# ANALYSIS OF RISKS AND MITIGATING STRATEGIES AMONGST POULTRY FARMERS IN KADUNA METROPOLIS

**BY**

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**A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (M.SC.) IN AGRICULTURAL ECONOMICS.**

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**MAY, 2015.**

## DECLARATION

I hereby declare that this dissertification titled "**Analysis of risk and mitigating strategies amongst poultry farmers in Kaduna metropolis of Nigeria"** was written by me and it is the record of my research work. No part of this work has been presented in any previous application for another degree of diploma at any institution. All references made to published literatures were duly acknowledged.

…… ……

**Adeyinka Jacob, TIMOTHY** **Date**
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## CERTIFICATION

This thesis titled "**Analysis of risk and mitigating strategies amongst poultry farmers in Kaduna Metropolis of Nigeria"** by **Adeyinka Jacob TIMOTHY** meets the regulations governing the award of the degree of Master of Science (Agricultural Economics) of theAhmadu Bello University, Zaria. It is adequate in scope and is approved for is contribution to knowledge and literacy.

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## DEDICATION

This thesis is dedicated to the Almighty God, the ever wise God, full of mercy and compassion. He is a faithful God.

**ACKNOWLEDGEMENTS**

My help in time of need and my ever present God, it is through the strength supplied by Him that I made it thus far.

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## ABSTRACT

The study focused on theAnalysis of risk and mitigating strategies amongst poultry farmers in Kaduna Metropolis, Nigeria.Specifically, the study examined the socio-economic characteristics of farmers, their sources of risk, mitigating strategies used and risk attitudes of poultry farmers in the study area.Multi stage sampling procedure, using simple random technique procedure to select 130 farmers.The data collected were through structured questionnaire. The data were analysed using descriptive statistics, attitudinal scale, Cronbach's coefficient test and Safety first principle. The socio-economic factorsresults showed that the average age was 45, the average household size was 9,and the average flock size was 1445.The study also reveal that the 3 most important risks in poultry farming were disease out-break, rise in cost of inputs, and change in poultry output prices (eggs and meat). These were reported by 100%, 96.9% and 94.6% of the respondents respectively. The result also revealed that majority (70.1%) of the farmers were risk averse, while 23% are risk takers and6.9% were risk neutral. This implies that the poultry farmers have a risk-averse behaviour.In addition, the result showed that other risk mitigation strategies used by the farm household in the study area were preventive medical treatment, quarantines / building rotation, off-farm income as important source of household income, young animals from own breeding, birds from safe and known supplier, feed from safe and known source, diversification, etc.The result of the regression analysis revealed that non-farm income exhibited negative relationship with risk attitude, this implies that the higher the off farm income the less risk averse the farmer will be. House hold size, poultry farming experience, flock size were found to be positively related to risk attitude, which implies as these factors increase the farmers risk aversion will be more. In conclusion, this study revealed that poultry farmers in the study area were more risk averse, employing mitigating strategies in poultry production. In conclusion, this study revealed that poultry farmers in the study area were more risk averse, employing mitigating strategies in poultry production.

# CHAPTER ONE

# INTRODUCTION

## 1.1 Backgroundto the study

Investing in Agriculture, like many other economic activities, is exposed to a wide variety of risks and uncertainties ranging from input supply and prices, agricultural yield, post-harvest losses and product prices to the vagaries of nature such as inclement weather conditions, pests and diseases (Nmadu and Peter, 2010; Aina and Omonona,2012). Other natural hazards such as floods and fire outbreaks are equally important with regards to their impact on the success or failure of an agricultural enterprise. In order to boost agricultural production considerably, it is imperative to reduce the impact of these risks and uncertainties to the barest acceptable minimum(Aina and Omonona,2012).

Agriculture is the mainstay of the economy, contributing about 40 per cent of GDP. The agriculture sector employs approximately two-thirds of the country's total labour force and provides a livelihood forabout 90 per cent of the rural population (IFAD, 2012).

In livestock production, poultry occupies a prominent position in providing animal protein as it accounts for 25% of local meat production in Nigeria (Okunlola and Olofinsawe, 2007). The Livestock production index (2004-2006 = 100) in Nigeria was last measured as 122.97 as of 2011, and in 2012 as 127.3 (OECD and FOA, 2011; WDI, 2014). The poultry industry witnessed a great leap in the population of birds in 2010, from 158,216,684 in 2006 to 166,127,481 in 2007, representing an increase of 2.35 percent, the figure rose to 192,313,325or 7.72 percent as well as the number of

poultry establishments (NBS, 2010).Poultry farming in Nigeria form 25 per cent of the country's agricultural Gross Domestic Product, (Thisday, PAN,2013).

Nigeria's commercial poultry sector has the potential to expand production to increase per capita consumption levels, which have increased only slightly since 2000. The commercial sector could also begin producing poultry meat and eggs for export. The country's production prices are close to or below the world average. In addition, the sector has the support of a strong producer's group and links to multinational companies. Increasing production to take advantage of export prospects will likely depend on monitoring and mitigating Avian Influenza outbreaks and controlling high feed prices (Obi*et al*, .2008; USDA 2002).Nigeria produced 1.61 kilograms per capita of chicken meat and 3.66 kilograms per capita of eggs in 2008. Per capita production rates increased only slightly from 2000 to 2008 (FAOSTAT**).** Chickens, ducks, Guinea fowls, turkeys, pigeons, and ostriches are commonly raised in Nigeria. Poultry stocks are distributed throughout the country, like other West African countries, production generally falls under two main categories, traditional rural systems and intensive commercial operations.

Studies on the significance of poultry to families have also shown thatkeeping poultry is a part of life in rural Africa (Sonaiya*et al.,* 1999).A large number of poultry farmers in Nigeria produce under conditions that are exposed to the vagaries of nature and limited infrastructure like storage facilities and power (Onuorah, 2008). The importance of the poultry industry in Nigeria has been demonstrated by the number of researches conducted. The risky nature of the enterprise is usuallyworsened by the outbreak of Highly Pathogenic Avian Influenza, in 2006. Studies have evaluated behaviour or

attitude to risk and responses of poultry farmers to risk and agricultural insurance (Aye and Oji, 2007; Ajemtomobi and Binuomole, 2006; Olubiyo et al 2009; Ajieh, 2010).

Nigerian livestock operations, estimated at 33.8 million head of sheep and 175 million poultry birds (Bénard*et al*., 2010).Demand for livestock products, including poultry, is expanding in West Africa as a result of population growth and increased urbanization (Killebrew*et al.,* 2010). Poultry is far the largest livestock group, consisting mainly of chickens, ducks and turkey. Poultry is the most commonly kept livestock and over 70% of those keeping livestock are reported to be keeping chickens (Udoh and Etim, 2007). Poultry is raised for various reasons. Specifically, the roles of poultry in providing the much needed animal protein for the increasing population cannot be over emphasized. (Udoh and Etim, 2009).

Poultry meat and eggs are still considered luxury foods for many Nigerians. In rural areas, poultry consumption is reserved for special occasions, meat and eggs typically come from household flocks. Urban dwellers consume larger amounts of poultry due to their relatively higher income levels and greater access to fresh or frozen products in markets and fast food outlets. Eggs are a daily part of the diet in urban areas, while poultry meat is consumed on an occasional basis, (Adene and Oguntade 2006).

The poultry industry plays importantroles in the development of Nigerianeconomy. It is a major source of eggs andmeat which have a high nutritional valueparticularly in the supply of protein. Eggsare also important in the preparation ofconfectionary and vaccines. The poultryindustry also provides employmentopportunities for the populace, therebyserving as a source of income to thepeople (Akanni, 2007).The poultry industry is of considerable economic relevance because it serves as a source of food, income, employment and poverty alleviation (Bosnjak and Rodic, 2008; Hodges, 2009).

## 1.2 Problem Statement

Agricultural production is riskier than businesses in other sectors of economy (Hardeaker*et al*., 2004). Riskiness of agriculture may be attributed to several factors that are beyond the control of producers.Many factors including vagaries of nature, diseases, insect infestations, general economic and market conditions contribute to the price, yield or net return variability of agricultural producers.The sources of risk in agriculture are numerous and diverse (World Bank, 2005;Dupaigre*et al.,* 2006).According to Adebusuyi, 2004, Alderman, 2008, pointed out that risk in production is a strong characteristic ofagricultural production.Researchers have found that risks cause farmers to be lesswilling to undertake activities and investments that have higher expected outcomes, butcarry with them risks of failure.

In agriculture, farmers express their risk mitigation in diverse ways, some of which are forward pricing,production practices, insurance, holding liquid reserves,diversification, and liability management or theircombination, (Adejoro, 2000). Generally, these ways of risk mitigation have commanded substantial resources from farmers and researchers. In Nigeria,however, most poultry farms are small scale with littleopportunity for diversification and insurance. The farmers are not sure of weather, government policies, and new changes in technology – factorswhich make it difficult for them to predict the future with certainty.One key element in many versions of the spiral, in any country or environment, is risk aversion (Aye and Oji, 2007). Theirattitudes to risk are nevertheless major determinants ofthe rate of diffusion of new technologies among thefarmers and of the outcome of rural developmentprogrammes (Tonye*et al.*, 1977; MANR, 1997; Adejoro2000).In developing countries, farmers also lack access to both modern instruments of risk management—such as agricultural insurance, futures

contracts, or guarantee funds—and ex post emergency government assistance. Such farmers rely on different "traditional" coping strategies and risk-mitigation techniques, but most of these are inefficient(Wenner, 2010).

The Nigerian poultry sectorexperiences many problems such as a rise in the price of feed, avianinfluenza,floods, fire-out break,inadequate credit withthe global financial crisis. The poultry sector is characterized by a low levelof production specialization, (FOA, 2006, Bello 2011). These factors bring about uncertainty in poultry production;thus affecting the supply of poultry products in the markets (NAN, 2013). The events of a number of periods of price uncertainty and movement (volatility) have caused companies to fall into bankruptcy, farmers leaving the business, farmers falling into semi-permanent poverty traps and consumers to face spiralling costs for food and consequently, decline in the growth of the poultry sector (Adeyemo and Onikoyi, 2012).

A large number of poultry farmers in Nigeria produce under conditions that are exposed to the vagaries of nature and limited infrastructure like storage facilities and power (Onuorah, 2008). Nigerian farmers are increasingly faced with risk factors such as droughts, floods, diseases, pests, windstorms, accidents, fire, theft, damage and several other unplanned events whose occurrence cannot be readily predictedand therefore, poses serious threat to the success of farming enterprise in Nigeria (Eleri*et al*., 2012).A general lack of accurate information on the risks sources and mitigation strategies in the livestock sector, combined with insufficient veterinary and breeding services, non-existent or inadequate regulations concerning production, commerce and animal health control are also other important obstacles to the mitigation of risks in poultry production (FAO, 2008).

It is against this backgroundthat this study is being conducted in order toanalyze the risks faced by poultry farmers and the mitigation strategies employed amongst poultry farmers in Kaduna state.The following research questions will be addressed in this study:

i. What are the socio-economic characteristics of poultry farmers in the study area?

*ii.* What are the risksfaced by poultry farmers in the study area?

*iii.* Which mitigating strategies is being use by poultry farmers in the study?

*iv.* What are the farmers' attitudes to risk?

*v.* What are the farmers' attitudes to risk?

### 1.3 Objectives of the Study

The broad of objective of this study is to examine and evaluate risks andmitigating strategies of poultry farmersin Kadunametropolis; while the specific objectives are to:

*i)* describe the socio economic characteristics of the poultry farmers;

*ii)* identify and classify the risksfaced by poultry farmers ;

*iii)* identify and describe risk mitigating strategies employed by poultry farmers;

*iv)* determine poultry farmers risk attitude

*v)* determine the influence of socioeconomic characteristics of farmers on risk attitude

## 1.4 Justification for the Study

Risk is believed to play an important role in the investment decisions of individual or businesses (Isik and Khanna, 2003; Knight *et al.,* 2003). In order to protect agriculture-based livelihoods, food and nutrition security, it is essential to reduce underlying risks and strengthen the resilience of farmers, livestock holders, fishers and foresters.Increasing production to take advantage of export prospects will likely depend on monitoring and mitigating risk in poultry farming, such as in Avian Influenza outbreaks, disease spread, theft and controlling high feed prices.

Understanding risk mitigation for poultry farming requires an identification of the various sources of risks in poultry farming. Hence, knowledge on risk faced by poultry farmers, and the mitigation strategies poultryfarmersuse is important indetermining the output, outcome,development of the poultry sector.Thus, it is expected that the study will also serve as a means of providing information for prospective investors in poultry production and highlight on the existing risks and the current mitigating strategies used by farmers in the case study area.

Therefore this study is timely and will reveal the risksfaced by the poultry farmers as well as thefactors that accentuate them, as a starting point for developing appropriate policies and strategies frame work that will enhance and facilitate development of the poultry sub-sector in the agricultural sectors. A good understanding of poultry risks sources and the mitigation strategies required, including challenges facing poultry farmers in the study area**.**The result will assist policy makers and stakeholders tounderstand the current situation and provide the needed policy to assist in the mitigationof risks involved in poultry production.

## 1.5 Test of Hypothesis

The hypothesis of the study is:

i. There is no significant relationship between the poultry farmer's risk attitudes and their socio-economic characteristics.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1. Business risks and economic globalization

For a business enterprise, risk implies anything that can cause variability in business value such as unexpected increase in cash outflows or unexpected reduction in cash inflows. In effect, business risk refers to variability in cash flow. The major business risks that give rise to variability in cash flows are (i) price risk, (ii) credit risk, and (iii) pure risk. In recent times, these risks have greatly increased as a result of economic globalization.

Globalization is the process by which national economies are increasingly integrated and dependent on one another. It is rooted in three technological revolutions: in transportation, communication, and information technology. Globalization has drastically reduced economic transaction costs from afar and has tended to swallow up inefficient production systems in developing countries with cheap imports from industrialized nations (Schuh, 2002).

### 2.1.1 Concept and sources of risks

Risk can be defined as: 'Uncertain future events which could influence the achievement of the organisation's strategic, operational and financial objectives.'Risk is uncertainty that affects an individual's welfare, and is often associated with adversity and loss.Risk is a condition in which there exists a quantifiable dispersion in the possible outcomes from any activity (CIMA,2005*)*.Risk inagricultural production can be exogenously-caused or endogenously-induced. Whileexogenous risk, which may arise from extreme weather conditions or threats of disease andpest outbreaks, is independent of farmers' production decisions, endogenous risk is incurredsolely by such production decisions.

In other words, while the pest outbreaks can becategorized as exogenously-caused, the change in risk from the use of pesticide to controlpest outbreaks is endogenously-induced by farmers' decisions (Rabin,2000; Rabin and Thale, 2001;Knight *et al*., 2003).

Agricultural risk is associated with negative outcomes stemmingfrom imperfectly predictable biological, climatic, and price variables.These variables include natural adversities (for example, pests anddiseases), climatic factors not within the control of agricultural producers,and adverse changes in both input and output prices,in addition to biological issues, the lack of breeders, marketing(The markets for agricultural inputs and outputs have a direct incidence on poultry farming risk) and processing technology present technical constraints to poultry sector growth(Dupaigre*et al.,* 2004; World Bank, 2005).

There are many sources of risk in agriculture, ranging from price and yield risk to the personal risks associated with injury or poor health. In dealing with risky situations, risk management involves choosing among alternatives to reduce the effects of the various types of risk. It typically requires the evaluation of trade-offs between changes in risk, changes in expected returns, entrepreneurial freedom, and other variables.

### 2.1.2Sources of risks in farming

Some risks are unique to agriculture, such as the risk of bad weather significantly reducing yields within a given year. Other risks, such as the price or institutional risks discussed below, while common to all businesses, reflect an added economic cost to the producer. If the farmer's benefit-cost trade off favours mitigation, then he or she will attempt to lower the possibility of adverse effects. These risks include the following:

**Production or yield risk** occurs because agriculture is affected by many uncontrollable events that are often related to weather, including excessive or insufficient rainfall, extreme temperatures, hail, insects, and diseases. Technology plays a key role in production risk in farming. The rapid introduction of new crop varieties and production techniques often offers the potential for improved efficiency, but may at times yield poor results, particularly in the short term. In contrast, the threat of obsolescence exists with certain practices (for example, using machinery for which parts are no longer available), which creates another, and different, kind of risk, (Huirne*et al.*,2000,Hardaker*et al.*, 2004).Production risks facing poultry farmers include weather, disease, feed quality, and chick quality.Disease risk includes both catastrophic losses, such as losses to avian influenza, and chronic disease losses, which more slowly erode profits.Poultry production risks include fire; physical injury resulting from structural failures, panic, and noises; weather; disease; equipment failure; and input quality. Production risk can be systemic or idiosyncratic. Systemic risks, such as wide temperature excursions or labour shortages, affect all operations in a region. Other elements of production risk for poultry operations are idiosyncratic, affecting individual growers. Examples of idiosyncratic production risk include the breakdown of an automatic feeding system, an isolated disease outbreak, or a ―stampede in a cage-free poultry house (USDA, NASS, 2009).

Weather-related risk in poultry production is minor compared to weather risks in field or row crop production. Severe weather affects a small number of individual flocks every fifth or sixth year. The effects of weather on energy availability and energy costs are a much greater concern to poultry stakeholders than are the direct effects of weather on production, assuming best management practices, such as back-up generators, are followed.Disease risk includes chronic disease losses, which slowly erode production

and consequently affect profits and potential losses to catastrophic diseases, such as avian influenza, (USDA, NASS, 2009).

**Price or market risk**reflects risks associated with changes in the price of output or of inputs that may occur after the commitment to production has begun. In agriculture, production generally is a lengthy process. Livestock production, for example, typically requires on-going investments in feed and equipment that may not produce returns for several months or years. Because markets are generally complex and involve both domestic and international considerations, producer returns may be dramatically affected by events in far-removed regions of the world.Both poultry (output) prices and feed (input) prices are subject to market forces. Together, risks associated with prices can result in considerable variability in the economic situation in the poultry industry, (USDA, NASS, 2009).

**Institutional risk**results from changes in policies and regulations that affect agriculture. This type of risk is generally manifested as unanticipated production constraints or price changes for inputs or for output. For example, changes in government rules regarding the use of pesticides (for crops) or drugs (for livestock) may alter the cost of production or a foreign country's decision to limit imports of a certain crop may reduce that crop's price. Other institutional risks may arise from changes in policies affecting the disposal of animal manure, restrictions in conservation practices or land use, or changes in income tax policy or credit policy.Institutional risk of concern to poultry growers includes husbandry standards, environmental policies, and international regulations.

Farmers are also subject to the ***human or personal risks*** that are common to all business operators. Disruptive changes may result from such events as death, divorce,

injury, or the poor health of a principal in the firm. In addition, the changing objectives of individuals involved in the farming enterprise may have significant effects on the long-run performance of the operation. Poultry workers, including poultry caretakers, farm managers, flock supervisors, and poultry catchers, spend most of their time in buildings and are in high-risk labour categories. Hazards include respiratory hazards (such as ammonia gas, dust, moulds, and airborne animal wastes), noise hazards that may lead to worker hearing loss, animal hazards (such as risk of tetanus infections), and mechanical hazards, ((Ellington, G., 2002; USDA, NASS, 2009).

**Asset risk**is also common to all businesses and involves theft, fire-outbreaks, or other loss or damage to equipment, buildings, and livestock. A type of risk that appears to be of growing importance is **contracting risk**, which involves opportunistic behaviour and the reliability of contracting partners.

**Financial risk**differs from the business risks in that it results from the way the firm's capital is obtained and financed. A farmer may be subject to fluctuations in interest rates on borrowed capital, or face cash flow difficulties if there are insufficient funds to repay creditors. The use of borrowed funds means that a share of the returns from the business must be allocated to meeting debt payments. Even when a farm is 100-percent owner financed, the operator's capital is still exposed to the probability of losing equity or net worth. Price and credit risks are sometimes classified in economic literature as financial risks (Trieschmann*et al*., 2001).

**Pure Risk**

Pure risk refers to reduction in business value as a result of damage to business property by theft, robbery, fire, flood or the prospect of premature death of employee due to work-related illness or accident (Trieschmann*et al.*, 2001). Pure risk can also occur

through legal liability suits for damages to customers, suppliers, shareholders and other parties (Harrington and Niehaus, 1999).Liability risks have increased greatly in recent times, with businesses and individuals often held financially liable for damages resulting from a vast and expanding array of situations. Liability judgements may result in huge payments to compensate injured parties as well as to punish those responsible for the injuries (Trieschmann*et al*., 2001). Pure risk results only in loss and reduction in business value. No possibility of gain is presented by pure risk – only the potential for loss. Business value can increase if losses from pure risk turn out to be lower than expected. But if very high and greater than expected, they can threaten the firm's viability. Indeed, pure risk is sometimes defined as risk where the random outcome results only in loss for the economy (Harrington and Niehaus, 1999). It differs in this respect from price risk where losses emanating from fluctuation in prices hurt some and benefit others. Losses from pure risk usually are not associated with offsetting gains for other parties. The implication is that losses from pure risk reduce total wealth of society, whereas fluctuations in input and output prices need not reduce total wealth since they hurt some and benefit others.

**TABLE 1:** Key Risks Faced by Farmers

| RISK | EXAMPLES/ FACTORS | EFFECTS |
|---|---|---|
| Weather risks | Rainfall or temperature variability or extreme events | Lower yields, loss of productive assets or income |
| Biological risks | Pests, disease, contamination | Lower yields, loss of income |
| Price risks | Low prices, market supply and demand, volatility | Lower prices, loss of income |
| Labour and health risks | Illness, death, injury | Loss of productivity, loss of income, increased costs |
| Policy and political risks | Regulatory changes, political upheaval, disruption of markets, unrest | Changes in cost, taxes and market access |

Source: Jaffee,S. *et al*., (2010).

| Table2: Identified Risk Sources in Nigerian poultry management |
|---|
| Risk Sources |
| High mortality/death rate |
| Infestation of disease |
| Changes in input prices |
| Output price fluctuation |
| Changes in weather/climate condition |
| Cannibalism and feather pecking |
| Breakage of egg/poor collection |
| Inconsistent government policy |
| Attack by predator |
| Power failure/erratic power supply |
| Heat stress/poor ventilation |
| Poisoning by chemicals |
| Untreated injury |
| Contaminated feed /untreated drinking Water |
| Poor housing |
| Contaminated litter |
| Poor and inadequate finance |
| Poor storage facilities |
| Attack /action of human being |
| Occurrence of natural disaster |

Source: Effiong*et al.*, 2014

## 2.2Risk management instruments and strategies in agriculture

Risk management strategies start with decisions on the farm and the household: on the set of outputs to be produced, the allocation of land, the use of other inputs and techniques, including irrigation and the diversification of activities on and off-farm. Farmers can also manage risk through market instruments which include insurance and futures markets (Anton, 2009).

More concrete risk management strategies can be grouped into three categories (Holzmann and Jogersen, 2001): prevention strategies to reduce the probability of an adverse event occurring, mitigation strategies to reduce the potential impact of an adverse event, and coping strategies to relieve the impact of the risky event once it has occurred. Prevention and mitigation strategies focus on income smoothing, while coping strategies focus on consumption smoothing. Strategies can be based on arrangements made at different institutional levels: farm household or community arrangements, market based mechanisms and government policies.

Having first become aware of a risk and then having assessed it, the next issue is how the party (or parties) at risk can seek to manage that risk. It should first be noted that risk management should be planned on an ex-ante basis (that is, before realization of an event). Some ex-ante plans are provided (financially or otherwise) for actions on an ex-post basis (for example, insurance payouts and government relief programs). Managing realized risks on an ex-post basis only is not considered to be risk management—after all, if something has already happened, it is no longer a risk (although a future reoccurrence might be).

- **Mitigation** is the lessening or limitation of the adverse impacts of hazards and related disasters. Risk mitigation options are numerous in agriculture and varied (for

example, crop and livestock diversification, income diversification, soil drainage, mulching, use of resistant seeds, avoidance of risky practices, and crop calendars).

- **Transfer:** Transfers of risk occur when one party lowers their risk by shifting that risk to someone else, often for fee.While insurance is the best-known form of risk transfer, in developing countries the use of informal risk transfer within families and communities is extremely important. Common examples include futures and options contracts, crop insurance, and fire andhail insurance. These transfers are accomplished with a known cost, i.e. the cost of insurance,options contracts or the like.
- **Coping** refers to improving the resilience to withstand and manage events, through ex-ante preparation and making use of informal and formal mechanisms in order to sustain production and livelihoods following an event. Although we have noted that coping is an ex-post activity, it is possible to plan and to prepare for coping activities on an ex-ante basis. This is often fiscally beneficial, as the ability to quickly respond to events often reduces losses.

A fourth approach is that of

- **Risk avoidance** or **risk prevention**.Avoidance is the process of structuring the business so that certain types of risk are nonexistent.

### 2.3 Methods of managing agricultural risks

Human ingenuity has not failed to device ways and means to reduce risks or to mitigate their results. Sada (1993) classified the methods of managing agricultural risks into five: risk avoidance, risk assumption or retention, risk prevention, risk distribution and risk transfer.

### 2.3.1 Risk Avoidance

Risk avoidance is an important method of managing risk in agriculture. Risk avoidance is the first device that strikes the mind immediately especially for those risks which are avoidable. Avoidance is the process of structuring the business in such a way so that certain types of risk arenonexistent. For example in poultry production, there are considerable risks associated with layer and broiler production operations including disease, death or loss of newbornchicks, andothers, (Alan*et al*., 2004). However, most farmers take their risk by calculating the probability of any of the event occurring and not occurring, and take the risk to establish the business or continue with the process.

### 2.3.2 Risk Assumption or Retention

Risk assumption or retention is a situation in which either knowingly or unknowingly, risk is retained without being passed off to another person or agency. Unplanned risk assumption usually occur when no consideration whatsoever is given to the risk probably because it is insignificant or because the farmer is not aware of it. Planned risk on the other hand, assumes the risk in question would have been identified but the individual or corporate body may decide the risk or chances of loss occurring are insignificant or can be easily absorbed within the financial resources available. Assumption/retention is the process of retaining or accepting risks with the objective thatassuming this increased risk is to maintain control and/or enhance overall profitability.Assumption may occur simply because we cannot transfer it, rather than accepting in willingly.However, by accepting/retaining it we do assess and catalogue it. Integrators in both crop andlivestock production may retain ownership of products being produced under contract. Considerfor example, an integrator who contracts with

growers to finish hogs. The grower is oftenresponsible for providing the grow-out facilities, for a fixed or minimum guaranteed fee, whilethe contractor retains ownership of the market hogs. Since the grow-out facilities are notrecorded on the balance sheet of the contractor, traditional measures of financial leverage (suchas the debt/asset ratio) may not reveal the risks associated with this arrangement. Because thecontractor retains ownership of the animals and has a signed contract with the grower, one canthink of this arrangement as a pseudo guarantee by the contractor for the loan taken out by thegrower. The integrator is retaining more risk with the expectation of enhanced profits, (Alan*et al*., 2004).

Three ways by which this method may work. These include:

**a) Self-Insurance:** Since certain agricultural risks must be assumed, Ray stated that assumption can be done in several ways; arisk may be borne by the subject of uncertainty himself, either alone or in combination with a group of persons or it may be transferred to others. If it is a one-man enterprise, he may undertake to protect himself by accumulating funds in good years to support him in lean years or when risk occurs. The farmer may also opt to operate on a large scale thus reducing or carrying his losses up to a point especially when the units of ownership or operation is spread over space. This is referred to as self-insurance or latent insurance.

**b) Mutual Insurance:** This as a situation in which a small owner or operator, either of a few animals or of a few acres of land, can however, protect himself against risk of concentrated loss by spreading it over space and time through combination with a number of small owners like himself. This combination may be in form of pooling of resources to set up a cooperative farm where losses would be shared by all in proportion to assets posted or by subscribing small sums in order to meet any eventual loss to one

or more of them, the aggregate subscription being just sufficient to indemnity that loss plus incidental expenses.

**c) Speculation and Insurance:** here, the subject of uncertainty may without bearing the risk either individually or in a group, transfer it to others who specialize in uncertainty bearing. Such transfer may be affected through two different processes, which are similar in that both are aimed at reducing uncertainty to a measured risk by grouping similar uncertainties. These two processes are insurance, which offers protection in case of physical loss to person or property in consideration of a small stipulated sum, and speculation which is chiefly a cover against probable loss of value. The speculator by a system of transfer to risks, take up themselves the chance of gain or loss through fluctuations in the value of certain commodities in the hand of the producers, dealers and manufacturers. Although their immediate object is to make money through fluctuations of prices, they serve indirectly to reduce the cost of uncertainty. A specific instance is the hedging contract under which two contracts of opposite character are made at about the same time to offset the gain or loss from one by loss or gain from the other.

### 2.3.3 Risk Prevention /Reduction

This includes any reasonable step taken to prevent a loss or any action that has the effect of reducing the possibility of loss. Prevention of risk in agriculture means the reduction of uncertainties through improved facilities and techniques as well as organization.Reduction is the process of lowering the risks associated with the business venture.Consider the following example from the crop production side. A grain producer can hire cropscouts to spot disease, nutritional imbalances, and pest control

problems. This helps reduce therisk of poor yields, but the risk is not eliminated completely. In an industrialized form ofagriculture, there are often good opportunities for producers to reduce these risks. Contractors forgrain and livestock production may, for example, supply experts who help the producer reduceproduction risks through timely advice. Again, this reduction of risk may result in implicit orexplicit reductions in net returns.Another common way for producers to reduce risk is to diversify across differententerprises. For example, traditional independent swine producers are often diversified acrosscrop and livestock enterprises. For industrialized agriculture, risk reduction through enterprisediversification is seldom a driving force. Rather, industrialized agriculture often involvesspecialized production as a means of achieving economies of size in one particular enterprise, (Ray, 1986, Alan*et al*., 2004).

### 2.3.4 Risk Distribution

This term is used generally in connection with speculative risks. It involves the incorporation of a firm as a limited liability company with ownership and risk distribution amongst the shareholders with each shareholder's liability being limited to the proportion which the loss bears to share capital subscribed(Alan*et al*., 2004).

### 2.3.5 Risk Transfer

Risk transfer is one of the common techniques of risk management in agriculture. It involves the transfer of the risk or a potential loss to a third party. An example of risk transfer is under a contract of insurance where the risk generator pays a premium to an insurer who is a professional risk bearer and thereby transfers the risk to the insurer.

Transfers of risk occur when one party lowers their risk by shifting that risk to someoneelse, often for fee. There are numerous methods in agricultural production to shift risks in thismanner. Common examples include futures and options contracts, crop insurance, and fire andhail insurance. These transfers are accomplished with a known cost, i.e. the cost of insurance,options contracts or the like.Risk transfer can also occur in situations in which the "cost" of the transfer is moredisguised or vague. For example, grain farmers can transfer price risk through forward contracts.Likewise, a contract producer of vegetables may be able to transfer price risk to the contractor.The monetary and non-monetary costs of such risk transfer are often in the form of lostopportunities (the unexpected price rise) and are less clear.Industrialized agriculture tends to alter the mechanisms for managing risk. Producers whooperate under contract may have better opportunities for yield and price risk avoidance,reduction, and transfer than do traditional independent producers. However, these opportunitiesmay be offset by increases in less traditional risks such as relationship risks and strategic risks.Integrators, on the other hand, have opportunities to assume more risk in the new industrializedforms of agriculture. Of course, higher returns are expected for accepting such risks, (Alan*et al*., 2004).

**Diversification**

A farmer diversifies when he uses his resources in different activities and/or assets instead of concentrating them on a single one. In an imperfect market, returns from different enterprises or activities are not perfectlyand positively correlated. A favourable result in one enterprise may help to cope with a loss inanother enterprise. Thus, diversification reduces overall risk. Lack of managerial expertiseand market outlets as well as climate, soil quality or the availability of water may limit theopportunities for diversification of farm activities. Diversification also includes off-

farmstrategies. Taking-up off-farm employment reduces dependency on agricultural income andtherefore, it can be considered as a strategy(NABARD, 2011).

**Contracts and Vertical Integration**

In a contract, the farmer and a buyer of the agricultural output agree in advance on the terms of delivery, including the price.The contract is standardized in terms of quantity, quality, and time and location for delivery. In a marketing contract, the farmer agrees to sell a commodity at a certain price to abuyer before the commodity is ready to be marketed. The farmer retains full responsibility forall production management decisions. The contracts can take many forms. They can be basedon a fixed price, or alternatively depend on the development of the commodities futuresprice. The latter type of contract does not eliminate price risk completely. Price risk is zeroonly in those cases, where the exact price to be paid to the producer before delivery is fixed.

The costs, borne by the farmer, result from forgoing the opportunity of achieving a higherprice on the open market. Intermediate and final consumers may be willing to pay a higherprice for a contractual guarantee of a certain quality. Contracting allows distributing thisadditional value along the production chain. However, the premium agreed on in most of thequality-related contracts is not fixed at a specific value but rather depend on marketconditions. A further advantage of marketing contracts in the crops sector is related to timemanagement. During the busy harvesting season, time does not have to be allocated toselling the product,(NABARD, 2011).

**Production contracts** give the contractor (the buyer of the commodity) considerablecontrol over the production process. These contracts normally specify the production inputsto be used, the quality and quantity of the final product and the price to be paid to theproducer. The contracts vary in the degree of control exercised by the contractor. Apart fromother possible advantages for the farmer, the contract partially

shifts price risk to theprocessor. On the downside, the farmer depends to a large extent on one buyer, thus incurringa risk of losing his only outlet following contract termination. A vertically integrated firmretains ownership control of a commodity across two or more levels of activity. There aremany reasons for vertical integration and risk reduction one among them. Basically, it helpsin reducing risks associated with a variation in quantity and quality of inputs or outputs.

Vertical integration is more common in the livestock sector, with integration being backwardinto inputs (feed manufacturing) or in the fresh vegetables sector with forward integrationinto sorting, assembling and packaging, (NABARD, 2011).

**Hedging in futures and options**

On spot or cash markets, prices are set for goods that are immediately available.

Production and marketing contracts as well as futures markets add the time dimension tothese markets. They allow users to hedge their price risk by locking in the price of acommodity they wish to purchase or sell at a future date. Future market contracts differ inthree important issues from production and marketing contracts:

I. They are standardised in terms of contract terms and thus, they can be more easily traded;
II. They are traded in organised exchanges under rules and regulations; and
III. While production and marketing contracts usually involve physical delivery of goods at maturity, in futures markets this is the exception.

**Trading in futures** enables shifting risk from a firm that desires less risk (the hedger)to someone who is willing to accept the risk in exchange for a profit. A hedger can be afarmer, a trader or a processor, who wants to “lock in” a price for a commodity he is going tosell or buy on the spot market at a later stage. Futures contracts help to protect against pricerisk, as futures and cash prices converge against the end of the delivery

period, resulting inlosses and gains in the two markets offsetting each other, (NABARD, 2011).

**Insurance**

Insurance is nothing but risk pooling. Risk pooling involves combining the risks facedby a large number of individuals who contribute through premium to a common fund, whichis used to cover the losses incurred, by any individual in the pool,(NABARD, 2011).

## 2.4 Risk Attitude

David and Murray (2004), defined Risk attitude as "*chosen state of mind with regard to those uncertainties that could have apositive or negative effect on objectives*", or more simply "*chosen response to perception ofsignificant uncertainty*".

A range of possible *attitudes* can be adopted towards the same situation, and these result indiffering *behaviours*, which lead to *consequences*, both intended and unintended.

Risk-averse (or risk-avoiding)

Risk-neutral

Risk-loving (or risk-seeking)

**Risk averters** are cautious individuals who preferless risky sources of income or investments. They willsacrifice some amount of income to reduce theprobability of low income or losses; this implies that theywill forego some possible gains to reduce the probabilityof losses. This is referred to as his "risk premium" and itincreases with the degree of risk aversion. Averting riskdoes not mean that the individual will bear no risk

at all;instead he must be compensated for taking risks byreceiving a return that is greater than what would bereceived if the outcome of an action choice were certain.**Risk preferring** individuals however, would notbe willing to give up the possibility of gains in order toreduce the probability of losses; he prefers more riskybusiness alternatives. But a preference for risk does notmean that the individual will accept any risk regardlessof the return; instead, it means that an individual will paya premium or accept a return that is lower than would beexpected if the outcome of a choice of action werecertain in exchange for the opportunity to take a chance.

**Risk neutral** individuals on the other hand makedecisions based on the expected values of distributionsof consequence. He selects the action with the highestexpected value irrespective of the associateddistribution of outcomes (Babalola, 2014).

In their definition of risk attitude; Meuwissen et al. (2001),Flaten et al. (2005) talk about comparative risk aversion. Aye and Oji (2005) just talk about risk attitude. The authors talk about the same construct but defined it differently. What they describe is farmers' attitude towards risk, which means as much as farmer's willingness to take risk. That author's talk about the same construct is also emphasized by the fact that the authors use similar questions in their surveys to measure relative risk attitude, comparative risk aversion and risk attitude.

Meuwissen et al. (2001) and Flaten et al. (2005) defined risk attitude as a farmer's willingness to take risk *compared to others*. This is done to make the construct risk attitude better definable for respondents. It is assumed that there are no farmers who will 'like' to take risks (everyone is risk averse). Statements in which a respondent is asked to indicate their willingness to take risk compared to others makes it easier to define their risk attitude. This is done by Meuwissen et al. (2001) and Flaten et al. (2005). Explaining farmer's willingness to take risk is an attempt to explain a sort of

economic behaviour. Explaining economic behaviour has often been a subject of research and has led to several theories. Huirne (2003) tried specifically to explain the risk behaviour of farmers and discussed several theories.

## 2.5 Poultry production management

Poultry management activities involves:providing the proper temperature,ventilation, lighting, and litterconditions for the birds, feeding and watering, treatment with drugs and cleaning poultry houses, vaccination, building poultry houses and marketing poultry.In commercial poultry farms routine animal health practices include vaccinations against variousdiseases, de-worming of the birds, prophylactic antibiotic treatment and mineral supplementation.Others include administration of Coccidiostat, de-lousing and de-beaking. These services are providedby qualified animal health specialists.In rural extensive poultry systems in Nigeria there are little orno animal health interventions provided by qualified veterinarians. To reduce costs it is quitecommon for such small scale farms to utilise the services of non-professional animal health serviceproviders. This group of unqualified animal health service providers have been implicated in thespread of HPAI from one location to the other. Alternatively such rural poultry farmers patronizeethno-veterinary medicine.

Controlling Agricultural risk associatedwith poultry production such as HPAI and mitigating its impact requires a goodunderstanding of the extensive poultry production system, which is important owing to thezero or minimal biosecurity level associated. Free range poultry have easy access to risk factors,especially wild birds. Research has recently linked agricultural practices (rice paddy and ducks) andHPAI spread in Asia (Gilbert et. al., 2007).

The bio-security measures differ depending on the type of poultry production system. In mostmedium and large-scale commercial farms, bio-security measures include walling/fencing of thefarm, provision of farm gates, foot and vehicle dips with constantly replenished disinfectants andmovement control. Other measures include non-recycling of egg crates, provision for a separatesales department for poultry and poultry products well removed from the farm housings and bird-prooffacilities.The level of biosecurity, in the Small-scale commercial production systemis moderately high. Unlike backyard poultry producers whoconsult pseudo-experts (Non-professional Animal Health Service Providers), semi-commercialfarmers resort to periodic professional consultation especially through the local and stategovernments' veterinary departments. In commercial production, the biosecurity level is very high, coupled with a verysophisticated level of technology input obtained through importation and from local sources. Thesector is the most organised of all, with each of the industrial integrated farms having its own feedmill and significant staff strength covering areas such as farm administration, health and safety,veterinary control, quality control and quality assurance, engineering, stock control and marketing.Poultry disease prevention measures applied in poultry management are mainly cleaning, vaccination, quarantine, and disinfection.

### 2.5.1 Poultry diseases

Diseases, ranks highest as the main cause of poultry losses. Some 65.7 percent of households experienced high mortality (of more than 50 percent) in their flocks, mainly due to diseases and predators. Common diseases of poultry are NCD, fowl typhoid,

coccidiosis, gumboro, fowl pox and ectoparasites. The most affected poultry species are chickens, ducks and turkey.

### 2.6Opportunities for Poultry Development and Economic Growth

The Poultry Association of Nigeria (PAN) is a producer organization whose members include large-scale commercial poultry operators, medium-scale producers, and small-scale commercial and backyard producers.PAN promotes production and hygiene standards, communicates with members about poultry-related current events, and is an influential stakeholder in the sector, (Riviere, 2006; Obi *et al.*, 2008).Smallholder poultry keeping is widespread in Nigeria, but consumption rates, particularly for rural households, remain low compared to the West African average. Increasing the productivity of smallholder systems depends largely on overcoming disease-related poultry loss. Rural poultry keepers would benefit from better access to vaccines and veterinary services.

In addition to expanding the supply of poultry products for household consumption, increasing production could allow smallholders to sell birds and eggs, an activity that is currently not common among rural producers. Improved methods of transporting and storing eggs could also increase egg sales, which are currently hampered by high rates of spoilage. Nigerian consumers' preference for indigenous chicken breeds offers a potential product niche for smallholder poultry keepers. The country's growing backyard production sector also offers an opportunity for poultry development. Veterinary services and training support could both increase the productivity of backyard producers and help a greater number of them in the transiting to full-fledged commercial operations

### 2.6.1 Domestic Production

FAOSTAT data show that Nigeria's domestic poultry production has supplied close to 100 percent of the country's consumption, both before and after the 2002 import ban. However, large volumes of undocumented imports entered the country prior to theban, accounting for up to 21 percent of domestic consumption in 2002 according to the USDA Foreign Agricultural Service. The import ban has reduced, but not eliminated, undocumented imports (USDA, 2002,).

### 2.6.2 Commercialization of poultry and poultry products

All components of the Nigerian poultry marketchain have a well-defined role in the overall objective of supplying consumers with poultryproducts, notwithstanding differences in quantity of demand and products in different periodsof the year.

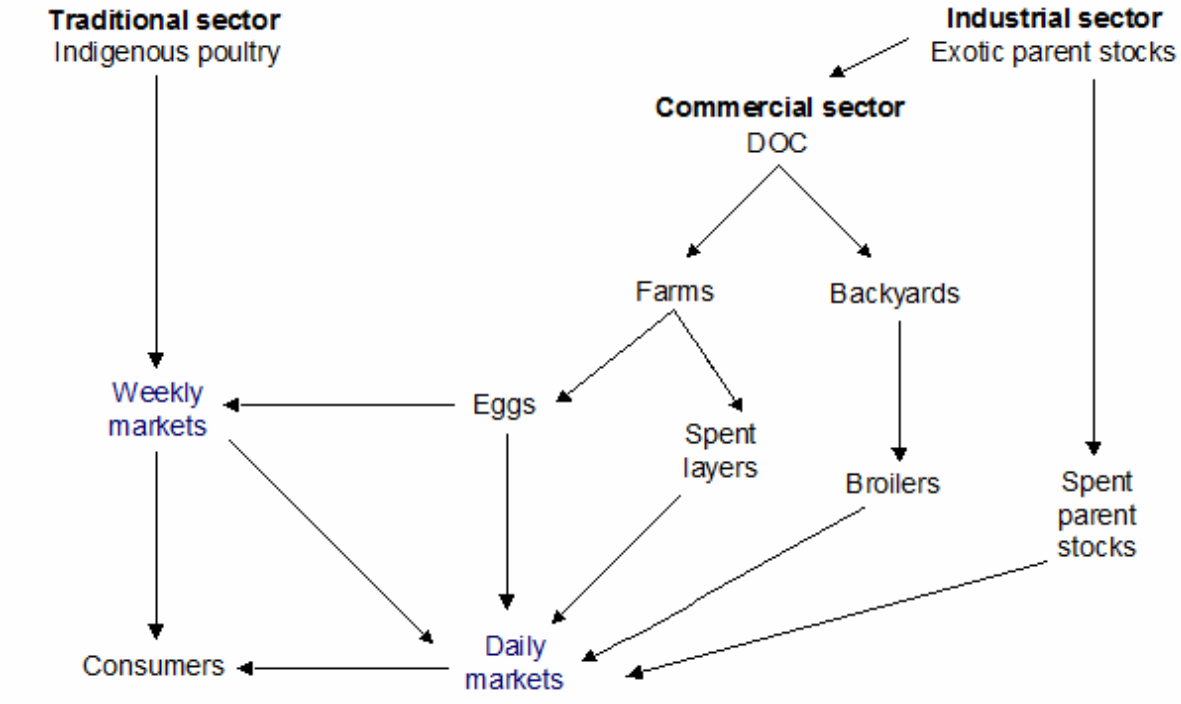



**Fig 1:** TheNigerian poultry market chain

Source: FAO 2008

A large percentage of exotic improved breeds in Nigeria are layers and they provide thelarge majority of commercial eggs. Exact numbers are not available but it is estimated tPhat70-80 percent of exotic breeds are layers and the rest are broilers. Normally, spent layerstogether with local poultry and, to a less extent, spent parent stocks, supply the largestportion of poultry meat. During festive occasions (Christmas, New Year, Easter, end ofRamadan and Tabasky), there is a peak in demand for poultry meat and this is mostlyprovided by broilers.

Production is concentrated in different locations and there are differences in producers'profiles:

(i) Indigenous poultry: mostly produced in the northern part of the country by rural producers.

(ii) Grandparent stock: concentrated in the south-west and generally brought from Europe.

(iii) Parent stocks and DOCs: mostly produced in the south-west by big industries.

(iv) Eggs: produced everywhere, but mainly around the major urban centres, by big andsmall farms.

(v) Broilers: scattered all over the country and principally produced in the backyard sectorand partially by farms, (FAO, 2008).

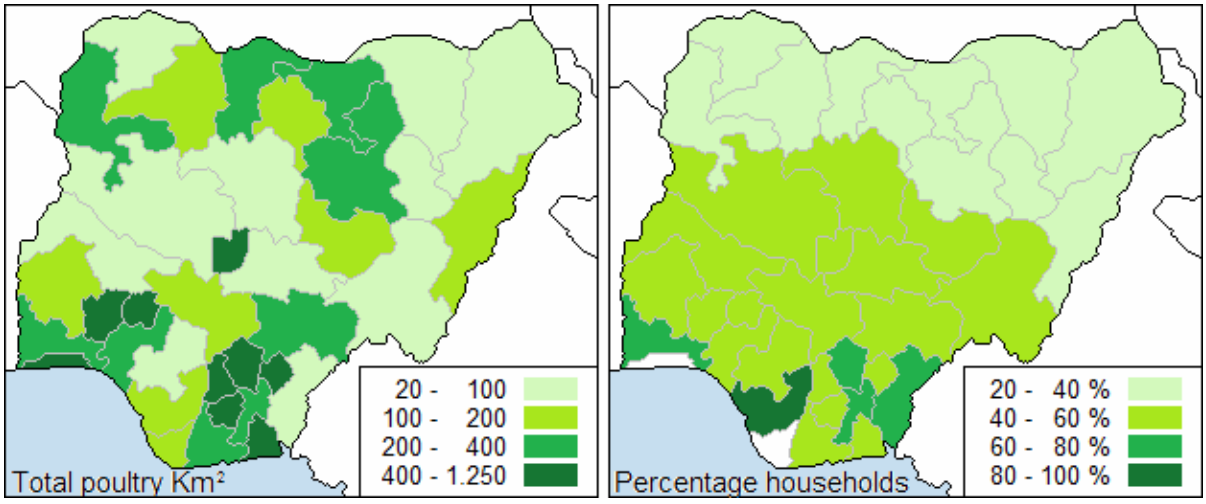



Fig 2: Total poultry densityHouseholds rearingsubsistence poultry

**Source:**Census (2006) by States of the Federal Republic of Nigeria.

### 2.6.3 Structure of the Poultry Sub-sector

The classification of poultry production systems in recent years began with a dependence on generalclassification with housing scale as the key criterion. Kitalyi (1998) classified poultry production inAfrica into three sectors: intensive, semi-intensive and extensive. The intensive system is commonlyreferred to as the commercial scale production while the semi-intensive system is referred to as the‘backyard poultry production’, which is also the intermediary among the three systems. While it isclear from several studies that family poultry is a growing area in developing countries (e.g. Sonaiya,1999), it is unclear from some studies whether family poultry in Africa is a rural or urban and/orintensive, extensive or mixed ‘concept’. For instance, in the lead paper 3 of INFPD/FAO ElectronicConference on Family Poultry, it is referred to as encompassing intensive, backyard and scavengingmanagement system, which could lead to a misconception of family poultry as including commercialproduction (referred to as intensive management). It is also

tempting to assume that family poultryin Nigeria is a rural concept, as presented in Adene and Oguntade (2006).However, it is crucial to note that family poultry in Africa is a transitory process, which is growingfrom a village system to rural-town and urban production processes. Also, it encompasses bothintensive/semi-intensive (backyard production) and extensive (free-range) management systems. Inline with this, Sonaiya and Swan (2004) provided a comprehensive definition of family poultry as‘small-scale poultry keeping by households using family labour and, wherever possible, locallyavailable feed resources’. This definition clarifies that family poultry comprises a flock size of 5 – 100birds in Africa, but recent data from short survey by Adene and Oguntade (2006) show that this hasincreased over time in Nigeria. This is corroborated by the NBS data on household keepingsubsistence poultry across geopolitical zones in Nigeria where average poultry flock size perhousehold is up to 177 birds in Delta State (South-South).It is also worthwhile to mention that while many studies (e.g. Kitalyi, 1998; Muchadeyi et. al., 2005)have shown that family poultry production in Africa is largely extensive, in Nigeria, an importantfactor in determining the type of poultry management system practiced is location. Therefore, it canbe noted that extensive and backyard (extensive) poultry production systems are common in therural-village while backyard (intensive) systems are common in rural-town and urban areas. This iswhy the Adene and Oguntade (2006) household survey data does not provide precise guidance onthe range of poultry flock size in Nigeria and why it is unclear whether their samples were takenfrom rural-town or rural-village areas. Hence, it is difficult to attribute a flock size of 59 – 181chickens to free-range or village extensive production systems (in south-east Nigeria), which theyregarded as conventional rural poultry.

Apart from a classification based on the housing scale, biosecurity level has become the key criterionin recent literature probably due to increasing emergence and spread of TADs across continents.

FAO (2004) defined four poultry production sectors based on experiences in Asia as follows:

(a). Sector 1: Industrial Commercial Farms - integrated system with high level biosecurity and birds/products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity).

(b). Sector 2: Large Commercial Farms - poultry production system with moderate to highbiosecurity and birds/products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife).

(c ). Sector 3: Small Commercial Farms - poultry production system with low to minimal biosecurity and birds/products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).

(d). Sector 4: Village or backyard production with minimal biosecurity and birds/products consumed locally.

This classification emphasizes commercial production by segregating it into 3 levels of intensivemanagement and biosecurity. Although scale of production and level of biosecurity are glaringcriteria that separately identify sectors 1 and 2, overlaps still exist between these criteria for theoperational sectors of commercial production in Nigeria. The Adene and Oguntade (2006) reportshows that in some respects, there is no clear

cut-off line among the sectors. For instance, somesector 2 farms have a production capacity (e.g. 250, 000 flock of turkey), high biosecurity level(except for different vaccination schedules) and input scale (e.g. automation) as high as those insector 1.Available data show that the Nigeria poultry sector is dominated by small commercial farms andfamily poultry, which suggests a bottom-up approach for classifying poultry production systems inthe country since the lower sectors are the most important for the prevention, control andsurveillance of HPAI. This approach was utilised in a recent study (UNDP, 2006) in which the poultrysub-sector is classified into commercial, semi-commercial, backyard (intensive) and extensivesectors. The information presented in FDLPCS (2007) was based on this classification.

## 2.7 Theoretical Framework

A model is a figurative representation of a perceived object used to guide one in pursuit of knowledge (Morrow and Torre, 1995).A risk management system can therefore be seen as a set of complex relations among the three different axes that involve the original sources of risk, the available tools and strategies, and the government measures**.**The simultaneous determination of the elements in these axes generates an identification problem when analyzing risk management. When certain events or measures of variability of relevant farming variables are observed, they already reflect the actions taken by the farmer to manage risk and the government measures and regulations that affect both farming risk itself and availability of risk management tools. Any reasonably precise measurement of farm income variability already includes to a great extent the impacts of existing risk management strategies and government programs in place. This explains the need for a holistic approach to deal with risk

management in agriculture. No single risk, strategy or policy can be properly analyzed in isolation (Antón,. J, 2009). The choice of a strategy is a function of the some socio-economic factors, as well as the institutional and individual incentives of management offered by the government or other bodies, and the farmer, which are conditioned in turn by other stakeholders and their respective incentives. How effective the selected strategy is in reducing risks; such as disease outbreak, theft and so on then depends not only on its technical efficacy, but also again on the capacity and incentives of the health education, extension services, to deliver it as intended and also the adoption and proper use of the mitigation strategies, (Onkundi, 2010).

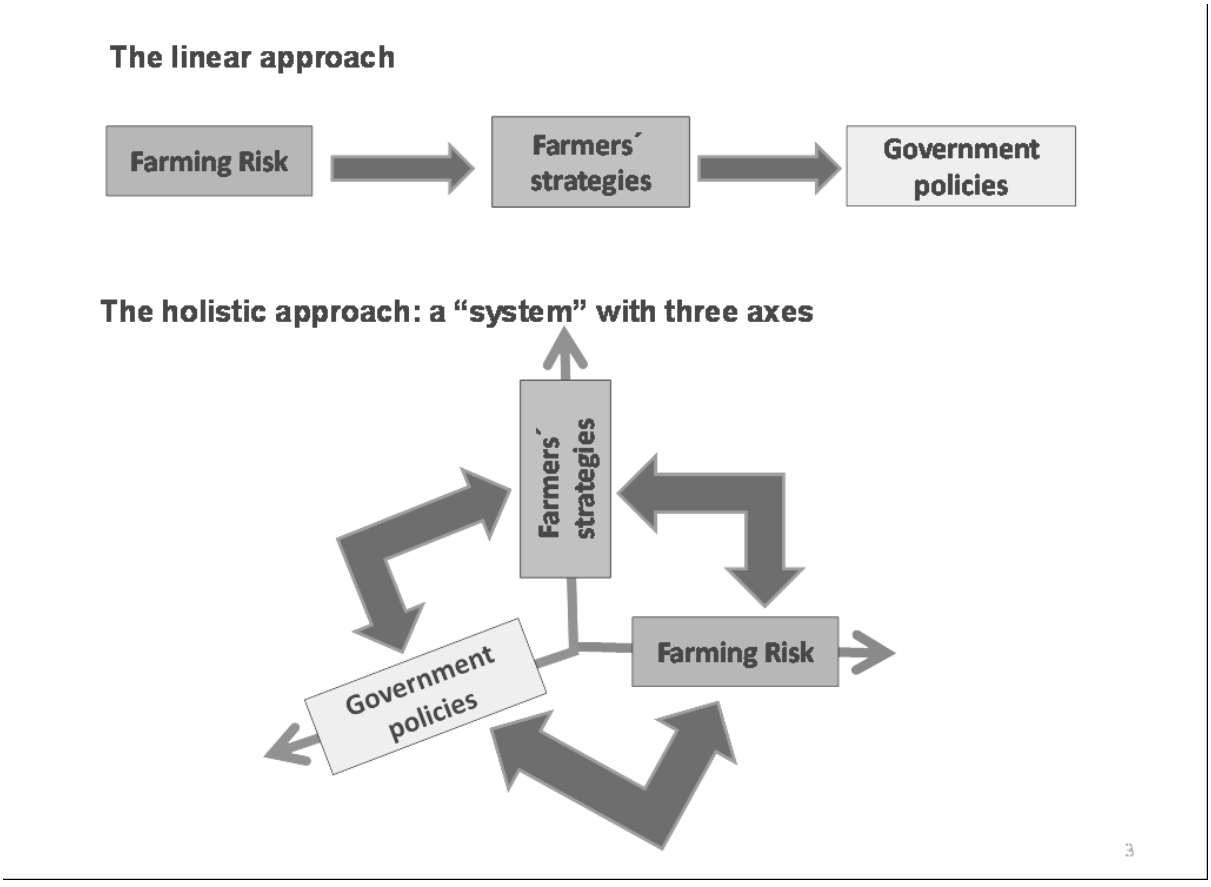



Fig 3: **Two approaches for the analysis of agricultural risk management**

Source**:** Antón, .J (2009).

The model for is the holistic approach, this study posits that identifying risks in poultry can be reduced by use of mitigating strategies and socio-economic characteristics of poultry farmers and institutional variables which influence adoption of risks mitigating practices. This model demonstrated how various sources of agriculturalrisks mayaffect the decision making process, as wellas in guiding our understanding of the relationship between risks and mitigation strategy use. In the model, strategic decisions are made in the context of an uncertain exogenous environment where the implications of the socio-economic, political, biophysical and technological environments are not completely understood. The interaction of these environments (including disease, weathervariability) creates conditions which influence farm level decision making in employing mitigation strategy. Decisions are further influenced by the endogenous attributes ofthe farmer(personal goals, experiences, preferences, risk taking behaviourandso on) and the farm operation (farm type, farm size, income and so on). How afarmer manages risk is also related to the availability of appropriate management strategies. The mitigation strategies available to farm operator are characterized as financial, marketing and production. Depending upon the type of strategy, it may be employed within the affected growing season (tactical), or to reduce the risk associated with subsequent growing seasons (strategic). For example, a farmer may choose to decrease the risk associated with weather by securing off-farm employment to provide a stable income, or by diversifying the farm operation to include different crops and livestock.

### 2.7.1Empirical framework

The expected utility theory-dominant model for modelingbehavior under risk**,** major contributors were Von Neumann and Morgenstern. The non-expected utility model-Prospect Theory (PT)-developed first by Kahneman and Tversky (1979), their argument was based on certainty effect. Paired Comparison Method (PCM) -used by Bradley and Ralph (1976), and adapted by Durojaiye (1991) and Adewumi and Omotesho (2002) was used to develop the farmers' attitude toward risk

The methodology for developing an attitudinal scale is applied to assessing farmers' Attitudes toward the risk in production agriculture**.** One's risk attitude is a unique reflectionof a person's personality. It is influenced by socio-economic factors and life experiences. Therisk attitude also influences how a farmer manages his business. Due to these interactions andhow these interactions manifest their influences, "true risk attitudes" are not always apparent.

Therefore, risk attitudes must usually be measured indirectly.Theory suggests that risk attitudes influence the way farmers manage risk (Robison et al.,1984; Hardaker, Huirne and Anderson, 1997). Therefore, it is hypothesized that attitudestowards mechanisms or tools used for managing risk reflect the producer's underlyingconstruct of a risk attitude.Empirical studies on how risk varies across individuals can be useful in predicting households' technology adoption, participation on off-farm work and in crop portfolio selection, since risk and risk aversion behavior plays an important role in these decisions.

### 2.7.1.1 Attitudinal scale Approach (ASA)

The widely used Likert's scale was used to determine the risks attitude of poultry farmers, due to its' suitability in measuring an individual's attitude and perception as established by Chattopadhyaya (1963), Samanta (1977) and Bhattacharya (1993).Uematsu and Mishra (2011) found strong correlations between Likert scale risk attitude and enterprise diversification, use ofcontracts, and use of crop insurance and other types of insurance.A scale is an instrument which measures subjective variables.The response was measured on a 5-point scale.An item for a Likert scale is a declarative sentence with responses indicating varyingdegrees of agreement with, or endorsement of, the statement. The number of responses mustbe broad enough to co-vary, provide the respondent with the ability to discriminate meaningfully,and be odd numbered to permit a neutral attitude. In this study, the responsesconsist of five levels of agreement ranging from strongly agree to strongly disagree, (Bard and Barry, 2000).A 5-point Likert scale was used to measure an individual's attitude as established by Bhattacharya (1993). The responses measured on a 5-point scale include, Strong disagreement (score of 1) implied the willingness of farmer to adopt the risk management strategy in question (risk aversion). On the other hand, strong agreement (score of 5) indicated a risk taking attitude.In between the two extremes, disagreement (score of 2), undecided/neutral (Score of 3) and agreement (score of 4) will be included as alternative responses. Thus, a lower total for the respondent is then hypothesized to correspond to higher degree of risk aversion.

The self-assessment question was asked the participants to assess their attitudes towardaccepting risk on a scale of 0 to 10, defined over highly risk averse to highly risk seekingattitudes. Considered a "single-item" scale, a self-assessment is frequently used as a proxyfor risk aversion. The Kastens and Featherstone (1996), Patrick and

Ullerich(1996), andSchurle and Tierney, Jr. (1990) studies are examples in agricultural economics. However,McIver and Carmines (1981) state that single-item measures are not merely less valid, lessaccurate, and less reliable than their multi-item equivalents, but they also provide a single measurement with insufficient measurement properties.

Before drawing inferences on the basis of the total score obtained by an individual on the attitudinal scale, it is pertinent to test how well the statements reflect on the risk attitude of the farmers. The empirical analysis consists of reliability testing and validity testing. The reliability of the attitudinal scale depends on the extent to which individual statements reflect the risk attitude of the respondents. **Validity testing** can be construct validity testing and convergent validity testing. Construct validity testing analyze the extent to which the total risk attitudinal score is related to different categories of respondents, in this study to different categories of farmers based on their landholdings. Convergent validity testing measures how different measures of the same risk attitudes, here total score based on the attitudinal scale and self-assessment score, relate to each other.Divergence of the estimated average score from the neutral score will be tested by using the ‘t’Test.

### 2.7.1.2 Reliability Testing- empirical analysis of Attitudinal Scale Approach (ASA):-

The result of reliability and Optimizing tests are presented in table 4.3.The 32 statements about mitigating risk were drafted with the objective of reducing thenumber of statements. The resulting product was to be a refined scale containing the optimalamount of information about risk attitudes. Reliability analysis indicates which

statementscontribute to the explanation of unique risk attitudes and how removing the statements fromthe scale affect the overall reflection of risk attitudes.

For reliability testing, Cronbach’s coefficient alpha as used by Bard and Berry (2000) and Lagerkvist (2005) was used to evaluate the reliability of the attitudinal scale. It is measured as:

$$\alpha = k/k\text{-}1\ \{1\text{-}\ (\sum \square^2_i / \square^2_y)\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(1)$$

Where, $\alpha$ = Cronbach’s coefficient alpha; k= number of statement items in the ASA Model; $\square^2_i$ = variance of ith statement item; $\square^2_y$ = total variance of the k- statement item scale

The higher is the Cronbach’s coefficient alpha, the better is its reliability. Therefore, the scale would be optimized by deleting statements with negative or very low CISC.

The minimum acceptable alpha value of 0.65 was proposed by Devillis (1991). Also, Bard and Berry (2000) and Lagerkvist (2005), reported a minimum acceptable alpha value of 69% and 83% respectively.

**Validity testing** can be construct validity testing and convergent validity testing. Construct validity testing analyze the extent to which the total risk attitudinal score is related to different categories of respondents, in this study to different categories of farmers based on their landholdings. Convergent validity testing measures how different measures of the same risk attitudes, here total score based on the attitudinal scale and self-assessment score, relate to each other.

**Reliability testing**

Cronbach’s coefficient alpha as used by Bard and Berry (2000) andLagerkvist (2005) was used to evaluate the reliability of the attitudinal scale. It is measured as:

$\alpha = k/k\text{-}1\ \{1- (\sum \square^2_i/\square^2_y)\}$…….. (2)

Where, α = Cronbach's coefficient (alpha); k= number of statement items in the ASA Model; $\square^2_i$ = variance of ith statement item; $\square^2_y$ = total variance of the k- statement item scale.

The objective is to have α as high as possible. The implication of a very high α is that the statement (management strategies) included in the ASA model accounted for a total variation of the risk attitudes of the respondent. The higher is the Cronbach' s coefficient alpha, the better is its reliability.

The reliability of a scale being developed can be increased by deleting statements from the original scale, which have weak relationship to remaining statements' responses (Devillis,1991). This relationship is found through Corrected Item Score Correlation (CISC), which is measured as:$ri(y-i) = \frac{r\ y\ i\ \sigma y - \sigma i}{\sqrt{\sigma i^2+\sigma y2+2\sigma 1\sigma yryi}}$ …… (3)

Where, $r_{yi}$ is the correlation of statement i with total score y, σy is the standard deviation of thetotal score, σi is the standard deviation of statement i, and $r_{i(y\text{-}i)}$ is the correlation of statement I with sum of scores of all statements, excluding statement i (Bard and Berry, 2000 andLagerkvist, 2005). The scales are then optimized and the value of Cronbach' s coefficient alphais increased by deleting statements with negative or low- item score correlation.

## 2.8 Safety First Approach

Among the approaches used by economists to capture decision making in risky situations is the "safety-first"method. One of the most celebrated applications ofsafety-first models is that of Moscardi and deJanvry(1977). The present study madeuse of the

indirectelicitation method of the safety-first model viaregression parameter estimations to determine a riskaversion index for individual farmers.The factors influencing the degree of risk aversion have been found to be important considerations in the classification of farmers according to their risk bearing capabilities (Bamire and Oludimu, 2001).The Safety-First Principle of determining risk attitude coefficient, proposed by Kataoka (1963), modified by Moscardi and de Janvry (1977), used in Nzenwa (2005); Ajetomobi and Binuomote, (2006) and Olaniyi et al, (2007). This principle assumes that the individual's objective is to minimize the probability of experiencing variability (a shortfall) in output or income below a certain initial level, (specified levels of disaster). The method involves the use of ordinary least squares (OLS) techniques. Based on this, we develop discrete choice model to analyze theeffects of particular factors (socio economic, farmspecific and farmers' attitudinal variables) on riskpreferring, neural and averse farmers and on thedegree or extent of their risk aversion.

**Model specification:** Following safety first rule, the study was based on two major assumptions namely therandomness of net income and the relationshipbetween inputs (Vector X) and Income (Y) as representedby a multiple regression model.

The postulated relationship is

$$I_nY = (\alpha + \beta_1 I_n X_1 + \beta_1 I_n X_2 + \beta_3 I_n X_3 + \beta_4 I_n X_4 + ... + \beta_{11} I_n X_{11} + U) \text{...Double-log-------(4)}$$

Where,

$I_n$ = natural logarithm

Y = dependent variable

$\alpha$ = constant term

$\beta_1$- $\beta_{11}$ = regression coefficients

$X_1$-$X_{11}$ = independent variables

U = error term

The risk aversion coefficient for each producer is obtained from equation 5. The cost of most significant input from the result of the regression function analysis was used in the computation of the risk parameter. The risk parameter (K) is computed as:

$$K = 1/\gamma \{1-\frac{PiXi}{Pf1\mu y}\} \text{ ---------- (5)}$$

The coefficient of variation of output $\gamma = Sy/\mu y$---------- (6)

Where: $\gamma$ = coefficient of variation of output (market weight) Sy = the standard deviation of output, $\mu y$ = the mean of output $X_i$ = average quantity of the most significant input for each respondent. $P_i$ = input price (market price of feed per kg), P = market price of output (weight birds/eggs) $f1$ = the elasticity of production of input.

Following Moscardi and deJanvy (1977), the riskaversion parameter *K*was used to classify sampledfarmers into three (3) distinct groups as: low risk (O <*K*< 0.4), intermediate risk ($0.4 \leq K \leq 1.2$), high risk($1.2<K< 2.0$).

The risk-aversion coefficients can be expressed as a function of input prices, marginal products, output risk, and marginal output risk, all of which are either observable or estimable. These risk-aversion coefficients can then be used as the dependent variable in regression to check the influence of socioeconomic variables on risk attitudes.

$K = f(V_1, V_2, V_3, V_4, V_5, V_6, V_i, e)$---------- (7)

Where: K = Risk attitude coefficient $V_1$…..Vi = Socioeconomic variables.

## 2.9 Review of Empirical studies on risk and risk management strategies in Agricultural production

The poultry industry in Nigeria has suffered agreat deal of losses, which affect poultry farmersas well as poultry consumers (Ogoke, 1990).Adesimi (1988) observed that high cost of feeds, poor quality of day old chick (DOC) and brooding techniques involved has been the bane to industrial poultry production in Nigeria.Empirical studies have proved the effect of agricultural risk on poultry production. Umar, (2012) in his findings on the susceptibility of poultry production to disease and sensitivity to environmental factors; this constraint was ranked 3$^{rd}$ in the order of risks affecting poultry production. Usually, the main cause of flock depletion is mortality, particularly in chicks. Disease is the greatest cause of mortality, especially in the changeable conditions. Unfavourable climatic conditions like extremes of temperature, wind, relative humidity, rainfall and so on cause heat stress and reduce activity which lower egg production and in some cases event result in death of birds, particularly chicks.

In a study on risk and risk management of Dutch livestock farmers (Meuwissen*et al.*,, 2001), it was found that meat price, epidemic diseases and milk price were the most important perceived risks and the most relevant risk management strategies were to produceat the lowest possible cost and buy business and personalinsurance (in this order). The study also pointed out that although price risks were perceived as a major source of risk, risk management strategies to deal with price risks, such as price contracts, futures and options market, were not perceived as important. Beef producers in the Texas and Nebraska states of the US rated drought and price variability as the greatest two concerns, with average responses of 4.4 and 4.3 on a 5-point Likert scale, respectively. The next cluster of the sources of risk between a scale of 2.5 and 3.0 included extremely cold weather and disease. Finally, four sources of risk that were

rated between 2.0 and 2.5 included: land price variability, variation in rented pasture availability, labour availability, and labour price. In terms of risk management strategies, maintaining animal health was viewed as the most effective strategy (mean score of 4.2). This finding is somewhat paradoxical because disease was ranked relatively low as a source of risk. Being a low-cost producer, maintaining financial or credit reserves, and off-farm investments were also considered important strategies (mean of 3.8, 3.6, and 3.6, respectively). Forward contracting and use of futures and options market were considered as least effective in risk mitigation. Again, this was a paradoxical finding, considering the beef producers' perception of the high potential of price variability to affect ranch or farm income (Hall*et al.,* 2003*).*

# CHAPTER THREE

# METHODOLOGY

## 3.1 Description of the Study Area

Kaduna state lies in the north western part of the country's geopolitical zones. The state lies between latitudes 11°32 and 09°02 N and longitudes 08°50 and 06°15 E (KDSG, 1996). Kaduna state shares boundaries with Katsina and Kano states to the north, Plateau State to the north east, Nassarawa and Abuja to the south, and Niger and Zamfara States to the west (KDSG, 2012). The State occupies an area of approximately 48,473.2 square kilometres and has a projected population of 6.67 million based on annual population growth index of 3.2% (NPC, 2006). The projected population growth rate for 2014 at 3.2 growth rate is 8377520The mean annual rainfall shows a marked decrease from South to North (1,524mm to 635) which favours crop and livestock production (Kaduna state government, 2010). Involvement in small, medium and large – scale livestockproduction such as rearing of chickens, ducks, goats, sheep andpigs as well as marketing of their products are predominant in the State. The people live mostlyin organized settlements, towns and cities (NBS, 2005).Livestock produced include sheep, goat, poultry and fish. The National Animal Production Institute located in Zaria, is a major source of the parent stocks of poultry.Kaduna is known for her agrarian status and the numerous poultry commercial enterprises,some of which have either formal or informal status, such as NIYYA farms limited, Saminaka resorts. Kaduna state is a live bird market (FOA, 2008). Household and poultry keeping data across the six geopolitical zones in Nigeria showed that number of households keeping subsistence poultry in Kaduna is 340,768 (NBS,2006).Nigeria's poultry population in Kaduna backyard poultry is 2,564,100,exotic poultry is 256,993 and thetotal is 2,821,093(FMARD 2006).

### 3.2 Sampling Technique and Sampling Size

A multistage sampling procedure was employed. In the first stage, a purposive sampling was used to select two local governments from the twenty three Local Government Areas in Kaduna State, based on the number of registered poultry farmers in the state. The LGAs selected are Kaduna south and Kaduna north local governments. In the second stage, five and four districtseach werepurposively selected from the two LGAs (Kaduna South LGA and Kaduna North LGA) respectively based on the numberof poultry producers in the respective villages.The nine districts involved in poultry productionwere purposivelyselectedfrom Kaduna south and Kaduna north:UngwanRimi, UngwanSarki, Kawo, and UngwanLimanfromKaduna North LGA, while Television, Barnawa, Kakuri(KurminGwari), Kurminmashi and Tudun Wada were the districtsselected from Kaduna South LGA respectively. This constitutes 40 percent of the total population of 327 registered poultry farmers in Kaduna State.The pre–study visit tothe respective study areas informed the population of 327 registered producers (both broilerand layers)out of which a sample size of 130 respondents (70 farmers, from Kaduna South and 60 farmers from Kaduna North)wererandomly drawn from poultry producers in the study area.The difference in sample size between the twoLGAs is because of the unequal population of poultry producers inthe two LGAs. These two Local Government Areas were selected because of their high level of involvement in poultry farming (Emaikwu K. K.,*et al*., 2011; KADP, 2013).

**Table 3: Distribution of respondents in the study area**

| LGA | Village | Sample frame* | Sample size (40%) |
|---|---|---|---|
| Kaduna South | Television, | 25 | 11 |
| | Barnawa | 20 | 8 |
| | Kakuri | 50 | 18 |
| | Kurminmashi | 24 | 10 |
| | Tudun Wada | 62 | 23 |
| Kaduna North | UngwanSarki | 58 | 23 |
| | Kawo | 22 | 9 |
| | UngwanRimi | 39 | 16 |
| | UngwanLiman | 27 | 12 |
| | Total | 327 | 130 |

*Source: Kaduna State Agricultural Development Programme (KADP)

### 3.3 Method of Data Collection

Primary data were used for the study. The primary data were collected by me in 2014, using structured questionnaire that wasadministered to the selected poultry farmers by interviewing the respondents. The information that were generated included socio-economic characteristics of poultry farmers (age, sex, level of education, household size, flock size, poultryfarming experience, production system practiced, membership of association, source of capital), the inputs used (birds, feeds, drug, labour), the incomefrom sale of birds and eggs (the quantity of birds and eggs sold),types of risk in poultry faming, risks facing poultry farming, farmers opinion about a method of risk

mitigation employed,and the mitigation strategies farmers employ in managing risks associated with poultry farming.

### 3.4 Analytical Technique

The following tools of analysis were employed to achieve the objectives of this study.

i. Descriptive statistics

ii. Attitudinal Scale Approach

iii. Safety first principle

#### 3.4.1 Descriptive Statistics

This involves the use of tables, charts, measures of central tendency such as mean, median, frequency distribution,it was used to achieve objective(s) i,ii and iii

#### 3.4.2 Attitudinal scale Approach (ASA)

The Likert's scale was used to achieve objective iv. Farmers' risk attitudewas measured using an attitudinal scale approach. An aggregate score based on farmersresponses to a total of 32 statements (items), each representing a risk management tool in poultry farming was estimated. The responses to each of the statements correspond to the socio-psychological attribute of the individual farmer and his rating of the item conveys his attitude towards risk, based on his proclivity to adopt the particular risk management tool that the item reflects. This methodology of developing a risk attitudinal scale was used by Bard and Berry (2000), Lagerkvist (2005) and Meuwissen*et al* (1999). The underlying assumption in this method of measuring the risk attitude is that if attitude towards risk is a determinant of risk management strategy adopted by the farmers, the farmer's response to specific risk management tool was an

indicator of their risk attitude. The respondent's rating of the items were summed up to yield an aggregate score for the respondent, which was a quantitative measure of his attitude.The responses were measured on a 5-point scale. Strong disagreement (score of 1) impliedthe willingness of farmer to adopt the riskManagement tool in question (risk aversion). On the other hand, strong agreement (score of 5) will indicate a risk taking attitude.In between the two extremes, disagreement (score of 2), undecided/neutral (Score of 3) and agreement (score of 4) were included as alternative responses. Thus, a lower total for the respondent is then hypothesized to correspond to higher degree of risk aversion. While administering the schedule, both positive and negative statements were included to avoid response bias.

| Table4 | : Mitigating Strategy Adopted by Poultry Famers | | | | | |
|---|---|---|---|---|---|---|
| S/N | Statements | SA | A | N | D | SD |
| 1 | I do not use Preventive medical treatment | | | | | |
| 2 | I never Quarantines / Building rotation | | | | | |
| 3 | Young animals from own breeding is important | | | | | |
| 4 | Birds from safe and known supplier | | | | | |
| 5 | I do Diversification (practising poultry with other livestock farming) | | | | | |
| 6 | I do not keep live in-dead out | | | | | |
| 7 | Off farm income is not important | | | | | |
| 8 | I never Insure my poultry birds | | | | | |
| 9 | I nevertake Future market | | | | | |
| 10 | Separation of birds by age is not important | | | | | |
| 11 | Separation of birds by species is not important | | | | | |
| 12 | Water from safe and known source is important | | | | | |
| 13 | I get my feed from safe and known source | | | | | |
| 14 | I do not disinfect my poultry premises | | | | | |
| 15 | No or controlled access to visitors | | | | | |
| 16 | Changing shoes when entering is not important | | | | | |
| 17 | Wash hands before handling/after handling | | | | | |
| 18 | I avoid contact between poultry and wild birds | | | | | |
| 19 | Attending extension workshops on poultry | | | | | |
| 20 | Production of feed by self is never done | | | | | |
| 21 | I keep extra cash at hand for emergencies | | | | | |
| 22 | I never have steady market/Integrator or distributor | | | | | |
| 23 | I avoid overcrowding | | | | | |
| 24 | Proper ventilation of housing is needed | | | | | |
| 25 | Locating poultry house away from residential buildings | | | | | |
| 26 | Proper record keeping is important | | | | | |
| 27 | Use of saw dust in beddings is not important | | | | | |
| 28 | Rodent and pest control is not important | | | | | |
| 29 | Clean/disinfection of all crates used in poultry farms | | | | | |
| 30 | Appropriate nutrition in feeds is not important | | | | | |
| 31 | Use of suction fans, ventilators and cooling system is not important | | | | | |
| 32 | Others | | | | | |

### 3.4.3Safety First Principle

The safety firstmodel was used to achieve objective v which is to determine the influence of socio-economic variables on the risk attitude of farmers in the study area.

The Safety – First Principle was used in the determination of the risk attitude parameter of poultry farmers in the study area. Estimation using the Safety-first principle permits consistent estimation of the risk-aversion coefficients for each producer.This enables us to ascertain the influence of farmer socio-economic characteristics on risk attitude.

This analytical tool was used to examine the relationship of some variables on income from poultry production. Multiple regression analysis was used to achieve objective v representing the Safety First Approach.

$$Y = \alpha + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X8 + \mu\text{--------}(8)$$

Where:

Y = Income from sales of poultry birds/eggs in Naira

a = intercept of the equation;

$X_1$ = Cost of housing in naira (capital rent on land and premium cost);

$X_2$= Average cost of stock (birds) in naira

$X_3$ = Labour (Cost Man days both family and hired)

$X_4$ = Cost of feed (in naira)

$X_5$ = Cost of drugs and veterinary in Naira

U = Error term i.e. random variable which captures factors outside farmer's control.

The risk aversion coefficient for each producer was obtained from equation 9. The income from the sales of birds and eggs from the result of the multiple regression

analysis was used in the computation of the risk parameter.Following Moscardi and deJanvy (1977), the riskaversion parameter *K*will be used to classify sampledfarmers into three (3) distinct groups as: low risk (O <*K*< 0.4), intermediate risk (0.4 ≤ *K*≤ 1.2), high risk(1.2<*K*< 2.0).

The risk parameter (K) is computed as:

$$K = 1/\gamma \left(1-\frac{PiXi}{Pf1\mu y}\right) \text{ ---------- (9)}$$

Where

K= Coefficient of risk aversion (Risk Averse Category $Y_a$ : 0<k<0.4;Risk Neutral Category $Y_n$: 0.4≤k≤1.2;Risk Preference Category $Y_p$: 1.2<k<2)

γ = coefficient of variation =Sy/μy

Sy = the standard deviation of income

μy = the mean of income;

$X_i$ = Average cost of the most significant input for each respondent (feed)

Pi = input price (market price of feed per kg);

P = market price of output (weight birds/eggs)

*f*1 = Income elasticity of input.

The risk-aversion coefficients can be expressed as a function of input prices, marginal products, output risk, and marginal output risk, all of which are either observable or estimable. These risk-aversion coefficients will then be used as the dependent variable in regression to check the influence of socioeconomic variables on risk attitudes.

$K = f(X_1, X_2, X_3, X_4, X_5, X_6, e)$ ---------- (10)

The computed risk attitude coefficient (K) was used to classify the respondents into three risk aversion groups:

| **Risk Attitude Category of the Respondent** |
|---|
| Risk Averse Category ( $Y_a$ ): $0<k<0.4$ |
| Risk Neutral Category ( $Y_n$ ): $0.4\leq k\leq 1.2$ |
| Risk Preference Category ( $Y_p$ ): $1.2<k<2$ |

Where: K = Risk attitude coefficient

$X_1$= Age of farmers

$X_2$=Household Size

$X_3$=Farming Experience in years

$X_4$=Number of Birds

$X_5$=Non-farm income

### 3.5 Operational measurement of variables

**i. Age ($X_1$)**

This was measured in years. It is assumed ceteri paribus that older farmers tend to be less prone to take risks than younger ones.While some studies have found that risk aversion increases with age (e.g., Dillon and Scandizzo, 1978; Gómez-Limón et al., 2003), others have not found a significant effect for this variable (e.g., Abdulkadri et al., 2003; Moscardi and de Janvry, 1977).

**ii. House Hold Size ($X_2$)**

This variable can be positive or negative. Two opposing interpretations can be given to the relationship between risk taking and family size, on one hand, the larger the size of the family, the higher the subsistence consumption needs and given a fixed amount of land used for poultry housing, the lower the willingness of the farmers, to assume risks. On the other hand, family size might affect the labour capacity of the peasant household in which case a larger family size implies greater capacity to assume risks.

**iv. Experience in years ($X_3$)**

It is expected that with growing experience in farming, the farmer is able to better understand the production technology and all associatedchallenges thereby forming models of how to deal with such challenges intuitively. Intuitively, it is expected that experienced farmers will be more risk-taking than less-experienced farmers.

**v. Number of Birds ($X_4$)**

Stock size is expected to have a negative relationship to risk attitude of farmers. Natural risk associated with the poultry enterprise is spontaneous and can be highly devastating, so farmers are normally apprehensive of the risk of this nature. Using stock size as a proxy for assets shows that farmers who have more assets are more risk averse because of their level of investment (Ajetomobi and Binuomote 2006).

**vi. Non-FarmIncome ($X_5$)**

Non-farm income is expected to be negative. This confirms with a priori expectation that non-farm income supplements the farmers to meet annual farm income and subsistence needs hence if it decreases, risk attitude will increase because subsistence need may be at risk. Having off-farm income was found to reduce risk aversion, a result also found by Ayinde (2008) and Picazo-Tadeo and Wall (2011).

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## 4.1 Socioeconomic Characteristics of Poultry farmers

The socio-economic characteristic of the sampled poultry farmers are presented in Table 4.1.The result indicated that more men were involved in poultry farming;the predominant age group of poultry farmers were between 31-40 years. The average age of the respondents was found to be 45. This implies that the poultry farmers are within the active labour forceand are expected to be assiduous in managing their poultry farms more effectively.This finding is similar to the findings of Adewumi, (2008).The average years of poultry farming experience was revealed to be 2 years and the average household size was 9. The result showed that 25.38% of the respondents had a flock size of less than 500 birds, 34.6% of the respondents had flock size of 501-1000, 19.26% of the respondents were having 1001-2000 birds, while 20.76% of the poultry farmers owned a flock size of above 2000 birds and the average flock size was 1445, this implies that the poultry farmers were involved in medium scale and large scale poultry production.The study also shows that graduates of tertiary institutions were mostly involved in poultry farming with about 53%, followed by farmers with secondary school educational level (22.3%). There is high literacy level among the farmers in thestudy area. This could positively influence theirparticipation in development programmes, awarenessand adoption of innovations and risk managementpractices (Fawole and Fasina, 2005). Similar findings were reported by Mafimisebi*et al., (*2006) among livestock farmers in South-western Nigeria and by Adewumi, (2008) in his study economics of poultry production in Egba division of Ogun state.

**Table 4.1. Socio-economic characteristics of respondents in the study area**

| Characteristics | Frequency | Percentage(%) |
|---|---|---|
| **(a) Gender** | | |
| | Male | 51.5 % |
| | Female | 48.5 % |
| **(b) Age** | | |
| 21-30 | 3 | 2.4% |
| 31-40 | 46 | 35.3% |
| 41-50 | 47 | 36.2% |
| 50 above | 34 | 26.1% |
| Average | 45 | |
| **(c )Educational Level** | | |
| No formal Education | 5 | 3.8% |
| Primary school Education | 26 | 20% |
| Secondary school Education | 29 | 22.32% |
| Tertiary Education | 70 | 53.87% |
| **(d)Household Size** | | |
| 1-6 | 42 | 32.3% |
| 7-11 | 58 | 44.6% |
| 12-16 | 19 | 14.6% |
| 17-21 | 11 | 8.5% |
| Average | 9 | |
| **(e) Years of poultry farming Experience** | | |
| 1-4 | 33 | 25.3 % |
| 5 above | 97 | 74.7 % |
| Average | 2 | |
| **(f) Flock size** | | |
| 500 or less | 33 | 25.38% |
| 501-1000 | 45 | 34.6% |
| 1001-2000 | 25 | 19.26% |
| 2000 Above | 27 | 20.76% |
| Average | 1445 | |
| **(g) Locations of poultry farms owned** | | |
| 1-3 | 124 | 95.38% |
| Above 4 | 6 | 4.62% |

Source: Field survey data, 2014

**4.2 Major risksources to poultry farmers**

The result of the crosstab analysis presented in Table 4.2,shows that all the respondents interviewed, 130 poultry farmers (100%)identifiedpoultry disease as the highest source of risks in the business. This is expected given the prevalence of widespread diseases (especially, e.gAvain influenza, Gumboro) in poultry production, in Nigeria 2006, the outbreak of Avian influenza killed 258,676 (99.30%) of poultry chickens (Saidu, 2008).The problem of diseases due to weather condition was indicated by all the farmers. During the rainy season, most common problems experienced by farmers include Chronic Respiratory diseases and *Coccidiosis*while too much heat during dry season also causes heat stress. Endemic diseases such as New Castle and *Gumboro*are problems to poultry farmers, which however require reliable vaccines which are not often available also reported by Lawal et al 2009. Rise in cost of input in the study area was indicated by 96.92% of the farmers and 35.58% of the poultry farmers indicated inadequate credit as risk source.Earlier reports by Effiong et al (2014) that the most severe risk in the study area were changes in weather/climate, power failure, high mortality rate of birds, infestation of diseases and changes in input prices.

**Table 4.2 Identified risks that posed threats to poultry production**.

| | Risk to poultry production | Number of farmers | Percentage(%) | Ranking |
|---|---|---|---|---|
| 1. | Disease outbreak | 130 | 100 | 1 |
| 2. | Rise in cost of inputs | 126 | 96.92 | 2 |
| 3. | Change in poultry output prices(eggs and meat) | 123 | 94.62 | 3 |
| 4. | Theft and pilfering | 122 | 93.84 | 4 |
| 5. | Snake attack | 121 | 93.07 | 5 |
| 6. | Lack of medication and vaccination health programmes | 112 | 86.15 | 6 |
| 7. | Rise in cost of exotic breed | 107 | 82.3 | 7 |
| 8. | Lack of animal vaccination | 105 | 80.76 | 8 |
| 9. | Low market demand | 94 | 72.3 | 9 |
| 10. | Unfavourable weather | 94 | 72.3 | 9 |
| 11. | Lack of electricity power supply | 86 | 66.15 | 11 |
| 12. | Lack of storage facilities | 77 | 59.23 | 12 |
| 13. | Stampede in poultry | 77 | 59.23 | 12 |
| 14. | Low quality feeds | 68 | 52.3 | 14 |
| 15. | Inadequate family labour | 63 | 48.46 | 15 |
| 16. | Lack of stocks | 55 | 41.94 | 16 |
| 17. | Lack of technical know-how of improved farming technologies | 49 | 37.5 | 17 |
| 18. | Inadequate credit facilities | 47 | 35.58 | 18 |
| 19. | Conflict within the community | 50 | 34.46 | 19 |
| 20. | lack of information to upgrade meat and egg performance | 32 | 24.61 | 20 |
| 21. | High interest rate | 31 | 23.85 | 21 |
| 22. | Lack of brooding technical knowhow | 29 | 22.31 | 22 |
| 23. | Ill health of the farmer | 26 | 20 | 23 |

Source: Field survey data, 2014

**4.3 Mitigating strategies used by poultry farmers.**

The Reliability and Optimizing tests were conducted on the Attitudinal Scale Approach (ASA) using Likert's scale to assess risk mitigating strategies used by farmers.Table 4.3 presents each statement's corrected item-scale correlation, the coefficient alphacalculated with that particular statement excluded from the scale of the remaining 27 statements, and the overall coefficient alpha for all 32 statements. The overall coefficient alpha of 0.787 indicates that the 32 statements account for 78% of the total variation.

For example, deleting Statement 12 (Water from safe and known source is important), Statement 15 (No or controlled access to visitors),Statement 17 (Wash hands before handling/after handling), Statement 18(I avoid contact between poultry and wild birds), Statement 31,(Use of suction fans, ventilators and cooling system is not important)would increase the aggregate coefficient alpha for the remaining 27 statements to 0.863.

Based on the alphas reported in Table 4.3, removal of at least Statements 12, 15, 17, 18, and 31 would increase the coefficient alpha, therefore, increasing the scale's reliability.With this finding, the scale was optimized by eliminating statements that had negativeor low item.

Thus, risk mitigation strategies such as preventive medical treatment, quarantines / building rotation, off-farm income, young animals from own breeding, birds from safe and known supplier, feed from safe and known source, diversification, disinfection of premises, I Keep extra cash at hand for emergencies, attending workshops on poultry, proper ventilation of houses,use of saw dust in beddingsand appropriate nutrition were utilized as valid risk mitigation strategies among the poultryfarmers. These statements (1,2,3,4,5,6,7,8,9,10,11,13,14,16,19,20,21,22,23,24,25,26,27,28,29,30,32) were amongst retained statements, showing the mitigation strategies practiced by poultry farmers due to the risk aversion attitude of the respondents.

**Table 4.3: Reliability Testing of Attitude**

| Statements-items | Corrected Item Scale(CIS) | Cronbach'sAlpha (α) |
|---|---|---|
| 1.I do not use Preventive medical treatment | 0.448 | 0.781 |
| 2.I never Quarantines / Building rotation | 0.502 | 0.771 |
| 3.Young animals from own breeding is important | 0.324 | 0.780 |
| 4.Birds from safe and known supplier | 0.667 | 0.771 |
| 5.I do Diversification (practising poultry with other livestock farming) | 0.157 | 0.787 |
| 6.I do not keep live in-dead out | 0.430 | 0.774 |
| 7.Off farm income is not important | 0.522 | 0.769 |
| 8.I never Insure my poultry birds | 0.677 | 0.763 |
| 9.I never take Future market | 0.514 | 0.770 |
| 10.Separation of birds by age is not important | 0.200 | 0.786 |
| 11.Separation of birds by species is not important | 0.430 | 0.774 |
| 12.I get my feed from safe and known source | 0.085 | 0.791 |
| 13.I do not disinfect my poultry premises | 0.078 | 0.787 |
| 14.Changing shoes when entering is not important | 0.469 | 0.772 |
| 15.Attending extension workshops on poultry | 0.187 | 0.785 |
| 16.Production of feed by self is never done | 0.143 | 0.786 |
| 17.I keep extra cash at hand for emergencies | 0.210 | 0.784 |
| 18.I never have steady market/Integrator or distributor | 0.593 | 0.769 |
| 19.I avoid overcrowding | 0.307 | 0.781 |
| 20.Proper ventilation of housing is needed | 0.765 | 0.763 |
| 21.Locating poultry house away from residential buildings | 0.369 | 0.779 |
| 22.Proper record keeping is important | 0.605 | 0.768 |
| 23.Use of saw dust in beddings is not important | 0.539 | 0.772 |
| 24.Rodent and pest control is not important | 0.391 | 0.776 |
| 25.Clean/disinfection of all crates used in poultry farms | 0.088 | 0.791 |
| 26.Appropriate nutrition in feeds is not important | 0.521 | 0.769 |
| 27. Others | 0.420 | 0.764 |
| Coefficient Alpha for the entire 32 statements | | 0.789 |
| Coefficient Alpha for the entire 27 statements | | 0.863 |

Source: Field survey data 2014.

### 4.4 The perceived risk attitude of the poultry farmers in the Study Area

A set of 32 statements put before the farmers to ascertain their risk attitudes and themean score of each statement for each category of farmers, and also for all categories combinedare given in Table 4.4. The statements are negatively worded and as mentioned earlier, thescoring of options were done in such a way that the option of strongly disagreeing got a scoreof 1, while that of strongly agreeing was assigned a score of 5. Thus, the lower the score for anindividual statement, more likely the farmer is going to adopt or utilize the risk managementtool that the statement reflects, due to his risk-averse attitude. Thus 13 statements, viz. statement numbers 3, 4, 5, 12, 13, 17, 18, 21, 23, 24, 25, 26 and 29are positively worded, but here strong agreement wouldcorrespond to a risk-averse attitude of the farmer.

From table 4.3, the result showed that 70.1% of the respondents were categorized among probable risk averse individual, while, 6.9% of the respondents were categorized as neutral to risk and 23.0%of the respondents were categorized as risk preference individual. The mean score and the standard deviation of all the statements were given as 3.04 and 1.09respectively.

**Table 4.4: Distribution of aggregate score measuring risk attitude of the respondents**

| Probable Risk Category | Frequency | Percentage (%) |
|---|---|---|
| Risk Aversion(32<=Ya<=95) | 91 | 70.1 |
| Risk Neutral(Yn=96) | 9 | 6.9 |
| Risk Preference (97<=Yp<=160) | 30 | 23.0 |

Source: Field data 2014

Statement with attitudinal scores statistically lower than the neutral score of value 3 were statements 1,2,3,6,7,8,10, 14,15,16,19,22,27,28,30 and 32. Taking future markets, separation of birds by specie had a mean score of 3, which showed neutral attitude.

This implies that the poultry farmers in the study area placed higher preferenceon risk-averse behavior by adopting mitigating strategies to averse risk in poultry farming, followed by risk taking behavior; and lastly risk neutral.Ayinde (2008) found out in his study that the risk averse attitudes of small scale farmers ranked first, while risk neutral behavior ranked second and risk taking behavior ranked third among the small scale farmers attitudes towards risk in their crop production.

The study established a high degree of risk aversion as revealed bythe adoption of such risk mitigating tools like vaccinating the animals, calling a veterinarian,prevention of illness, maintaining hygienic conditions, diversification, attending workshops, quarantine, and feeding adequate concentrates.Hence, there is a strong tendency on the part of the farmers to mitigate the production risks atfarm level by adapting appropriate measures, to reduce the effect of risk in their poultry production.

### 4.5 Influence of socio-economic characteristics on risk attitude of poultry farmers

The estimation of the risk attitudecoefficients, K, required estimation of income function for the study area. Multiple regression model was first estimated in which the relationship between thedirect input vectors (x) and poultry income wasestablished.

The regression results are presented on table 4.5.1 The derived marginal productivity of feed (Xi), together with the coefficient of variation of income, (used as a proxy for the income) and the market price of poultry products (P) and factor (Pi) prices of feed per kg provided a value of K for each farmer using the safety first model.

**Table 4.5.1: Multiple regression model of poultry farmers**

| Variables | Regression Coefficients | Std Error | t-value |
|---|---|---|---|
| Constant | -1.999 | 1.328 | -1.506 |
| Cost of housing | 0.026 | 0.083 | 0.312 |
| Cost of stock | 0.300* | 0.061 | 4.913 |
| Cost of drugs | 0.669* | 0.080 | 8.363 |
| Cost of feed | 0.221* | 0.051 | 4.296 |
| Cost of Labour | 0.112** | 0.055 | 2.025 |
| $R^2$ | 0.79 | | |
| Significant level: * 1%; **5% &***10% | | | |

Source: Field survey data, 2014

The result of the multiple regression analysis of the four functional forms showed that the double log function gave the best fit of 79% (table 4.5).The adjusted coefficient of determination ($R^{-2}$) is 0.79 indicating that 79 percent of the variation in the income realized from the sales of poultry meat and eggs is explained by the variations in thespecified independent variables. The result showed that there was a positive and

significant relationship between cost of labour, cost of stock, cost of feed and cost of drugsused in poultry production and the total income from poultry sales, while capital spent on housing had no significance on the income gotten from poultry production. The most significant input was found to be cost of feed.

### 4.5.2 Risk attitude of poultry farmers

Table 4.6 shows therewere varying degrees of risk attitude. The result of thedistribution of respondents by risk aversion class ispresented in table 4.6. The result shows a distribution of risk attitude categories highlyskewed towards the risk averters. About 30.22% of the respondents were risk preference, while majority 64.40%of the farmers showed high risk aversion attitude, the risk aversion centered around K = 0.4and few respondents with 5.38%, showed risk neutral.

This implies that majority of the poultry farmers in the study area are risk averse, having an inclination to adopt risk mitigating measures in their poultry production.

**Table 4.5.2: Risk attitude category**

| Probable Risk Category | Frequency | Percentage (%) |
|---|---|---|
| Risk Averse Category ( $Y_a$ ): 0<k<0.4 | 84 | 64.40 |
| Risk Neutral Category(Yn):0.4<k<1.2 | 7 | 5.38 |
| Risk Preferal Category(Yp):1.2<k<2 | 39 | 30.22 |

Source: Field data, 2014

In order to determine the influence of socioeconomic variables of poultry farmer's on their attitude towards risk in the area, a regression model was estimated. Of the three functional forms tried, the semi log model was chosen onthe basis of the value of $R^2$and conformity of the parameter estimateswith a prior expectation. Results of the analysis

showed that R square was 0.52. This implied that 52% of the variation in Y (risk attitude) was explainedby the independent variables.

The result of theregression analysis is presented in table 4.6,age was found to be insignificant, household size and flock size, were significant at 10%level; poultry farming experience and non-farm income were significant at 1% level. Non-farm income exhibited negative relationship with risk attitude, this implies that the higher the off farmincome of the farmer, the less risk averse the farmer will be. Household size, poultry farming experience, flock size were found to be positively related to risk attitude, which implies as these factors increase the farmers risk aversion will be more.

**Table 4.6: Influence of socio-economic characteristics on risk attitude of poultry farmers**

| Variables | Regression Coefficients | Std Error | t-value |
|---|---|---|---|
| Constant | 0.78 | 0.108 | 7.21 |
| Age of farmers | 0.82 | 1.863 | 0.44 |
| House hold size | 0.33 | 0.195 | 1.69*** |
| Poultry farming experience | 0.85 | 0.035 | 23.74* |
| Number of birds | 0.221 | 0.115 | 1.91*** |
| Non-farm income | -0.51 | 0.146 | -3.47* |
| $R^2$ | 0.52 | | |
| Significant level: * 1%; **5% &***10% | | | |

Source: Field survey data, 2014

Household size was a significant determinant of risk attitude. There aretwo opposing interpretations as to the nature of the relationship betweenhousehold size and risk attitude. The larger the household size, the greater willbe the total consumption needs

of the farm family and thus, the less willingnessto bear risk. However, to the extent that larger household size also augmentsthe total labour supply of the farm household and thereby enhances its incomegenerating potentials, the effect of a larger household size on risk attitude maybe neutralised. This study shows a positive relationship between householdsize and risk attitude. Larger house hold size implies greater capacity to assume risks. The coefficient of family size waspositive and significantly related to level of aversion. The average of the household size was found to be 9 members.

Stock size has a direct relationship to risk aversion, implying that risk aversion increases with large stock size. Natural risk associated with the poultry enterprise is spontaneous and can be highly devastating, so farmers are normally apprehensive of the risk of this nature. Having more birds would permit the farmers to bear higher risks. Of all the variables, the coefficient of number of flocks was significant at 10% probability level and agreed with a priori expectation,using stock size as a proxy for assets shows that farmers who have more assets are more risk averse because of their level of investment (Ajetomobi and Binuomote 2006).The result from the table showed that non-farm income was negative, having off-farm income was found to reduce risk aversion, similar result was also found by Ayinde (2008) and Picazo-Tadeo and Wall (2011).

Years of poultry farming experience was positively significant at 1% which implies that as farming year's increase, the more risk averse the farmer becomes. Ogoke (2009) observed that the longer the years of farming experience, the more efficient the farmer becomes because thenumber of years a farmer has spent in the farming business may clearly give an indication of the practical knowledge he has acquired. This is an advantage to reduce farming risk which will help to boost production in any pre-determined period in farming business.

As a result the null hypothesis that there is no significant relationship between the poultry farmer's risk attitudes and their socio-economic characteristicswas rejected.The value of the F-statistics was found to be significant at 1 percent,F-value=21.689.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONAND RECOMMENDATIONS

## 5.1 Summary

The study analyses the risk and mitigating strategies amongst poultry farmers in Kaduna South and North LGA's, of Kaduna Metropolis.Two LGA's were purposefully selected. The structured questionnaires were used to collect relevant data from 130 randomly selected poultry farmers in the study area. The data collected were analysed using analytical tools such as descriptive statistics, attitudinal scale approach and safety first approach.

The farming households identified the following sources of risk in poultry:unfavourable weather, lack of animal vaccination, ill health of the farmer, inadequate credit facilities, inadequate family labour, lack of brooding technical knowhow, lack of electricity power supply, lack of information to upgrade meat and egg performance, lack of medication and vaccination health programmes, disease outbreak, lack of stocks, lack of storage facilities, lack of improved varieties, no market for poultry, rise in cost of exotic breed, rise in cost of inputs e.g feeds, inadequate labour, conflicts within the community, low quality feeds, low chick quality, stampede in poultry, change in poultry output prices(eggs and meat), low market demand, snake attack, theft and pilfering. Amongst these threats,diseases, lack of medication and vaccination health programmes, were ranked and chosen as the highest sources of risk. The finding could be useful in designing intervention programme in an integrated manner that would address poultry production, boost its output in a large scale and to enhancepoultry production.

The research finding distinctively showed that the poultry farmers in the study area exhibited the 3-probable categories of the risk attitudes obtainable. It was noted that the ratioof an individual being a risk preferredto risk aversed was 1:3. It then meant that in the study area, to every three farming households, one farm household could be categorized as having preference attitude and threehouseholds would be having risk aversed attitudes, using mitigating strategies against poultry risk. This could be useful piece of information in planning a more robust poultry management and production programme in the study area.

Based on the combined population of 130 poultry farmers, The result showed that the average income realized from poultry production was ₦ 5,380,270 for farmers with flock sizes of above 1000 birds, the poultry farmers that had flock sizes of less than 500 birds was ₦1, 708,889, the respondents that had flock sizes of 501-1000 had an average income of ₦3, 914,200.Stock size has a direct relationship to risk aversion, implying that risk aversion increases with large stock size. Natural risk associated with the poultry enterprise is spontaneous and can be highly devastating, so farmers are normally apprehensive of the risk of this nature. Having more birds would permit the farmers to bear higher risks. Using stock size as a proxy for assets shows that farmers who have more assets are more risk averse because of their level of investment (Ajetomobi and Binuomote 2006). The result showed that the average income of farmers with larger flock size was higher. This showed that the more risk averse a farmer by using mitigating strategies to reduce risk, the more yield which translates to more income.

The semi log regression results showed that increase in household size and stock sizewould increase the risk aversion attitude of the farmers. It was also revealed that with increase in non-farm income risk preference behaviour of the farmersincreases.

This is due to the negative relationship the variable had with risk aversion. The independent variables included in the analysis explained about 52 per cent of variation in risk aversion attitude.

The result showed that other risk mitigation strategies used by the farm household in the study area were preventive medical treatment, quarantines / building rotation, off-farm income as important source of household income, young animals from own breeding, birds from safe and known supplier, feed from safe and known source, diversification, disinfection of premises, controlled visitors, wash hand before handling, attending workshops on poultry, proper ventilation of houses,use of saw dust in beddingsand appropriate nutrition were amongst the mitigation strategies used by poultry farmers.

## 5.2 Conclusion

The study has shown that the poultry farmers in the Kaduna metropolis, with optional responses under poultry risk were either averse to such risks or preferred them. Poultry farmers that exhibited risk aversion attitudes, have risk mitigating strategies through which they reduce risk adverse effects. The regression result support the hypothesis that risk attitude of the poultry farmers can be influenced by their socio-economic characteristics. Particularlysignificant for that purpose were household size ofrespondents, non-farm income, years of poultry farmingand flock size.

## 5.3 Contribution of the study to knowledge.

This study has contributed to knowledge by providing empirical indicator of the current status of risk and mitigating strategies amongst poultry farmers in the study area. Other contributions of this study to knowledge are;

1. It was discovered that the 3 most important of risk in poultry were disease out-break, rise in cost of inputs, and change in poultry output prices (eggs and meat). These were reported by 100%, 96.9% and 94.6% of the respondents respectively.
2. The study also discovered that out of the 32 statements capturing the mitigating strategies employed by the poultry farmers, 27 accounted for 86% of the total variation with 5(Water from safe and known source is important, no or controlled access to visitors, wash hand before/after handling, Not allow contact between poultry and wild birds, use of suction fans is not important) giving low coefficient alpha.
3. This study showed that the ratio of being a risk preferred to a risk averse farmer was 1:3, meaning that to every three poultry farmer one could be categorized as having preference attitude, while three risk aversed attitudes and would employ mitigating strategies against poultry risk.
4. The result showed that the average income (₦5,380,270) of farmers with larger flock size of above 2000 birds was higher as a result of the use of risk mitigating strategies.

## 5.4 Recommendations

Based on the findings of the study, the following recommendations are made which include:

i. It is imperative to state that the result of the study showed that government and non-governmental organizations should ensure effective policy formulation to reduce the risk faced and improve risk mitigation strategies used by respondents in the study area.

ii. Poultry farmers should be encouraged by the government, development agencies and non-governmental organizations to increase their farm size since increased farm size leads to increased reduction of risk on the output.

iii. The government and non-governmental organizations should organize trainings, workshops and seminars on the effective risk mitigation strategies in poultry productionfor the respondents to ensure risk mitigation.

iv. Poultry farmers in the study area should be encouraged by Government and non-Government organizations to join cooperativesin order to have access to better health hygiene practices, veterinary services, extension services, and information's that will help in poultry risk mitigation.Unions or cooperatives will further facilitate positive interactions especially on risk sharing.This will present a collective bargaining front, and serveas a conduct for transmitting government extensionrecommendations to the farmer.

v. Small scale poultry farmers should be encouraged by government, non-governmental organizations and development agencies to engage in as many income generating activities as possible, as this tend to increase their off farm income level. This increase in off farm income would lead to increase in the reduction of risk on the output of respondents.

vi. The finding regarding the sources of risk in poultry by majority of the farmers should be usefulfor agribusiness firms in expanding and developing more poultry input companies, and also government institutions providing more robust veterinary services, drugs and vaccines to reduce the incidence of disease risk.

vii. Insurance companies entering the field of livestock insurance should be encouraged by the Government to provide insurance to cover poultry farmers, the results of this study could be useful to them in ascertaining the extent to which the farmers are risk averse or risk taker to get a measure of demand for their products.

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## APPENDIX

QUESTIONNAIRE

**DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY, AHMADU BELLO UNIVERSITY, ZARIA NIGERIA**

**POSTGRADUATE SCHOOL**

**PROJECT TITLE:** ANALYSIS OF RISK AND MITIGATING STRATEGIES AMONG POULTRY FARMERS IN KADUNA METROPOLIES, KADUNA NIGERIA.

All the information given here are to be used for research purpose. You are therefore assured of absolute confidentiality of all the information.

**A SOCIO – ECONOMIC DATA**

1.Date of interview: ---------- 2.Village name: ----------

3.LGA---------- 4.Age: ---------years

5a.Gender: Male ( ); Female ( )5b. Marital status: Single ( ); Married ( ); Divorced ( ) Widowed ( )

6. How long have you been into poultry farming? ……years

7a.Educational Status of the respondent: i.formal ( ); ii.non-formal ( ) (tick as appropriate).

7b.If formal, what is the highest level attended? i.Adult Education( ) ii.Primary Education( ) iii.Post Primary Education( ) iv.Tertiary Education( )

8. Years of formal education ---------- years

9. Household size

Number of wife (ves) _____

Number of male children _____

Number of female children _____

Number of other dependents _____

Total number of household _____

10a.How many Poultry farms do you have?_____

10b.What is the total size of your flock?----------

11. How did you obtain your land used for poultry house? a.Inheritance ( ) b.Lease/Rent ( ) c.Gift ( )d.Family land ( ) e.purchased ( ) f. Borrowed ( ) e. Government owned f.( ) Others----------

12. If rented, how do you pay your rent? Once a yr( ); 2twice a yr( ); every 2yrs( ); every 3yrs(); others----------.13b.How much do you pay in N ----------

13. If the land is bought, what is the purchase price N ----------/Year……?

14. Can you get extra land if you want to expand poultry farming enterprise? a. Yes ( ) b. No ( )

15. Is land for poultry house a constraint to your farming enterprise? a.Yes. ( ) b. No ( )

16a. Do you belong to any poultry farmers' association in your area? (a) Yes ( ) (b) No ( )

16b. If yes, which one ----------

16c. If No, why? ----------

17a.How much do you pay as membership fee N ---------- 17b. How long have you been a member ---------- 17c.When last were you in its meeting ----------

19. Do you have access to any extension services in your area? (a) Yes ( ) (b)No ( )

19. What is your primary source of income? i.Farming ( ) ii.Carpentry ( ) iii.Trading ( ) iv.Bricklaying( ) v.Civil service work( ) vi.Contractor ( ) vii.Tailoring ( ) viii.Others (specify) ----------

20. What other sources of income have you? ----------

21. What is your estimated annual income from all sources N ----------?

22a.What is estimated annual income that comes from poultry farming N ---------- 22b.How comes from other sources (non-farm) income N ----------

33. Do you have access to credit facilities in your area? (a) Yes ( ) (b) No ( )

**B HOUSEHOLD ECONOMIC ACTIVITIES DATA**

**(ii) Off-farm Enterprise**

34.What Off-farm enterprise do you engage in?(A).Carpentry ( )(B). Trading( ) (C).Bricklaying( ) D.Civil service work( ) E.Contractor ( ) F.Tailoring ( ) G.Others (specify) ----------

35.What are the threats to your Off-farm enterprise? (A).unfavourable environment e.g seasonal of the off-farm enterprise( ) (B).lack of initial capital ( ) (C).no market for off-farm enterprise( ) (D).ill health ( ) (E).lack of credit( ) (F).others----------.(multiple answers).

**(iii) Capital availability and use**

36. From where did you obtain capital for your poultry farming? A. Personal savings( )B. Relatives and friends( ) (C) Cooperatives society( ) (D). Money lender( ) (E). Government( ) (F). B.O.A( ) (G). Other(specify)……..

37.What are the threats to capital availability and use? (A).fear high interest ( )(B).lack of collaterals ( ) (C).Non-Availability of Functional Credit Bank in my area ( ) (E ).others----------( multiple answers)

**(iv) Labour Availability**

38.How often do you get labour? A.Regularly ( ) B.Occasionally ( ) C.when needed ( ) (E).Not at all ( )

39.What type of labour is easily available to you? A.Family ( ) B. Hired ( ) C. Communal ( ) E. Others (specify) ----------

40.What are the threats to availability and use of labour? i.high cost ( ) A.lack of family labour ( ) B. seasonality of labour ( ) C. Others----------( multiple answers)

**(iv) Inputs Use**

41. What are your suppliers of feeds?(a) feed miller (b) grain merchants/buyer agents (c) Importers of concentrates (e) poultry shops (f) others----------

42. What type of feeding? (A) Supplementary feeding ( ) (B) Complete rations ( )

43. Source of your feeds: (A) Commercial feeds ( ) (B) Home mixed rations ( ) (C) Kitchen wastes ( ) (D) Mill by-products (bran, etc.)( ) (E) Whole grains (maize, millet, sorghum, etc.)( ) (F) Others (specify)……..

44. What are your sources of drugs and veterinary used?(a) NVRI (b) poultry shops (c) importers of drugs and supplements (e)Extension agents(public and private ) (f) Veterinary doctors (g) others----------

45. What are the threats to availability and use of inputs? A. High cost ( ) B .Adulteration ( ) C. Lack technical know-how ( ). D. Others----------( multiple answers)

COST OF INPUT USED IN POULTRY PRODUCTION

| INPUTS | COST (N) | QUANTITY |
|---|---|---|
| 1. Capital | | |
| 2. Stock of birds | | |
| 3. Feed | | |
| 4. Drugs | | |
| 5. Labour(Man days) | | |

**(i) Farming System**

46. What type of animal husbandry do you practice? A. Poultry keeping( ) B. Pigery ( ) C. Goat&Sheep( ) D. Cattle( ). E. Others ( )

**Types and number of livestock you keep**

| | | Number | ManagementSystem. *I*S*E*Dl*Bc | | |
|---|---|---|---|---|---|
| Cow | | | | | |
| Sheep | | | | | |
| Goat | | | | | |
| Pig | | | | | |
| Poultry | Local chicken | | | | |
| | layers | | | | |
| | Broilers | | | | |
| | Cockerels | | | | |
| | Turkey | | | | |
| | Pigeon | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | Ducks | | | | |
| | Guinea fowl | | | | |
| | Quails | | | | |
| Others | | | | | |

*Intensive, Semi-intensive*Extensive. **Poultry**:*Deep liter*Battery cage

47. What type of poultry management system do you practise?

(A) Deep litter ( ) (B) Battery Cage ( ) (C) Both ( )

48. Do your poultry share housing with other birds, animals or humans? (A) Yes (B) No

49. If yes, which species?.....

50. Are your poultry isolated from other birds (belonging to neighbours, other farmers)? (A)

Yes (B) No

51. Do your poultry intermingle freely with neighbours' poultry?

(A) Isolated (B) Mixed with neighbours' (C) Others (specify)……

52. Do you have restrictions for entering the poultry house? (A) Yes ( ) (B) No

53 If yes, what type of restrictions?.....

54.. Are you aware of poultry risk in general? (A) Yes( ) (B) No ( )

56. What Poultry risk have you faced in your years of farming……

……
……

……
……
……

57. What are the problems you face in poultry farming? i. High cost of exotic pure breed parents stock ( ) ii. Unfavourable weather e.g drought ( ) iii. Lack of

improved varieties ( ) iv. Lack of incubation technique for mass production of chicks ( ) v. Lack of information to upgrade the meat and egg performance of poultry chicken ( ) v. Lack of medication and vaccination health programme ( ). vi. Lack of stocks ( ) vii.no market for farming produce ( ) viii. Ill health ( ) ix. Lack of credit ( ) x. Inefficient cash flow projection marketing strategies.xii. Lack of storage facilities, e.g, vaccine, fertile egg and processed meat ( ) xiii. Lack of brooding technical know-how ( ). xiv. Lack of electric power supply ( ).xv. Others ( ) ----------. (Multiple answers).

**C.MITIGATING STRATEGIES**

Which of these poultry management practices are you aware of and or adopt?

58. Indicate as appropriate the extent to which you agreed with the statements below.

SA=strongly agree=5, Agree=4, Undecided=3, Disagree=2, strongly Disagree=1

**D FARMERS ATTITUDE TOWARDS RISK AND DECISION MAKING**

Table 3: Mitigating Strategy Adopted by Poultry Famers

| S/N | Statements | SA | A | N | D | SD |
|---|---|---|---|---|---|---|
| 1 | I do not use Preventive medical treatment | | | | | |
| 2 | I never Quarantines / Building rotation | | | | | |
| 3 | Young animals from own breeding is important | | | | | |
| 4 | Birds from safe and known supplier | | | | | |
| 5 | I do Diversification (practising poultry with other livestock farming) | | | | | |
| 6 | I do not keep live in-dead out | | | | | |
| 7 | Off farm income is not important | | | | | |
| 8 | I never Insurance my poultry birds | | | | | |
| 9 | I never take Future market | | | | | |
| 10 | Separation of birds by age is not important | | | | | |
| 11 | Separation of birds by species is not important | | | | | |
| 12 | Water from safe and known source is important | | | | | |
| 13 | I get my feed from safe and known source | | | | | |
| 14 | I do not disinfect my poultry premises | | | | | |
| 15 | No or controlled access to visitors | | | | | |
| 16 | Changing shoes when entering is not important | | | | | |
| 17 | Wash hands before handling/after handling | | | | | |
| 18 | I avoid contact between poultry and wild birds | | | | | |
| 19 | Attending extension workshops on poultry | | | | | |
| 20 | Production of feed by self is never done | | | | | |
| 21 | I keep extra cash at hand for emergencies | | | | | |
| 22 | I never have steady market/Integrator or distributor | | | | | |
| 23 | I avoid overcrowding | | | | | |
| 24 | Proper ventilation of housing is needed | | | | | |
| 25 | Locating poultry house away from residential buildings | | | | | |
| 26 | Proper record keeping is important | | | | | |
| 27 | Use of saw dust in beddings is not important | | | | | |
| 28 | Rodent and pest control is not important | | | | | |
| 29 | Clean/disinfection of all crates used in poultry farms | | | | | |
| 30 | Appropriate nutrition in feeds is not important | | | | | |
| 31 | Use of suction fans, ventilators and cooling system is not important | | | | | |
| 32 | Others | | | | | |

Key: SA=strongly agree=5, Agree=4, Undecided=3, Disagree=2, strongly Disagree=1

59. How many mitigation strategies do you make use of?.....

60. Value the risk attitude below using 1 to 3 in view of what you prefer.

Risk averse (1)

Risk Neutral (2)

Risk preference (3)

61. Would you prefer to be classified as a: (a) risk averter or (b) risk neutral? a or b

62. Would you prefer to be classified as a:(a)risk averter or(b)risk preference?a or b

63. Would you prefer to be classified as a: (a) risk neutral or (b) risk averter? a or b

64. Would you prefer to be classified as a:(a)risk neutral or(b)risk preference?aor b

65. Would you prefer to be classified as a: (a) risk preference or (b) risk neutral? a or b

66. Would you prefer to be classified as a: (a) risk preference or (b) risk averter? a or b

**D GENERAL**

67. From your experience for the past 10 farming years, which crops/animal production are risky in terms of variability in returns generated? (List in decreasing order) i----------ii----------iii----------and iv----------

68. Apart from farming, from your experience in the past 10yrs, which other off-farm enterprise(s) are risky in terms of variability in returns generated? (list in decreasing order ) i----------ii----------iii----------and iv----------

69. What steps do you think can be taken by ADP or Government to minimize such variation in output and income as farmers ----------

70. What assistance do you receive from extension services/agent: i.Technical Assistance ( ), ii.Loan ( ), iii.Tractor hiring ( ), iv.TrainingProgrammes ( ), v.others (specify) ---

71. Have you received any training from the extension services? Yes/No

72. If yes, for how long was the training? ----------

73. In what ways has your household benefited from veterinary health services? ----------

74. Do you have problems with poultry keeping? (A) Yes [ ] (B) No [ ]

If yes, list and rank them……

75.Is your enterprise(s) e.g farming, carpentry, trading, bricklaying, civil service work, contractor, tailoring etcprofitable?A. Yes( ) B. No ( )

76.What major problems do you encounter in your farming and /or off-farm activities?
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77. What are your suggestions for solving your problems? ----------

78. Do you keep records of your farming and or/ off-farm activities? A. Yes( ) B. No ( )

79. If yes, what type of record do you keep?

i ----------ii----------

iii----------iv----------

80. If No, why? ----------

81. Any other useful information? ----------

**THANK YOU**