farmers, while Sarap and Vashist (1994), Kisaka-Iwayo *et al* (2005); Ding *et al* (2010) asserted that income is positively correlated with risk bearing ability. Kouame and Komenan (2012) also asserted that more wealth is correlated with a lower degree of risk aversion. In terms of age however, crop farmers in the rainforest zone were the oldest. If the observation of Nielsen *et al* (2013), that age is positively correlated with farmers' level of risk aversion were to have been positive in this case; respondents in the rainforest zone should have had the highest risk aversion level rather than the lowest. The finding of this study therefore shows that the presence of other sources of income has a higher effect on risk aversion than age.

Table 14: Distribution of respondents based on attitude towards risks related statements

	Coastal	Rainforest	Guinea Savanah	Total
1 I regard myself as the kind of person who is willing to take a few more risks than others.	3.50	3.67	3.38	3.52
2 I am generally cautious about accepting new risk management ideas	3.07	2.92	3.13	3.04
3. I must be willing to take a number of risks for my farm activities to be profitable	2.86	3.05	2.64	2.85
4 I am more concerned about large loss in my farm operation than missing a substantial gain.	2.48	2.39	2.33	2.40
5 I am ready to adopt a new risk management idea, once i hear it is beneficial	1.87	1.95	1.99	1.94
6 Profit is reduced when farm risks are managed	1.84	2.01	1.78	1.88
7 I encourage other farmers to adopt new and beneficial technologies that will reduce farm risks	1.66	1.57	1.53	1.59
8 I don't adopt risk management tools until I see them working for people around me	3.40	3.75	3.39	3.51
9 I am capable of influencing major decisions on my farm	2.00	2.73	1.91	2.21
10 I believe only in traditional methods of managing farm risks	2.95	2.76	2.43	2.71
11 I am less willing to take risks than my friends do	2.99	3.51	3.04	3.18
12 With respect to my farming operations, i like to take risks	2.08	2.44	1.70	2.07
13 I am concerned about a substantial gain than a large loss in my farm activities	2.50	2.81	2.32	2.54
14 I am always one of the last set of farmers to try a new idea	3.96	3.82	3.84	3.87
15 I am reluctant in taking risks when it comes to my farming activities	1.87	1.73	1.70	1.77
16 Using risk management strategies help to reduce farm risks	1.72	1.76	1.81	1.76
17 With respect to my farming operations, i do not like to take risks	1.95	1.88	1.80	1.88
18 Farm loss is reduced when risks are managed	1.94	1.99	1.78	1.90
19 Using risk management strategies is a waste of time	1.79	2.01	1.68	1.83
20 I must be reluctant to take a number of risks for my farm activities to be profitable	2.08	2.43	1.96	2.16
21 With respect to the conduct of my farm operations, I like to play it safe	1.94	2.22	1.87	2.01
	50.45	53.40	48.01	50.62

Source: Field Survey, 2011.

Table 15: Distribution of respondents based on attitude towards agricultural risks

Score	Freq	%	Std dev	Std Er	Mean	Risk Seeking ≥ 50.6		Risk Averse < 50.6	
1-21	0	0							
22-42	58	18.7							
43-63	209	67.4	6.07	0.41	50.6	49	(15.8)	261	(84.2)
64-84	27	8.7							
85-105	16	5.2							

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Section 5.5 Farmers' use of agricultural risk management strategies

Generally in terms of use of agricultural risk management strategies, as seen in Table 17, production strategies ranked first among those adopted. This implies that majority of the respondents utilise production strategies more than other strategies and this can be due to the fact that production risks were ranked most important in terms of risk exposure. From the means indicated in Table 16, strategies that majority of the respondents adopted were those related to seeds (use of improved seedlings-2.60 and buying seeds from reputable sources-2.52); soil enhancement (use of fertilizers-2.65 and soil conservation practices-2.31) and pest control measures (2.41). However, use of irrigation facilities (1.69), cultivating crops benefitting from public intervention (1.31) and use of flood control measures had low adoption rates (1.59). The low use of irrigation facilities amongst crop farmers confirms the observation of Mshelia (2012) that ninety percent of crop production in Nigeria is based on rain-fed agriculture. Crop farmers in the rainforest zone had lower adoption rates in terms of production risk management strategies than the other two zones. However, despite the fact that the coastal zone was less vulnerable to production risks than the guinea savannah zone, they adopted more production risk management strategies than the guinea savannah zone. This may be as a result of their higher level of education as Gana et al (2009) found out that education affects the technical competence of farmers.

Table 17 shows that the second category in terms of use of strategies was financial risk management strategies. Financial Strategies with higher adoption rates as shown in Table 16 include: minimizing leverage (2.94), increasing liquidity (2.57), use of cooperatives (2.56) and controlling family expenditure (2.40). In relation to farm liquidity, Ahsan and Roth (2010) in their study found out that increasing liquidity was one of the most important strategies among farmers. However, maintenance of adequate farm records (1.36), monitoring financial ratios (0.74) and use of crop insurance (0.14) were the least adopted financial strategies. According to Mshelia (2012), part of the challenges of agricultural insurance in Nigeria is the low level of awareness among farmers. Overall, farmers in the rainforest zone had better financial risk management skills than the other zones. This may be connected with their higher rate of off farm diversification as this might have enhanced their liquidity, thus making it easier for them to procure items needed to reduce risks.

In terms of social risk management strategies, Table 16 reveals that major social strategies that respondents utilise are: maintaining good relations with labourers/employees/contracting partners (2.73), securing labour before production (2.27)

and use of new/well maintained farm equipment (2.15). However, improving farm security (1.32), securing backup labour (1.28) and use of personal insurance (0.00) were the least utilised strategies. In fact none of the crop farmers held a personal insurance policy. Crop farmers in the coastal zone had the highest adoption level, followed by guinea savannah and lastly rainforest zone.

Table 17 also shows that marketing strategies were the least utilised by respondents and this may be due to the fact that marketing risk management strategies according to Le and Cheong (2011) are often beyond the control of farmers due to their complexity, reliability and availability. For instance, the use of futures/commodity exchange market (which is based on availability) had the lowest adoption rate (0.02), although a future exchange market exists in Abuja. This confirms the findings of Cervantes-Godoy *et al* (2013) that in developing countries, futures market is not widely accessible and it is mostly used in commercial agriculture. Production contract and cooperative marketing (which may be a bit complex depending on the terms between the contracting partners) also had very low adoption rates- 0.17 and 0.52 respectively. As observed by Dadzie and Acquah (2012), contract sales and hedging as strategies are not common with food crop farmers in their study. More than 80% of the pipfruit farmers in the study of Martin (1996) did not also use forward contracting and futures markets as a risk management tool.

Vertical integration had a mean score of 1.24. In relation to this, Fakayode *et al* (2012) observed that further processing of farm produce by farmers (which is a form of vertical integration) is low and attributable to lack of funds to purchase appropriate equipment or lack of technical knowhow and technologies.

Concerning the use of farm records, respondents had a mean score (1.56), with the guinea savannah zone having the lowest adoption rate as shown in Table 16. This low adoption rate in the zone conforms with the findings of Ampaire and Rothschild (2010) that lack of record keeping is attributable to low levels of education among farmers. Majority of the respondents however affirmed that they regularly use and share market information (2.48) with other farmers. According to Ahsan and Roth (2010) sharing of experience among farmers was one the most important strategies in their study. Generally in terms of marketing risk management, farmers in the coastal zone performed best followed by their counterparts in the guinea savannah zone and lastly farmers in the rainforest zone.

The ranking in Table 16 indicates that strategies with high utilization rate include; reducing leverage/outside equity (2.94), having good human relations with

labourers/employees/contracting partners (2.73), use of fertilizer to improve fertility (2.65), use of improved seedlings (2.60), increase in liquidity (2.57) and membership of cooperatives (2.56).

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Table 16: Farmers use of agricultural risk management strategies

	Coastal	Rainforest	Guinea Savanah	Total
Production strategies				
Use of improved seedlings	2.72	2.46	2.62	2.60
Buying seedlings from reputable source	2.71	2.35	2.49	2.52
Diversification of farm enterprise	1.90	1.93	1.95	1.93
Use of fertilizer to improve fertility	2.81	2.51	2.64	2.65
Use of irrigation techniques	1.79	1.30	1.97	1.69
Flood control (e.g chanelization)	1.86	1.35	1.56	1.59
Cultivating crops benefitting from public intervention (e.g cassa)	1.22	1.36	1.34	1.31
Consulting people with crop knowledge	2.48	2.02	1.90	2.13
Using soil conservation techniques	2.55	2.16	2.22	2.31
Pest Control Practices	2.62	2.24	2.36	2.41
Timely farm activities	2.67	2.22	2.34	2.41
	25.33	21.90	23.39	23.54
Marketing strategies				
Production contract	0.22	0.17	0.11	0.17
Marketing contract	1.56	1.22	1.37	1.38
Cooperative marketing	0.62	0.41	0.54	0.52
Using sequential sales	1.40	1.41	1.69	1.50
Ensuring direct sales to wholesaler and processors	2.43	2.18	2.25	2.29
Future/commodity exchange market	0.07	0.00	0.00	0.02
Vertical integration of farm produce	1.13	1.23	1.36	1.24
Using/sharing market information with other farmers	2.63	2.35	2.47	2.48
Keeping adequate records of farm produce	1.70	1.54	1.44	1.56
Forward pricing of inputs	0.56	0.52	0.59	0.56
	12.32	11.03	11.82	11.73
Financial strategies				
Crop insurance	0.05	0.28	0.09	0.14
increase liquidity e.g. maintaining credit reserves	2.55	2.61	2.54	2.57
having off farm employment	1.91	2.02	1.77	1.90
Making credit arrangement before production	2.14	1.98	1.99	2.04
keeping fixed costs low	1.80	1.96	1.82	1.86
Sharing information on financial risk management	2.02	2.06	2.15	2.08
Controlling family expenditure	2.36	2.43	2.41	2.40
Monitoring financial ratios	0.85	0.71	0.67	0.74
using lowest possible production costs	2.02	2.09	1.95	2.02
Membership of cooperatives	2.62	2.49	2.56	2.56
keeping adequate records of financial transactions	1.54	1.36	1.19	1.36
Reducing leverage (outside equity)	2.95	2.92	2.96	2.94
Leasing/renting expensive farm equipment	2.20	2.24	2.12	2.19
	25.01	25.15	24.22	24.79
Social strategies				
Securing labour contacts before production	2.30	2.34	2.17	2.27
Securing backup/emergency labour	1.40	1.28	1.17	1.28
Having good human relations with labourers/employees/contractors	2.87	2.59	2.73	2.73
Improving farm security e.g. fencing and use of guards	1.44	1.20	1.32	1.32
Use new/well maintained equipment/machinery	2.26	2.01	2.18	2.15
having backup machinery/equipment	1.47	1.14	1.29	1.30
using traditional practices like scarecrow and native medicine	1.50	1.53	1.55	1.53
Personal insurance	0.00	0.00	0.00	0.00
	13.24	12.09	12.41	12.58
Total Scores	75.89	70.17	71.84	72.64

Source: Field Survey, 2011.

Table 17: Ranking of risk categories in terms of use of risk management strategies

	Risk sources			
	Production	Marketing	Financial	Social
RMS scores	23.54	11.73	24.79	12.58
RMS number	11	10	13	8
Standard scores (mean)	2.14	1.17	1.91	1.57
Rank	1st	4th	2nd	3rd

Source: Field Survey, 2011

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Section 5.6: Effectiveness of agricultural insurance in managing risks

5.6.1: Adoption and effectiveness of agricultural insurance

As seen in Table 18, majority (57.1%) of the respondents were not aware of agricultural insurance. Tolongbose *et al* (1995) also found that 58.3% of the crop farmers sampled in their study were not aware of agricultural insurance. This shows that much has to be done in ensuring that farmers are aware of market instruments such as insurance that can help reduce agricultural risks. Many of the respondents were hearing about it for the first time at the time of interview and it had to be clearly explained before they could understand. The coastal zone recorded the highest level of awareness (53.4%), while the rainforest zone had the lowest level (32.4%).

When asked about their source of information, almost half (48.1%) of the respondents who were aware of agricultural insurance explained that they learnt about it through their friends or from family members. However 16.5% affirmed that they were told by extension agents, while 21.1% said they learnt about it either through NACRDB (now Bank of Agriculture) or other formal sources of credit. Respondents that heard through the electronic or print media were 14.3%. This indicates that friend/ family member is a very strong and effective means of passing information on agricultural risk management.

However, only 17.3% of those aware of agricultural insurance (7.4% of the total respondents) had ever purchased it. The food crop farmers in the study of Dadzie and Acquah (2012) also neglected the use of crop insurance to deal with risk in their farming business, however their neglect was mainly due to lack of awareness of crop insurance. Also in Teweldemedhin and Kafidii (2009), 95.2% and 98.2% of the commercial and communal farmers in their study had no insurance cover for their livestock. The rainforest zone however had the highest level of 33.3% for those farmers who had ever purchased insurance. This implies that a higher percentage of crop farmers purchase agricultural insurance in the rainforest zone than the other two zones. Almost half (43.5%) of those who insured their farms purchased crop insurance regularly. The low adoption rate despite awareness corroborates the findings of Tologbonse *et al* (1995); Ajijola *et al* (2011) who found that out of 51.7% and 10.0% respectively of farmers who were aware of agricultural insurance, none purchased it. According to Abdulmalik *et al* (2013), farmers' participation in insurance activities is low despite the existence of NAIC. This low rate of adoption indicates that there are strong factors preventing those aware from adopting it. Therefore, awareness is not a major determining factor in adoption of agricultural insurance even though it is a prerequisite.

The mean premium paid by respondents who had adopted agricultural insurance was ₦8,750, ₦11,000 and ₦14,200 in the coastal, rainforest and guinea savannah zones respectively. The difference in means may be a reflection of the difference in average farm sizes across the zones. Concerning efficiency of agricultural insurance in managing agricultural risks, Table 18 shows that 26.1 % of the respondents observed crop insurance had insignificant effect. More than one fifth (21.7%) of the crop farmers affirmed that crop insurance had significant effect on risk management, while majority (52.2%) observed that the effect was either moderately or very significant. Across the zones, respondents in the coastal zone had a higher perception of the efficiency of crop insurance in managing agricultural risks than the other two zones.

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Table 18: Effectiveness of agricultural insurance in managing risks

	COASTAL		RAINFOREST		GUINEA SAV		TOTAL	
	FREQ	%	FREQ	%	FREQ	%	FREQ	%
Awareness of Agric Insurance								
Yes	31	53.4	33	32.4	69	46	133	42.9
No	27	46.6	69	67.6	81	54	177	57.1
Source of awareness								
Family/friends	15	48.4	18	54.5	31	45.5	64	48.1
Extension/development agents	6	19.4	5	15.2	11	16.4	22	16.5
NARCD/Other formal credit sources	3	9.6	6	18.2	19	27.3	28	21.1
Print media	5	16.1	1	3.0	0	0	6	4.5
Radio	2	6.5	3	9.1	8	10.8	13	9.8
Ever purchased Agric Ins (N=310)*								
Yes	2	3.5	11	10.8	10	6.7	23	7.4
No	56	96.5	91	89.2	140	93.3	287	92.6
Ever purchased Agric Ins (N=133)**								
Yes	2	6.5	11	33.3	10	14.5	23	17.3
No	29	93.5	22	66.7	59	85.5	110	82.7
Frequency of purchasing Agric Insurance								
Frequently	1	50.0	4	36.5	5	50	10	43.5
Sometimes	1	60.0	5	45.4	3	30	9	39.1
Rarely	0	0.0	2	18.1	2	20	4	17.4
Premium								
Average premium paid	8750		11000		14200		11316	
Minimum premium paid	4000		5500		5250		4917	
Maximun Premium paid	13000		13000		18500		14833	
Efficiency of Agric. Insurance (N=23)***								
Not effective	0	0.0	3	27.2	3	30.0	6	26.1
Low effectiveness	0	0.0	2	18.2	3	30.0	5	21.7
Moderately effective	2	100.0	4	36.4	4	40.0	10	43.5
Very effective	0	0.0	2	18.2	0	0.0	2	8.7
Mean	3.0		2.5		2.2		2.6	

Source: Field Survey, 2011.

* N= 310: Total population of respondents

**N=133: Population of respondents who are aware of agricultural insurance.

***N= 23: Population of respondents who adopted agricultural insurance

5.6.2: Level of satisfaction with NAIC processes

In terms of satisfaction with NAIC processes, Table 19 shows that respondents were more satisfied with the amount of premium paid and settlement of claims period than the documentary requirements, information delivery processes and accessibility. The lower means recorded for information delivery and accessibility may be due to the zoning of the NAIC offices, in which there is only one office in each state of the federation. This zoning structure is likely to affect respondents' access to crop insurance due to increased travelling time and transportation costs. In order to boost the capacity of subsistence farmers, there is a need to increase their access to insurance (Haliru, 2012).

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Table 19: Level of satisfaction with NAIC processes

	COASTAL	RAINFOREST	GUINEA SAV	TOTAL
	Mean	Mean	Mean	Mean
Documentary requirements	2.7	2.3	2.5	2.5
Accessibility	2.5	1.8	3.0	2.4
Premium paid	3.0	3.5	2.7	3.1
Settlement of claims	3.0	3.2	3.5	3.2
Information Delivery	2.2	2.4	2.5	2.4

Source: Field Survey, 2011

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5.6.3: Inhibitors and motivators for agricultural insurance

When crop farmers who were aware of agricultural insurance but had not purchased were asked about the major factor inhibiting them from purchasing an insurance policy as seen in Table 20, majority of them (70.2%) indicated that agricultural insurance was somehow complicated. Sixty-five percent claimed it was not accessible, while 63.2% observed that the premium was high. Ajieh (2010) also concluded in his study that unpaid claims, bureaucracy and high premium were part of the major constraints hindering participation of poultry farmers in agricultural insurance. Thirty nine percent of the respondents associated their non-patronage to religious reasons. These religious reasons were the belief that loss was from God and the non-compliance of insurance procedure with their ethical beliefs. Part of the government initiative in making insurance process more compatible with investors' ethical beliefs is the incorporation of Takafful in to mainstream insurance.

According to Maysami and Kwon (1999) takafful insurance is a type of joint guarantee insurance mechanism based on the law of large numbers in which a group of members pool their financial resources together against certain loss exposures. The conceptual nature of Takaful entails mutual help/solidarity, mutual responsibility, mutual cooperation as well as mutual protection. Takaful is an alternative to conventional insurance and its products are not entirely new to the insurance industry in Nigeria, having been in the market for close to a decade (Jankara, 2011). He further explained takaful as an ethical financing and cooperative risk protection method which invigorates human capital, human solidarity and emphasises dignity, community self help and economic self development. As the potential of Takaful insurance is vast, Daniel (2012) observed that the National Insurance Commission has entered into a collaborative agreement with GIZ (a German agency for sustainable development) to conduct a diagnostic study on Takaful insurance business in Nigeria. Takafful can as well be incorporated into agricultural insurance policy so as to cater for farmers who are excluded due to ethical reasons.

Furthermore, 7.0% of the respondents indicated that loss was low; while 64.9% affirmed that insurance offices were not easily accessible. In a bid to stimulate competition in the agricultural insurance sector, the National Insurance Commission (NAICOM), recently disbanded the monopoly of Nigerian Agricultural Insurance Commission (NAIC) from the exclusivity of agricultural insurance. Although, NAIC has the exclusive right to insure all

subsidised agricultural risks, opportunities abound for other insurance companies in the areas of commercial unsubsidised agricultural risks.

Table 20 shows the motivating factors that respondents believed can either sustain or improve their interest in agricultural insurance. A higher percentage identified local availability (88.4) and higher propensity in getting claims (87.1%) as their possible key motivating factors. Seventy nine percent of the respondents said they would be stimulated to purchase an agricultural insurance policy if there were low bureaucratic procedures, while 61.0% affirmed that that the pedigree of the insurance company issuing the policy will affect their decision. Concerning propensity to get claims and insurance company involved, Mshelia (2012), asserted that low level of trust among farmers is one of the major challenges of agricultural insurance in the country, while Cole *et al* (2013) indicated that uncertainty about insurance (and whether the provider was trusted to pay out) was a significant determinant of the low take-up rate.

In relation to ethical considerations 28.7% of the respondents would be motivated if insurance processes are compatible with their ethical beliefs.

Table 20: Inhibitors and motivators for agricultural insurance

	COASTAL		RAINFOREST		GUINEA SAV		TOTAL	
	FREQ	%	FREQ	%	FREQ	%	FREQ	%
Inhibitors*	n=33		n= 22		n=59		n=114	
Complicated procedure	22	66.7	18	81.8	40	67.8	80	70.2
Loss is from God	5	15.2	4	18.2	17	28.8	26	22.8
Ethical beliefs	2	6.1	4	18.2	15	25.4	21	18.4
Loss is Low	3	9.1	1	4.5	4	6.8	8	7.0
Accessibility	26	78.8	13	59.1	35	59.3	74	64.9
high premium	21	63.6	12	54.5	39	66.1	72	63.2
Motivators*	n=58		n=102		n=150		n=310	
More Awareness	22	37.9	68	66.7	118	78.7	208	67.1
Local availability	41	70.7	93	91.2	140	93.3	274	88.4
low premium	44	75.9	81	79.4	118	78.7	243	78.4
claims	50	86.2	84	82.4	136	90.7	270	87.1
Less bureaucracy	49	84.5	83	81.4	115	76.7	247	79.7
If required by lender of loans	44	75.9	77	75.5	81	54.0	202	65.2
Ethical Compatibility	7	12.1	33	32.4	49	32.7	89	28.7
Risk exposure level	43	74.1	68	66.7	85	56.7	196	63.2
Insurance company issuing the policy	34	58.6	77	75.5	78	52.0	189	61.0

Source: Field Survey, 2011

*Multiple responses

Section 5.7 Farmers' level of risk management

Level of risk management refers to farmers' level of ability to manage risks. It is a function of the number of strategies utilised as well as the frequency of utilisation of the strategies.

5.7.1 Level of risk management

As indicated in Table 21, less than one percent (0.7%) of the respondents had a risk management score of not more than 25 out of a maximum score of 142. Thirty percent had between 26 and 50, while majority (55.5%) had between 51 and 75. Twelve percent had scores ranging from 75 to 100 . Less than two percent (1.5%) however had scores above 100 and three-fifth of this category were crop farmers from the coastal zone. The Table also indicates that more than half of the respondents (52.9) were in the high level of risk management category. More than sixty percent (67.2%) of crop farmers in the coastal zone were in this category. Fifty-three percent of those in the guinea savannah zone were also in the same category, while only 40.2% of crop farmers in the rainforest zone were in this category. This result implies that farmers in the coastal zone are better risk managers than the other two zones.

Table 21: Farmers level of risk management

	COASTAL		RAINFOREST		GUINEA SAV.		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%
Scores								
0 - 25	1	1.7	0	0	1	0.7	2	0.7
26-50	4	6.9	45	44.1	44	29.3	93	30.0
51-75	37	63.8	47	46.1	88	58.7	172	55.5
75-100	13	22.4	9	8.8	16	10.6	38	12.3
Above 100	3	5.2	1	1	1	0.7	5	1.5
High level (≥ 72.6)	39	67.2	41	40.2	84	56.0	164	52.9
Low level (< 72.6)	19	32.8	61	59.8	66	44.0	146	47.1

Source: Field Survey, 2011

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5.7.2 Farmers' risk management behaviour

As seen in Table 22; 19.0%, 10.2% and 15.3% of the crop farmers in the coastal, rainforest and guinea savannah zones were superior managers having at least 50% agricultural risk management mark in all four categories studied. Furthermore, about 15%, 29% and 43% in the rainforest, guinea savannah and coastal zones respectively were active managers, having at least 50 percent scores in three categories of risk management. Table 19 also shows the breakdown of farmers in the active categories. Active risk managers in the coastal (60.0%) and rainforest zones (46.7%) fall in the production/finance/marketing category, while 58.1% of those in the guinea savannah zone were active in the production/finance/social category. This implies that while those active managers in the coastal and rainforest zones were not good social managers, those in the guinea savannah zone were not good marketing managers.

Di-function managers also accounted for 33.2% of the crop farmers sampled. This set of farmers had 50 percent scores in only two categories of agricultural risk management. About 72% and 77% of di-function managers in the coastal and guinea savannah majored in the production/social risk management category. In the rainforest zone, about 83% of the di-function managers were active in the production/finance categories. This indicates that majority of di-function managers in the coastal and guinea savannah zones lack financial risk management skills, unlike those in the rainforest zone who are active in financial skills.

Also, mono function managers account for 21.9% of the respondents. This category of farmers had 50 percent scores in only one category of agricultural risk management. Majority (92.7%) of the respondents in this category were production managers, while 4.4% and 2.9% were marketing and finance managers respectively. None of the respondents were social mono function managers. This indicates that mono function managers in the study area specialize in the production category.

Only 4% of the farmers were part-time agricultural risk manager. These farmers are those who have less than 50% scores in all the categories of risk management. The guinea savannah zone had the highest percentage of part-timers with 5.4% of their crop farmers belonging to the category.

In summary it can be deduced from Table 19, that in terms of risk management behaviour, crop farmers in the coastal zone are better than the ones in the guinea savannah zone, while farmers in the rainforest zone recorded the lowest level. The extent to which they

are exposed to devastating risk from flood may be responsible for this variation. Furthermore by using standard scores as seen in Table 17, respondents had more skills in production risk management than financial skills, while social skills were better than marketing skills.

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Table 22: Agricultural risk managerial levels (Risk management behaviour)

MANAGERIAL LEVELS	COASTAL		RAINFOREST		GUINEA SAV		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%
Superior risk managers	11	19.0	10	10.2	23	15.3	44	14.2
Active risk managers	25	43.1	15	14.5	43	28.7	83	26.8
Di-function risk managers	18	31.0	41	40.2	44	29.3	103	33.2
Monofunction risk managers	3	5.2	33	32.2	32	21.3	68	21.9
Part-time risk managers	1	1.7	3	2.9	8	5.4	12	3.9
Active managers								
Production/marketing/finance	15	60.0	7	46.7	3	7.0	25	8.1
Production/marketing/social	7	28.0	4	26.7	15	34.9	26	8.4
Production/finance/social	3	12.0	2	13.3	25	58.1	30	9.7
Marketing/finance/social	0	0.0	2	13.3	0	0.0	2	0.6
Di-function managers								
Production/finance	4	22.2	34	82.9	7	15.9	45	14.5
Production/marketing	1	5.6	5	12.2	3	6.8	9	2.9
Production/social	13	72.2	2	4.9	34	77.3	49	15.8
Monofunction managers								
Production	3	100.0	31	93.9	29	90.6	63	20.3
Marketing	0	0.0	0	0.0	3	9.4	3	1.0
Finance	0	0.0	2	6.1	0	0.0	2	0.6
Social	0	0.0	0	0.0	0	0.0	0	0.0

Source: Field Survey, 2011

Note: Superior and Part-time risk managers do not have sub categories, since the two levels are made up of farmers having either less than or more than 50% in all the categories of risk management measured in the study.

5.8: Determinants of agricultural risk management behaviour of crop farmers

Determinants of agricultural risk management behaviour were analyzed with relevant variables using multinomial logit regression. Hypothesized variables were; age, formal education, farming experience, farm size, organization membership, attitude to agricultural risks, risk exposure level, coastal agro-ecological zone, rainforest agro-ecological zone and guinea savannah agro-ecological zone. The variable measuring coastal agro-ecological zone was however dropped by the model due to co-linearity. The part-time group of the dependent variable (Part time managers) was used as the reference/base category. The chi-square value of 140.84 and the significance level ($p=0.0000$) indicates that the explanatory variables in the model are significant in explaining the risk management behaviour of crop farmers in the study area. The parameter and marginal estimates are presented in Tables 23 and 24 respectively.

Result of the analysis in Table 23 indicates that farm size ($r=0.015$, $p=0.05$), organization membership ($r=0.079$, $p=0.01$) and risk exposure levels ($r=0.066$, $p=0.01$) were significant variables in determining crop farmers that are classified as mono-function managers relative to the reference group (part-timers). Being a Mono-function crop farmer was positively influenced (determined) by organization membership. This implies that being a member of an organization improves the probability of a crop farmer being classified as a mono-function manager relative to being a part-timer. Table 24 shows that membership of organization tends to increase the probability of being a mono-function manager by 80.1%. According to Shehu *et al* (2010), membership of organization creates an avenue for farmers to reduce their risks and this helps to improve their level of risk management. Farm size and risk exposure levels were negative predictors of mono-function managers and this implies that larger farm sizes or higher risk exposure levels lower the probability of a crop farmer being classified as a mono-function manager relative to part-timer. Larger farm size is an indication of more wealth and as observed by Kouame and Komenan (2012), more wealth is associated with a risk seeking attitude thereby lowering farmers' level of risk management. Unit increments in farm size and risk exposure level reduce the probability of being a mono-function manager by 37.1% and 37.4% respectively. One possible explanation for risk exposure level may be that when the level of risk exposure becomes unbearable or overwhelming, a farmer may decide not to do anything and this ultimately reduces his/her level of risk management.

Farm size ($r=0.003$, $p=0.05$) was also a significant and negative predictor of being a di-function risk manager. The marginal effect in Table 24 indicates that the probability of being classified as a di-function manager relative to the part-timer decreases by 16.7% for every unit increment in farm size.

Furthermore, farm size ($r=0.026$, $p=0.05$), organization membership ($r=0.034$, $p=0.05$), attitude to agricultural risks ($r=0.059$, $p=0.01$) and risk exposure level ($r=0.086$, $p=0.01$) were significant predictors of active risk managers. While farm size was negatively associated with the group; organization membership, attitude to agricultural risks and risk exposure level were positive predictors of the group. For every unit increment in farm size, the probability of being an active manager (relative to part-timer) decreases by 18.8% , while for every unit increment in organization membership, the probability of being an active manager (relative to part-timer) increases by 22.7%. Having higher risk exposure level also increase the odds of being classified as an active risk manager by 32.8%. According to Paul and Routray (2001) household ability to manage risk is determined by their risk exposure level. Active farmers are therefore stimulated to increase their level of risk management due to a rise in their risk exposure level. Attitude to agricultural risks was also positively associated with the active group. An explanation for this may be because high level of education is usually associated with a high level of risk seeking attitude and according to Ibrahim, Afolami *et al* (2011), higher level of education is believed to be associated with access to information on improved technologies and productivity; thereby improving the farmers level of risk management.

Being Superior risk managers was also positively influenced by their risk exposure level ($r=0.09$, $p=0.01$) and for a unit increase in risk exposure level; the probability of being a superior manager is increased by 19.4%. As observed by Ali and Kapoor (2008) farmers' response to risk is often consistent with their perceptions of that risk. Hence, a high level of risk exposure stimulates the superior risk managers to utilise more risk management strategies so as to reduce risk exposure level.

Table 23: Parameter estimates of the multinomial logit regression for determinants of risk management behaviour of crop farmers

Variable	Monofunction	Difunction	Active	Superior
Age	0.1249 (0.7913)	0.5982 (0.1926)	0.2181 (0.6416)	0.3072 (0.5230)
Formal Education	-0.169 (0.8054)	0.4125 (0.534)	0.5181 (0.6219)	0.3397 (0.6317)
Farming Experience	0.7276 (0.8747)	-0.3671 (0.4122)	-0.2258 (0.6219)	-0.3038 (0.5197)
Farm size	-0.1915 (0.015)**	-0.2096 (0.0032)**	-0.1602 (0.0263)**	-0.8049 (0.2066)
Organization Membership	1.4323 (0.0793)*	0.9291 (0.8977)	1.7556 (0.0341)**	1.1712 (0.1600)
Attitude to agric risks	0.8914 (0.1485)	0.9984 (0.1036)	0.1215 (0.0595)*	0.9537 (0.1552)
Risk exposure level	-0.1925 (0.0663)*	0.1817 (0.8546)	0.1744 (0.0865)*	0.1756 (0.0920)*
Rainforest zone	1.6136 (0.2399)	0.1325 (0.9915)	-1.5457 (0.2240)	-1.215 (0.3498)
Guinea savanah zone	1.2883 (0.3429)	0.1974 (0.8709)	-0.6086 (0.6187)	-0.7727 (0.5375)

**Significant at 0.05

*Significant at 0.1

The multinomial logit regression coefficients are above, while the r values are in brackets

Table 24: Marginal estimates of the multinomial logit regression for determinants of risk management behaviour of crop farmers

Variable	Parttimer	Monofunction	Difunction	Active	Superior
Age	-0.106 (0.3984)	-0.3612 (0.2042)	0.9336 (0.0253)	-0.3823 (0.3119)	-0.8400 (0.78070)
Formal Education	-0.9644 (0.5941)	-0.7609 (0.0737)	0.3314 (0.6184)	0.5081 (0.4044)	0.1787 (0.9706)
Farming Experience	0.7088 (0.5668)	0.4805 (0.0627)	-0.4951 (0.1655)	0.4150 (0.8990)	-0.9780 (0.7133)
Farm size	0.4913 (0.0201)	-0.3714 (0.6381)	-0.1665 (0.1871)	0.1883 (0.8633)	0.1357 (0.0401)
Organisation Membership	-0.267 (0.1931)	0.8009 (0.2323)	-0.3211 (0.0002)	0.2267 (0.0215)	0.4103 (0.5657)
Attitude to agric risks	-0.2949 (0.0734)	-0.1719 (0.6819)	-0.2119 (0.9743)	0.5663 (0.3541)	-0.7831 (0.8732)
Risk exposure level	-0.1524 (0.5690)	-0.3740 (0.0000)	-0.1326 (0.1610)	0.3281 (0.0001)	0.1938 (0.0024)
Rainforest zone	0.1033 (0.7663)	0.3007 (0.0002)	0.1436 (0.1363)	-0.3196 (0.0002)	-0.1340 (0.0456)
Guinea savanah zone	0.2651 (0.9937)	0.1985 (0.0301)	0.8124 (0.4287)	-0.1606 (0.0565)	-0.1195 (0.0694)

Marginal effects are above, while the r values are in brackets.

Section 5.9: Testing of Hypotheses

Six hypotheses were tested in the study. Results of the hypotheses testing are as presented below:

5.9.1 Relationship between crop farmers' socioeconomic variables and their level of agricultural risk management.

5.9.1.1 Variables measured at nominal level

The result of the chi-square test in Table 25 shows that there were significant relationships between level of agricultural risk management and sex ($\chi^2 = 23.932$), marital status ($\chi^2 = 33.042$) and educational level ($\chi^2 = 43.71$) of crop farmers. In terms of sex, males are usually more active and with a higher level of physical energy that may be needed to implement risk management strategies on farm. Furthermore, with household dependents, farmers are stimulated to reduce their risk exposure levels by utilising risk management tools. In relation to educational level, knowledge of agricultural risk management tools is often influenced by the literacy level which is needed to improve communication flows. Senadjki *et al* (2012) also observed a significant relationship between educational level and farmers' level of risk management. The contingency coefficient values in Table 25 shows that the strength of the relationships were 27.8% for sex; 32.6% for marital status and 35.2% for educational level. This implies that educational level has greater influence on crop farmers' use of risk management tools than marital status and sex.

Table 25: Chi square test of relationship between crop farmers' socioeconomic variables and their level of risk management

Variable	χ^2	df	p value	Contingency coefficient
Sex	23.932	2	0.001*	0.278
Marital status	33.042	6	0.007*	0.326
Educational level	43.71	8	0.000*	0.352
Major source of information	8.614	6	0.196	0.164
Membership of organisation	11.177	6	0.083	0.187

* Significant at 0.05

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5.9.1.2 Variables measured at interval level

Table 26 indicates that farm size ($r = -0.100$) had a significant relationship with level of agricultural risk management. This shows that farm size influences the way crop farmers manage their farms against risks. The negative correlation suggests that farmers with smaller farm sizes manage better than the older ones. However, age ($r = -0.143$) and farming experience ($r = -0.177$) had no significant relationship with level of agricultural risk management. Farmers' age was negatively correlated with level of agricultural risk management, thus indicating that younger farmers utilise more risk management tools than older farmers. This implies that younger crop farmers in the country are more receptive of productive ideas than the older ones. In a related study, Cole and Kirwan (2009) also observed that risk management was decreasing as farmers' age increases. There was also a negative correlation between farming experience and level of agricultural risk management. This implies that younger farmers having fewer years of farming experience manage their farms better than older farmers having several years of farming experience.

Table 26: PPMC analysis of relationship between crop farmers' socioeconomic variables and their level of risk management

Variable	r value	p value
Age	-0.056	0.329
Farming experience	0.088	0.120
Farm size	-0.100	0.049*

* Significant at 0.05

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5.9.2. Relationship between crop farmers' risk exposure level and their level of risk management

Table 27 shows that a positive correlation ($r= 0.207$) exists between crop farmers' risk exposure level and their level of risk management. This implies that as farmers risk exposure level increases so do their level of risk management improves. This could be adduced to the fact that the decision to utilise more risk management strategies may often be influenced by the level of risk exposure. According to Ali and Kapoor (2008) farmers' responses to risk is often consistent with their perceptions of that risk, while Yesuf and Randy (2008) affirmed that farm household base their investment and production decisions partly on the perceived risk of failure. This result also corroborates the findings of Paul and Routray (2010) that households 'ability to manage risk is determined by the severity and frequency of risks they face (i.e risk exposure level).

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Table 27: PPMC analysis of relationship between Risk exposure level and crop farmers' level of risk management

Variable	r value	p value
Risk exposure level vs level of risk management	0.235	0.000*

* Significant at 0.05

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5.9.3 Difference in crop farmers' level of agricultural risk exposure across the three agro-ecological zones.

The result as presented in Table 28 shows that a significant difference ($F= 40.72$) exists in farmers' level of agricultural risks exposure across the three ecological zones. When a Scheffe adjustment was made for the number of comparisons as shown in Table 29, significant differences exist between two pairs of zones in the comparison; Guinea savannah and Coastal were significantly different with mean difference of 8.18, as well as Guinea savannah and rainforest with mean difference of 11.65. However no significant difference exists in risk exposure between coastal and rainforest zones with mean difference of 3.47. This implies that farmers in the coastal and rainforest zones do not differ significantly from each other in terms of agricultural risk exposure levels. This variation may be connected with respondents' ages as Lucas and Pabuayon (2011) asserted that age has negative effects on farmers risk perception. Moreover, the extent to which crop farmers perceive the impact of marketing and financial risks as well as the extent of perception of occurrence of production and financial risks may also be responsible for this variation.

Table 28: Analysis of Variance Test (ANOVA) for difference in agricultural risk exposure levels across zones

Variable	Fvalue	p value
Risk exposure level	40.72	0.000*

* Significant at 0.05

Table 29: Post hoc tests using Scheffe

Zone pairs	Mean difference	p value
Coastal & Rainforest	3.47	0.146
Coastal & Guinea savanah	8.18	0.000*
Rainforest & Guinea savanah	11.65	0.000*

* Significant at 0.05

5.9.4. Relationship between crop farmers' attitude to agricultural risks and their level of risk management

Table 30 shows that significant relationship ($r = -0.142$) exists between crop farmers' attitude to agricultural risks and their level of agricultural risk management. This finding implies that farmers' attitude to risk correlates with their level of risk management. According to Ajzen (2002), attitude is one of the considerations that guide human behaviour. The negative correlation indicates that farmers that are risk averse are better risk managers than farmers who are risk seeking. This indicates that farmers that are risk averse tend to use more risk management strategies than risk seekers. The tendency to be risk averse leads to a higher usage of a variety of risk management tools in a bid to reduce level of exposure to agricultural risks. For instance, Jordan and Grove (2008) concluded that risk aversion has a positive influence on the use of both cash forward contracting and hedging through future contracts/options, while Mohammed and Ortmann (2005) affirmed that insurance is more attractive to risk averse farmers. The result of this study corroborates the findings of Harington and Niehaus (1999); Bard and Barry (2000) and Anton (2008) that farmers' level of risk management is influenced by their attitude towards risks.

Table 30: PPMC analysis of relationship between attitude towards agricultural risks and farmers level of risk management

Variable	r value	p value
Attitude towards risk vs level of risk management	-0.137	0.016*

* Significant at 0.05

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5.9.5. Hypothesis 5: Difference in crop farmers' attitude towards agricultural risks across the three agro- ecological zones.

The result as presented in Table 31 shows that a significant difference ($F= 16.98$) exists in farmers' attitude towards agricultural risks in the three zones. The result of the Scheffe adjustment made for the number of comparisons in Table 32 shows that significant differences exist between each pair of zones in the comparison, that is, Rainforest and Coastal had mean difference of 2.95; Rainforest and Guinea savannah had mean difference of 5.40; Coastal and Guinea savannah had mean difference of 2.44 and all the differences are significant.

According to Bard and Barry (2000), attitude to risk is often a unique reflection of a person's personality and it is influenced by life experiences. Such life experiences include farmers' exposure to agricultural risks. As observed from Tables 11 and 14, farmers in the Guinea savannah zone had the highest level of risk exposure. They were also more averse to risks than the others. Hence, the variation in risk exposure level across the zones has been reflected in respondents' attitude towards agricultural risks.

Furthermore, attitude to risk may also be influenced by socioeconomic factors. For instance, crop farmers' involvement in off farm occupation (Figure 11) may be connected with the variation in respondents' attitudes towards risks. According to Ayinde (2008), the presence of other sources of income enhances the risk bearing ability of farmers. Hoag, Keske and Goldbach (2011) also observed that women show a slightly higher aversion to risk than men. Thus, the higher percentage of women in the Guinea savannah zone (compared to other zones) as indicated on Figure 6 may also be responsible for the higher level of risk aversion in the zone. The variation in respondents' ages across the zones as shown in Table 4 is also reflected in respondents' attitude towards risks.

Table 31: Analysis of Variance Test (ANOVA) for difference in attitude towards agricultural risks across zones

Variable	F value	p value
Attitude towards risk	16.98	0.000*

* Significant at 0.05

Table 32: Post hoc tests using Scheffe

Zone pairs	Mean difference	p value
Coastal & Rainforest	2.95	0.033*
Coastal & Guinea savanah	2.44	0.046*
Rainforest & Guinea savanah	5.4	0.000*

* Significant at 0.05

5.9.6 Difference in crop farmers' level of risk management in the three agro-ecological zones.

As seen in Table 33, a significant difference exists in farmers' level of risk management ($F= 6.75$) in the three zones. The Scheffe adjustment made as shown in Table 34 indicates that there exist significant difference in the level of risk management in coastal /rainforest with mean difference of 5.72 and coastal/ Guinea savannah with mean difference of 4.05. However, there was no significant difference in level of risk management between rainforest and Guinea savannah with mean difference of 1.67.

This implies that in terms of level of agricultural risk management, crop farmers in the coastal zone differ significantly from those from other two zones and this may be connected with their higher level of formal education, which improves farmers' ability to source information from a variety of information channels. According to Breukers *et al* (2009), higher level of education influences the level of understanding of a risk. The knowledge of risk management tools to combat risk enhances farmers' ability in adopting new production technologies that may help to reduce risks.

The variation in level of risk management may also be connected with respondents' membership of organizations. As shown on Figure 9, the variation among crop farmers belonging to two or more organizations across the zones aligns with the variation in level of risk management across the zones. Membership of farmers associations creates an avenue for farmers to reduce their risks (Shehu *et al*, 2010). Tekleword and Kohlin (2010) also observed that membership of organization is a form of social capital, which acts as a forum for sharing experience and exchanging information about market behaviour and this can help improve their level of risk management.

Table 33: Analysis of Variance Test (ANOVA) for difference in agricultural risk management across zones

Variable	F value	p value
Risk management level	6.75	0.001*

* Significant at 0.05

Table 34: Post hoc tests using Scheffes

Zone pairs	Mean difference	p value
Coastal & Rainforest	5.72	0.002*
Coastal & Guinea savanah	4.05	0.008*
Rainforest & Guinea savanah	1.51	0.731

* Significant at 0.05

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CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 SUMMARY

Food insecurity is one of the top developmental challenges in Nigeria and it is partly due to lack of appropriate agricultural risk management capacities in the country. This is because farmers are confronted with several risks that have the potential to reduce output and farmers' productivity. This study therefore identified the determinants of agricultural risk management behaviour among crop farmers in Nigeria.

The study focussed on crop farmers who had at least five years farming experience. Focus Group Discussions were conducted to generate a deeper understanding of farmers' risks perceptions and responses, while an interview schedule was also developed to gather information on farmers' socioeconomic characteristics and information on agricultural risk management. Through random sampling, 323 questionnaires were administered in three agro-ecological zones in the country and 310 questionnaires were received. Data were subjected to descriptive and inferential analysis. Crop farmers were categorised on the basis of their risk management abilities.

6.11 Major findings

The study found that majority of the crop farmers in the study area were males (91.7%) and 89.7% were married. The mean age was 53.2 years, while majority (38.3%) of the crop farmers fell between age bracket 51 and 60 years. More than one-third (37.7%) of the crop farmers had no formal education, although farmers in the coastal zone were more educated than those in the other zones studied. The mean farming experience was 28.3 years, while the modal class was 31 and 40 years. Farm sizes were on the average of 3.4 hectares with the guinea savannah zone having larger farm sizes. Minority (32.9%) had off farm occupation and for most of the crop farmers (97.7%), the farm ownership structure was sole proprietorship. Majority (84.8%) belonged to one or more organizations, while friends/family (90.0%) was the major source of information on agricultural risk management. Friends/family was also the major source of labour for majority of the respondents (76.5%).

The study also established that the major types of risks in the study area were; inadequate cash flow (94.2%), occurrence of pests and diseases (91.3%), sickness/ill health of farmer and labourer (89.0%), lack of access to credit (88.4%), volatility in output price (85.8%) and variability in labour costs (84.2%). In terms of risk exposure level, respondents'

most important sources of agricultural risks were production (9.85) followed by financial (9.84). Marketing risks (8.78) were perceived to be third source of agricultural risks, while social risks (8.20) were ranked last. Agricultural risks with high exposure levels were; flood (15.88), occurrence of pests and diseases (15.16), lack of access to capital (14.51), inadequate cash flow (13.02), drought (12.36) and volatility in output prices (10.91). The means for risk exposure levels across the zones were: coastal (251.40); rainforest (247.93) and guinea savannah (259.58). The general mean value for risk exposure level was 252.87. While less than one-fifth (18.7%) of the respondents were at a low level of risk exposure, majority were at a moderate level (50.3%) or high level (31.0%) of risk exposure.

The mean value for respondents' attitude towards agricultural risks was 50.6 and more than three quarter (84.2%) of the respondents were risk-averse, with the rainforest zone being more risk seeking than the other zones. Furthermore, in terms of utilization of agricultural risk management strategies, respondents had the highest scores under production strategies, while marketing strategies had the lowest utilization rate. Strategies with high utilization rate include; reducing leverage/outside equity (2.94), having good human relations with labourers/employees/contracting partners (2.73), use of fertilizer to improve fertility (2.65), use of improved seedlings (2.60), increase in liquidity (2.57) and membership of cooperatives (2.56). The means for agricultural risk management levels across the zones were: coastal (75.89); rainforest (70.17) and guinea savannah (71.84). The general mean value for crop farmers' level of agricultural risk management was 72.6. Almost half of the respondents (47.1%) of the respondents were in the low level category.

Forty-one percent of the respondents were either superior or active agricultural risk managers, one third were di-function managers, while one quarter were either mono-function managers or part-timers. Moreover, the coastal zone had the highest number of active and superior risk managers, while the rainforest zone dominated the di-function and mono-function risk managers' categories. The guinea savannah zone had the highest number of part-time risk managers.

Majority (57.1%) of the respondents were not aware of agricultural insurance and less than one tenth (7.4%) of those aware adopted crop insurance. Although respondents who adopted perceive crop insurance as having significant effect on risk management, they complained that they were not satisfied with documentary requirements, accessibility and information delivery process of NAIC. Barriers preventing respondents from purchasing crop insurance include: complicated procedures (70.2%), high premium (63.2%) and accessibility

(64.9%). while strong motivators to improve interest in crop insurance were; local availability of insurance company (88.4%), high propensity in getting claims, (87.1%), less bureaucracy (79.7%) and lower premium (78.4%).

A multinomial logit regression analysis showed that for the mono-function managers, having larger farm size, and a higher risk exposure level tend to make the crop farmer a part-timer, while membership of organization tend to make the farmer a mono-function manager. The di-function managers were negatively predicted by farm size. At the active level, being a member of an organization, having higher risk exposure levels and a high risk attitude tend to make the farmer an active manager, whereas having larger farm sizes tend to make the farmer a part-timer. The superior managers were also positively influenced by risk exposure level.

Chi-square analysis revealed that sex ($\chi^2 = 23.932$), marital status ($\chi^2 = 33.042$) and educational level ($\chi^2 = 43.71$), had significant relationship with crop farmers' level of agricultural risk management. Pearson Product Moment Correlation also established that farm size ($r = -0.100$), risk exposure level ($r = 0.207$) and farmers' attitude towards agricultural risks ($r = -0.142$) had significant relationships with farmers level of risk management. There was a significant difference in attitude towards agricultural risks ($F = 16.98$) across the zones. There were also significant differences in crop farmers' level of risk exposure ($F = 40.72$) and level of agricultural risk management ($F = 6.75$) across the zones, although farmers in coastal and rainforest zones did not differ significantly from each other in terms of level of risk exposure while those in the guinea savannah and rainforests did not differ significantly in terms of level of risk management. Major predictors of agricultural risk management behaviour were: marital status, formal education, major source of information, ecological zone and risk exposure level.

6.2 CONCLUSION

The following conclusions are reached on the basis of the findings of the study:

- The study area is under a threat due to the high level of agricultural risk exposure especially production and financial risks. Moreover, the significant difference in levels of risk exposure across the study area indicates the disparity in the occurrence and impact of agricultural risks and that risk exposure is a function of the farmers' local environment.
- Farmers will be willing to utilize more risk management strategies if the risk management strategies are made accessible and affordable, as majority of the crop farmers in the study

area are risk averse. The higher risk attitude of crop farmers in the rainforest zone may imply that more energy may be expended in making them utilize risk management strategies.

- There is suboptimal use of agricultural risk management strategies among respondents as marketing strategies had low utilization rate and almost half of the respondents had low level of agricultural risk management despite the fact that majority are highly exposed to risks. The low use of strategies and the high percentage of di-function and mono-function managers in the rainforest zone further corroborate the high risk attitude of the farmers in the zone.
- There is a low level of use of crop insurance as majority of the respondents are unaware of crop insurance. Moreover, since majority of those aware do not utilise crop insurance, awareness may not be the major determining factor for crop insurance.
- There is the need to enhance farmers' network as membership of organization positively influenced the risk management behaviour of farmers.

6.3 RECOMMENDATIONS

1. The Federal Government needs to create a conducive environment for farmers to operate so as to reduce crop farmers' level of risk exposure especially the production and financial risks. Emphasis should also be placed on the level of vulnerability across the zones. Measures to reduce risk exposure level of farmers include; development of pest/disease tolerant seed varieties, improved subsidy packages on key inputs for production, improving farmers access to affordable credit, disaster prevention (such as flood control) and investment in irrigation infrastructures.
2. The Ministries of Agriculture should empower farmers to take their own risk management decisions by sensitizing and training them on available risk management strategies especially marketing strategies. Initiatives to improve farmers' financial literacy should also be encouraged. Likewise, risk reducing technologies should be made accessible and affordable to crop farmers so as to improve adoption.
3. The Nigerian Agricultural Insurance Corporation needs to strengthen their awareness campaigns so that farmers can be aware of the benefits of agricultural insurance and encouraged to adopt it. The insurance offices should be made available in farmers' communities instead of the use of zonal offices in each state of the federation as is

presently practiced. There should also be lesser bureaucracy, while claims period is shortened. The introduction of *takafful* (an alternative to conventional insurance, which entails ethical financing and cooperative risk protection) in general insurance can also be extended in to agricultural insurance so as to serve those excluded due to ethical considerations.

4. In order to facilitate the sharing of information on risks, crop farmers should be encouraged to join more than one farmers' organizations so as to improve farmers' level of risk management.

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APPENDIX
QUESTIONNAIRE
UNIVERSITY OF IBADAN
FACULTY OF AGRICULTURE AND FORESTRY
DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT
TITLE: DETERMINANTS OF AGRICULTURAL RISK MANAGEMENT
BEHAVIOUR OF CROP FARMERS IN NIGERIA

NOTE: This questionnaire is intended to cover the above topic. It is purely for scientific research. All information supplied would be treated as “STRICTLY CONFIDENTIAL”. Please tick (✓) as appropriate or fill in the gaps where necessary.

SECTION A: SOCIOECONOMIC CHARACTERISTICS

State: _____; Town/ village: _____

1. Sex: Male () Female()
2. Marital Status: Single (), Married (), Divorced (), Widowed ()
3. Age: _____ (in years)
4. Religion: Islam (), Christianity (), Traditional (), Others (specify)
5. Educational background: No formal Education (), Primary School (), Secondary School (), OND/NCE (), HND/B.SC (), Postgraduate () Others(specify)

6. Please tick and rank your source(s) of credit.

Credit source	Tick those applicable	Rank those ticked 1- Most important
Friends/family		
Cooperatives		
Private money lenders		
Commercial banks		
Microfinance banks		
NACRDB		
Others (specify)		

7. Are you a member of any organization? Yes (), No ().
8. If yes, how many organizations _____
What are the names of the organisations? _____
9. Do you hold any position in the organizations? Yes (), No ().
10. If yes, what positions? Leaders (), Executive members (), Ordinary members ().

- 11 How well do you participate in organizational activities? Adequately (), Moderately (), Rarely ()
- 12 How long have you been in to crop farming _____ (in years)?
- 13 What is the major crop you cultivate? _____
- 14 What other crops do you grow on your farm _____
- 15 What other types of agricultural enterprises are you in to? Cattle (), Sheep (); Goat(), Poultry (); Fishery (), Snailery (). Others (specify) _____
- 16 What is the ownership structure of your farm; Sole proprietorship (), Company (), Partnership (). Others (specify) _____
- 17 From which sources do you earn income?

Income source	Tick those applicable
Off farm:	
Wages/salary	
Pensions	
Investments	
Farm income	
Others (specify)	

- 18 What is the size of your farmed land? _____ (in hectares)
- 19 From which sources do you obtain labour for farm activities? Friends/Family (), Partnerships/Cooperatives (), Hired labourers (). Others (specify)
- 20 How available is farm labour when it is needed. Always available (), Sometimes available (), Rarely available (), Never available ().
- 21 Which category (ies) of people do you sell your farm produce to? Middlemen (); Processing industry (); Directly to individuals/ household (Consumers) (); Others (specify). _____
- 22 How easy is it to source markets for your farm produce? Highly accessible (), Moderately Accessible (), Not Accessible ().

SECTION B: FARMERS' AGRICULTURAL RISK FACTORS

23 Please indicate your perceived types of risks as well as your perceived level of risk exposure.

Sources	Tick relevant sources of risks	Likelihood of occurrence 1=Never 2= Unlikely 3=Possible 4=Likely, 5=Very likely	Perceived Average economic loss from risks (1= 0%-20%, 2= 21%-40%, 3= 41%- 60%, 4= 61%- 80%, 5= 81%-100% of produce)
Production types of risks			
Drought			
Excessive rainfall/ flood			
Pests and Diseases			
Shortfall in production e.g. Reduction in soil fertility			
Limited knowledge about usage of chemicals/ fertilizers			
Rainfall fluctuations			
Low quality seedlings			
Marketing types of risks			
Volatility in inputs costs			
Volatility in output price			
Market failure			
Inaccessibility to markets			
Consumer Preference			
Loss of bargaining power			
Inefficient storage/ Perishability			
Availability of transport facilities			
Variability in transport costs			
Financial types of risks			
Access to credit			
Inadequate cash flow			
Default risk			
Changes in Interest rate			
Social types of risks			
Labour availability			
Variability in labour costs			
Damage to equipment			
Sickness/ill health of farmer/ labourer			
War/Conflict			
Theft			
Fire outbreaks			
Contracting risk			

24 The questions in the table below relate to agricultural risk management, please indicate your responses to them.

	Questions	Utilise		Level of utilization		
		Yes	No	Utilise all the time	Utilise sometimes	Utilise rarely
	Production risk management strategies					
1	Use of Improved seedlings					
2	Buying seedlings from reputable source					
3	Diversification of farm enterprise					
4	Use of fertilizer to improve fertility					
5	Use of Irrigation techniques					
6	Flood control (e.g channelization)					
7	Cultivating crops benefitting from public intervention. E.g cassava					
8	Consulting people with crop knowledge					
9	Using soil conservation techniques e.g. crop rotation, minimum tillage					
10	Pest Control Practices					
11	Timely farm activities					
	Marketing risk strategies					
12	Production contracts					
13	Marketing contracts					
14	Cooperative marketing					
15	Using sequential sales					
16	Ensuring direct sales to wholesalers/ processors					
17	Future/commodity exchange markets					
18	Vertical integration of farm produce					
19	Using/ sharing market information with other farmers					
20	Keeping adequate records of farm produce					
21	Forward price of inputs					
	Financial risk Strategies					
22	Crop Insurance					
23	Increasing liquidity e.g. maintaining credit reserves					
24	Having off farm employment					
25	Making credit arrangement before production					
26	Keeping fixed costs low					
27	Sharing information on risk management					
28	Controlling family expenditure					
29	Monitoring financial ratios					
30	Using lowest possible production costs					
31	Membership of cooperatives					
32	Keeping adequate records of financial transactions					
33	Reducing leverage (outside equity)					
34	Leasing/ renting expensive farm equipment					

	Social risk management strategies					
35	Securing labour contracts before production					
36	Securing backup/emergency labour					
37	Having good human relations with labourers/employees/contracting partners					
38	Improving farm security e.g. fencing and use of guards					
39	Use new/ well maintained equipment/ machinery					
40	Having backup machinery/equipment					
41	Using traditional practices like scarecrow and native medicine					
42	Personal insurance					

25 From which sources do you obtain information on risk management strategies

Sources	Tick those relevant	Rank those ticked 1- Most important; 2- Next important etc
Other farmers/Friends and relatives		
Self		
Extension/Development agents		
Television		
Print media		
Radio		
Others (specify)		

26 The following questions pertain to your attitude towards agricultural risks, kindly indicate your responses.

	SA	A	U	D	SD
1 I regard myself as the kind of person who is willing to take a few more risks than others.					
2 I am generally cautious about accepting new risk management ideas					
3. I must be willing to take a number of risks for my farm activities to be profitable					
4 I am more concerned about large loss in my farm operation than missing a substantial gain.					
5 I am ready to adopt a new risk management idea, once i hear it is beneficial					
6 Profit is reduced when farm risks are managed					
7 I encourage other farmers to adopt new and beneficial technologies that will reduce farm risks					
8 I don't adopt risk management tools until I see them working for people around me					
9 I am capable of influencing major decisions on my farm					
10 I believe only in traditional methods of managing farm risks					
11 I am less willing to take risks than my friends do					
12 With respect to my farming operations, i like to take risks					
13 I am concerned about a substantial gain than a large loss in my farm activities					
14 I am always one of the last set of farmers to try a new idea					
15 I am reluctant in taking risks when it comes to my farming activities					
16 Using risk management strategies help to reduce farm risks					
17 With respect to my farming operations, i do not like to take risks					
18 Farm loss is reduced when risks are managed					
19 Using risk management strategies is a waste of time					
20 I must be reluctant to take a number of risks for my farm activities to be profitable					
21 With respect to the conduct of my farm operations, I like to play it safe					

SECTION C: EFFECTIVENESS OF AGRICULTURAL INSURANCE IN MANAGING RISKS

- 28 Are you aware of the Nigerian Agricultural insurance Corporation (NAIC) agricultural insurance scheme? Yes (), No ()
- 29 If yes, how did you hear about it? Family/Friends (), Extension/Development agents (), NAR/CDB/ Other formal credit sources (), Print media (), Radio (), Others (specify) _____
- 30 Have you ever bought their agricultural insurance? Yes (), No ().
- 31 If Yes, how often do you buy it? Frequently (), Sometimes (), Rarely ().
- 32 What is your perception of the effectiveness of agricultural insurance? Very effective (), Moderately effective (), Low effectiveness (), Not effective ().
- 33 What is the average premium you have paid for crop insurance? _____
- 34 Please indicate your level of satisfaction with NAIC activities

Services	Excellent	Very Good	Good	Bad	Very bad
Documentary Requirements					
Accessibility					
Premium paid					
Prompt Settlement of claims					
Information Delivery					

- 35 What factors prevent you from buying agricultural insurance?

Inhibiting factors	Tick those applicable	Rank those ticked. E.g. 1- Most important factor, 2- next important
It is complicated		
loss is an act of God		
Insurance procedures are against my ethical values		
loss is too low		
Accessibility		
High premium		
Others (specify)		

36 What factors will motivate you to purchase agricultural insurance?

Motivators	Tick those applicable	Rank those ticked. E.g. 1-Most important factor 2-next important
Subsidy of premium		
Higher Probability of receiving claims		
Lesser bureaucracy		
Insurance company issuing the policy		
Level of risk exposure		
If required by lender of loans		
Compatibility of insurance procedures with my ethical values		
More awareness		
Local availability		
Others (specify)		

Thank you.

Olajide, F. O

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