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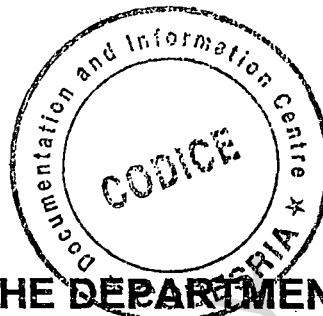# Effect of Poverty on risk attitudes of Farmers in Benue State, Nigeria

JULY, 2005.

EFFECT OF POVERTY ON RISK ATTITUDES OF FARMERS IN BENUE STATE, NIGERIA

**A DISSERTATION SUBMITTED TO THE DEPARTMENT
OF AGRICULTURAL ECONOMICS UNIVERSITY OF
NIGERIA NSUKKA, IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE AWARD
OF MASTER OF SCIENCE (M.Sc) IN
AGRICULTURAL ECONOMICS**

BY

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PG/M.SC/02/32513**

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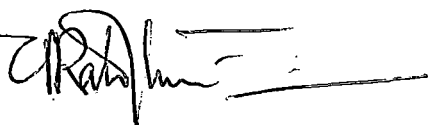
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JULY, 2005.

CERTIFICATION

NZENWA, GOODNESS CHIOMA, a postgraduate student in the Department of Agricultural Economics, University of Nigeria, Nsukka, with Registration Number PG/M.Sc/02/32513 has satisfactorily completed the course and research work for the award of Master of Science (M.Sc) in Agricultural Economics.

The work embodied in this dissertation is original and has not been submitted in part or in full for any other diploma or degree of this or any other university.

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Date: _25, August 2005_

Date: _25, August 2005_

DEDICATION

Dedicated solely to God Almighty under whose everlasting arm I lean and who has granted me favour before all who had one thing or the other to do with respect to this work.

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ABSTRACT

The study investigated the Effects of Poverty on the Risk Attitudes of Farmers in Benue State, Nigeria. Nigeria has remained one of the poorest countries in the world and Benue State in particular was ranked the eight poorest of the thirty-six states of the Federation. The dominance of the oil sector and the consequent neglect of agricultural sector is one of the major precursors of poverty in Nigeria. Small-scale farmers who operate in an environment characterized by risk and uncertainty produce the bulk of Nigeria's food and fibre. Presently, the Nigerian agriculture is characterized by low productivity, low level of technological adoption, and use of inefficient production techniques. The present poor state of the Nigerian agriculture is related to farmers' attitudes towards risks in the production and socioeconomic environment.

Based on the above problems the specific objectives of the study were to: determine the extent of poverty among farmers in Benue State; identify the various risk situations faced and risk aversion strategies employed by farmers with differing poverty levels; assess the risk attitudes of farmers; and determine the effect of poverty and socioeconomic variables on risk attitudes of the farmers.

A multistage random sampling technique was used for selecting the respondents. One hundred and twenty (120) farm households were used for the study. The data were collected during the 2003/2004 farming season. The data were analyzed using the Foster Greer Thorbercke poverty measures, descriptive statistics, Likert scale, safety-first model and multiple regression analysis.

Results of the study showed that the households on the average contained about 7.6 persons, with annual per capita income of ₦32,491 and had a total land holding of 4.8 hectares. The household head was about 44 years and had spent about 5.5 years in school. Using the international poverty line of US$1 per day per person, the result revealed that 78.3% of the respondents were poor and that the depth of poverty, that is the mean distance of the income of the poor from the poverty line was 42.5% which is approximately ₦19,800 below the poverty line (₦46,519 per annum). Majority of the respondents lived in thatched mud houses (51.7%), fetched water from unsafe sources such as wells and

rivers (96.7%), had no toilet facilities (49.2%), and no access to electricity (85%). The degree of poverty was found to be related to farmers' socioeconomic characteristics.

The study identified the following types of risk situations faced by farmers: changes in crop yield/livestock production (16.7%), crop/livestock prices (8.3%), technology (4.2%), cost of inputs (9.2%), credit availability (11.7%), labour scarcity/availability (9.2%), weather (15%) etc. Analysis showed that risk situations faced by farmers were independent of their poverty levels. The risk management strategies used by the farmers included among others: combination of different crops/livestock (14.2%), combination of crop and livestock enterprises (8.3%), replanting of crops (7.5%), use of improved varieties (10.8%), use of pesticides/herbicides (9.2%), spreading of sales/harvest (6.7%), engagement in non farm income activities (10.8%) etc. Result showed that the risk management strategies employed were independent of farmers' poverty levels.

The result of the assessment of farmers' attitudes toward price risk showed that 86.7% were risk averse, 11.7% were risk seeking and 1.7% were risk neutral using scale 1 classification, whereas all farmers were classified as risk averse under scale 2. Using the safety first model to assess respondents attitude towards yield risk, it was found that 71.7% were high risk averse, 25.8% were intermediate risk averse, 1.7% were low risk averse and only 0.8% was risk preferring. Regression analysis showed that age, household size, educational level, extension contact, membership in a solidarity group and degrees of poverty were significant determinants of risk attitudes.

Based on the findings of the study there is need to consider socio-economic and poverty variables of farmers when designing new farm technologies and other agricultural policies in Benue state. Policies to improve the literacy level of the people, and access to agricultural inputs were recommended. Also the use of social protection practices such as income insurance, price-support schemes, credit insurance, etc, which may be helpful strategies in mitigating the effects of poverty on risk attitudes of farmers were recommended.

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CHAPTER ONE

INTRODUCTION

1.1   Background Information

Nigeria, though endowed with abundant human, capital and natural resources and in spite of her oil revenue has remained one of the poorest countries in the world. Various national and international bodies have documented this high incidence of poverty. The Federal Office of Statistics (FOS, 1999) and the United Nations Development Programmes (UNDP, 1998) asserted that despite a remarkable decrease in poverty in the 1980s, the dramatic increase in the 1990s was discouraging.

Over two decades ago, the country enjoyed relative prosperity but progressively saw 40% of the population slide into poverty (Adegbite and Akintola, 2002). The proportion of Nigeria's population in abject poverty gradually increased from 40% to 70.2% between 1992 and 2002. As at the end of 1997, nearly 49% of the population were living in poverty. FOS (1999) reports that prior to the end of 1997, Nigeria's poverty level was 65.6% and she was ranked among the twenty-five poorest countries of the world (table 1.1)

The Human Poverty Index (HPI) was 41.6% implying that one out of every two Nigerians was poor. Life expectancy has gradually declined to a little above 50 years (FOS, 1999); whereas UNDP (1998) put it at 52 years. The percentage of adult literates was 55% and only 49% had access to portable water and health services. The Gini coefficient of poverty increased from 0.38 to 0.43 within the same period and became worse at 0.52 by the end of the 1990s (UNDP, 1999).

As at December, 1999, 54% of the world's population were considered to be poor by the United Nations, on the basis of each country's score on an index of human income and human suffering. The percentage is far higher in some countries such as Sri Lanka, Burma where 90% of the people are below poverty line, and Nigeria where about 67.1 million of the people are below poverty line. It was estimated that only 50% of Nigerians have access to safe water; 50% have never attended any school at all; demand for food increases by about 3% annually while the annual growth rate of food production was

between 1-1.5% (Olaitan et al, 2000). Moreover, UNDP (2004) noted that the Human Development Index (HDI), a composite measure of income and access to education and health services, ranked Nigeria 152nd out of 175 countries in 2000. This low HDI reflects the situation with regard to poor access to basic social services in the country. Further the reports indicate that in 2001 over 70% of the population lived below the international income poverty line of $1 per day. Specifically in Benue State, FOS (2001) report showed that the household economic situation worsened by 27.6% compared to the previous year, access to safe water was 25.6%, adult literacy was 58%, 59.9% had access to primary school, 35.7% had access to secondary school and 32% had access to health services.

Agriculture plays a vital role in the economic development of Nigerian economy. It employs about 70 percent of the labour force and contributes about 41% to the GDP (World Bank, 2004). In Nigeria, over 80 percent of the agricultural population are smallholder farmers with fragmented farm holdings. The smallholder farmers are poor and dwell in the rural areas and are characterized by low income, large family size, lack of formal education, low savings and investment, lack of access to credit facilities and use crude farm production technologies (Olayide et al 1980).

A fundamental problem for all decision makers is the absence of complete information about the decision environment. If all possible actions, events and conditional outcomes could be predicted with complete certainty, then decision-making would be the simple mechanical exercise of calculating the optimal action according to some predetermined criteria. In practice, of course, the decision environment is characterized by uncertainty or the absence of perfect and complete information. Actions are undertaken in anticipation of future benefits that may not be realized. Thus all decisions contain some element of risk because of the unpredictability of outcomes, which imposes an opportunity cost on the decision-making (Hill, 1989). Furthermore, risk arises because uncertainty impacts directly on the decision process through the decision-maker's attitude towards risk. The prudent or cautious manager may well choose different actions from the decision-maker who has confidence (or resources) to take greater risk (Hill, 1989).

Over their lifetime, all men and women are subject to a wide variety of risks. Some of these risks affect their well being in the most direct manner: illness, accident, and death. Others affect their ability to support and feed themselves, either temporarily – unemployment, crop failure, loss of property – or permanently – disability, business failure, skill obsolescence (Fafchamps, 1999). According to Adegeye and Dittoh (1985), most agricultural decisions are taken in the environment of risks and uncertainty. Farmers will have to make decisions now, which will affect their production later. The farmers are not sure of weather, government policies, and new changes in technology – factors which make it difficult for them to predict the future with certainty.

Table1.1: Incidence of Poverty in Nigeria (1992 – 2002)

POVERTY INDICATOR	1992		1996/97		2002	
	UNDP	FOS	UNDP	FOS	UNDP	FOS
%Poor Total Population	34.7	42.7	48.5	65.6	70.2	57.8
% Extreme Poor in Total Population	40	13.9	45	29.3	n.a	19.8
Poverty line (N/annum per capita)	395	2299.65	658	11294	43560	36733
Extreme Poverty line (ditto)	164	1149.82	320	5646.31	n.a	n.a
% Poor in rural areas	39.2	46.0	n.a	69.8	n.a	64.1
% Poor in urban areas	22.8	37.5	n.a	58.2	n.a	35.4
%Female headed household (HH) Poor	n.a	39.9	44.5	58.5	n.a	n.a
% Male headed household poor	n.a	43.1	49.9	66.5	n.a	n.a
Adult literacy rate	52.5	54	55.6	51	66.8	66.8
Primary school enrolment boys	90.3	90.3	66.8	86	49	n.a
Primary school enrolment girls	71.9	71.9	63.9	75	41	n.a
Life expectancy at birth (years)	50.4	52	52	50	51.6	45.3
Infant mortality per 1000 live births	191	191	114	114	110	100

Sources: *Adapted from: FOS (1996,1999) Poverty Profile in Nigeria, UNDP Human Development Report (1997,1998, 2004)*
n.a indicates not available.

Farmers are unable to take actions which will extricate them from poverty because they are poor. Thus the vicious circle of poverty takes many forms, since the attribute of poverty which makes escape difficult may be poor health, lack of skill, lack of self-confidence or support mechanisms, remoteness from markets and institutions, lack of physical assets or borrowing power or combinations of the above. But one key element in many versions of the spiral, in any country or environment, is risk aversion. If poor people are risk-averse to the extent that they are unwilling, to invest in the acquisition of modern assets because that involves taking risks, they will remain poor. Thus the willingness to climb the ladders out of poverty' – processes of investment in physical, human and social capital – being confined to those who are economically secure and in possession of sufficient defences against risk (Mosley and Verschoor, 2003).

1.2   Problem Statement

Agriculture has remained the mainstay of the economy for over three decades. However, since 1970, the dominance of the oil sector has led to a relative neglect of the agricultural sector in terms of policy responses resulting in declining productivity, growth and competitiveness and increased poverty. Small-scale farmers are known to produce the bulk of the food and fibres of the country. The farming population constitutes over 60percent of the countries population. Presently the Nigerian agriculture is characterized by low productivity, low level of technological adoption, use of inefficient production techniques, etc. The present poor state of Nigerian agriculture is related to farmers attitudes towards risks in the adoption of new production techniques, as well as risks in the production and socioeconomic environments.

Since poverty is a major constraining factor in the farmer's production and socioeconomic environment, there is need for a detailed study on the effect of poverty on farmer's attitude towards risks. At present there is no major

information on this aspect of study in Benue state. The closest study to this present study is the work of Madu (1997), which addressed the risk attitudes of farmers in Enugu state, and the prospect for surplus production if farmer's risk factors are mitigated. The study however did not explicitly address the relationship between farmer's poverty and risk. The other study by Ogah (1995) addressed risk status of crop farmers in Benue state and technology adoption and there was no specific attempt to relate risk attitudes to farmer's poverty. The study by Adeyemo and Ajobo (1990), focused on risk management strategies employed by farmers and neither addressed risk attitudes nor related it to poverty. Moreover, Mosley and Verschoor (2003) in their study on risk attitudes and vicious circle of poverty in Ethiopia, Uganda and India noted that much of such studies have not been conducted in low-income countries. Therefore the present study attempts to fill this knowledge gap by providing answers to the following research questions:

- What are the socio-economic characteristics of farmers in the area?
- What is the level of poverty among farmers in the area?
- What are the various risk situations these farmers encounter?
- How do they behave or respond to the risk situations?
- Does poverty affect their attitudes towards risk?
- What strategies do they employ in managing risks?

1.3 Objectives of the Study

The broad objective of this study is to analyse the effect of poverty on the risk attitudes of farmers in the study area.

The specific objectives are to:

1. determine the extent of poverty among farmers in the study area;
2. identify the various risk situations faced by farmers with differing poverty levels;
3. assess the risk attitudes of farmers towards the identified risks;
4. identify the risk aversion strategies employed by farmers with differing poverty levels;
5. determine the effects of poverty and socioeconomic variables on risk attitudes of the farmers.

1.4   Research Hypothesis

Based on the above specific objectives, the following null hypotheses were formulated:

1. The risk situations faced by farmers are independent of their poverty levels.
2. There is no statistical difference in mean risk aversion coefficients of farmers in the different poverty levels.
3. The risk aversion strategies employed by farmers are independent of their poverty levels.
4. Poverty and socioeconomic characteristics have no significant effect on risk attitudes of farmers in the area.

1.5   Justification of the Study

There are controversies concerning the effect of income and wealth on risk attitudes of farmers. This can be found in the works of Dillon and Scandizzo (1976), Binswanger (1980), Mosley and Verschoor (2003). This study is thus justified as it intends to shed some light on this issue.

The study is further justified in that much work has not been done on poverty and risk attitudes in low-income countries (Mosley and Verschoor, 2003). There have been studies on poverty or risk management in Nigeria but little or no attempt has been made to research on poverty and risk attitudes. This is the focus of this study. More so, the study is justified because the study area, Benue State is largely agrarian; irrigation farming is not commonly practiced and consequently farmers incomes are spread over the year.

Moreover, the study is justified because its findings and recommendations will benefit the following stakeholders: researchers, policy makers, farmers, Non-Governmental Organizations (NGOs) and extension agents.

To the researchers, it will serve as a reference point. They will benefit from the wealth of knowledge emanating from this study and this will provoke further studies.

To the policy makers, it will serve as a guide in formulating polices that will enhance the rural farmers' investment capabilities and well being thus reducing their fears about risk.

To the farmers, the study will reveal their poverty situation and their risk attitudes and consequently attract development interventions to them. To the NGOs, the study will encourage them to channel more aids, develop more effective development interventions and special projects for farmers.

To the extension agents, the knowledge of farmers attitudes towards risks will enable them know their rate of adoption of new technologies and the particular ones to disseminate to them.

1.6   Limitations of the Study

The study was carried out in an environment where illiteracy was widespread and farmers kept little or no records of their farming activities. Thus the study relied entirely on farmers' memory recalling abilities. Moreover, the researcher does not understand the language of the people. This problem was overcome by use of enumerators from the Benue State Agricultural and Rural Development Authority (BNARDA) for data collection. Further, there were time and financial constraints and as such the study relied on sample. However, these limitations, did not seriously affect the findings of the study and their interpretations.

CHAPTER TWO
LITERATURE REVIEW

2.1   Concept of Poverty

There has been bewildering ambiguity in the use of the term 'poverty'. Is poverty simply about the level of income obtained by households or individuals? Is it about lack of access to social services? Or is it more correctly understood as the inability to participate in society, economically, socially, culturally or politically? The answer is that the term has been used in all these ways. Maxwell (1999) gave a list of the terms with which poverty has been described. These include income or consumption poverty, human (under) development, social exclusion, ill-being, (lack of) capability and functioning, vulnerability, livelihood unsustainability, lack of basic needs and relative deprivation.

According to Nguyet (2003), poverty refers to the state of a part of the population which is not provided with the basic human needs that is in accordance with the socio-economic development level and local habits in each nation. UNDP (1999) views poverty as the state of being deprived of those opportunities and choices that are essential to human development: for a long, healthy, creative life; for a reasonable standard of living; for freedom, dignity, self-respect and respect from others (life situation approach).

The World Bank defined poverty according to accessible resources, that is to say, according to the monetary income. The poor are, then, those who fall short of a certain income threshold and/or a certain amount of expenditure for consumption. Kapheth (2003) views poor households as those whose resources are insufficient to provide basic nourishment, shelter and quality of life which are considered as conventional or 'normal' in that particular society. This idea of relative deprivation represents an attempt to conceive of poverty in sociological terms rather than in the economic framework adopted by most governments and by many early academic studies of the phenomenon.

According to Sen (1985), people who lack the "capability" to function in society might have lower well-being or be more vulnerable to income and weather shocks. Thus, poverty means lack of command over commodities in

general (i.e., a severe constriction of the choice set) or a specific type of consumption (e.g., too little food energy intake) deemed essential to constitute a reasonable standard of living in a society, or lack of "ability" to function in a society.

Poverty is also associated with insufficient outcomes with respect to health, nutrition and literacy, to deficient social relations, to insecurity, and to low self-confidence and powerlessness. According to World Bank (2000), "poverty is pronounced deprivation in well-being", where well-being can be measured by an individual's possession of income, health, nutrition, education, assets, housing, and certain rights in a society, such as freedom of speech. Also poverty is lack of opportunities, powerlessness, and vulnerability defined as the probability or risk today of being in poverty, or falling deeper into poverty in the future and is a key dimension of well-being since it affects individual's behaviour (in terms of investment, production patterns, coping strategies and the perceptions of their own situations).

Olaitan et al (2000) defined poverty as the scarcity of human basic needs or the inability of an individual or society to acquire basic human needs for existence. He further opined that individual poverty is one that results from individual misfortunes or inability to obtain the basic necessities of life like essential clothing, three square meals a day that are nutritious, a habitable house and a means of transportation either by land, sea or air while community, group or nation that could not provide basic needs for its members are poor.

Poor individuals live in traditional sub-standard houses made up of mud or clay, thatches or straw materials without health facilities and their environment is usually filled with human wastes especially in the rural areas and disadvantaged outskirts of urban settlements called ghettos (Olaitan, et al 2000). In support of the above, Lawal (1998) described poverty as a condition in which people earn so little that they are unable to provide the basic necessities of life needed for an acceptable standard of living. It is a situation where an individual is not able to cater adequately for his/her basic needs of food, clothing and shelter, he is unable to meet social and economic obligations, lacks gainful employment and infrastructure such as education,

health, portable water, and sanitation and consequently has limited chance of advancing his welfare to the limit of his capabilities.

Trager (2000) categorized the following as poor especially within the Nigerian context:

a) households or individuals below the poverty line and whose income are insufficient to provide for their basic needs;

b) households or individuals lacking access to basic service and other forms of support;

c) people in isolated rural areas that lack essential infrastructure;

d) female-headed household;

e) persons who have lost their jobs and those who are unable to find employment as a result of economic reform under structural Adjustment Programme (SAP) and those who are in danger of becoming the new poor as a result of unemployment especially in urban centres.

Poverty is a word that is used in at least three different ways. Each poses questions which every society should be prepared to answer. The first usage poses questions about hardships, misery and 'destitution poverty' – conditions which are still occasionally to be found, among low-paid workers as well as people out of work. The second usage poses questions about the income; wealth and real living standards of different kinds of people: the answers will not provide a scientific measure of 'subsistence poverty', for that cannot be clearly defined, but they will show whose living standards are the lowest and may suggest the reasons for these patterns. The third usage poses questions about inequality, exclusion, discrimination, injustice and relative poverty'. If this third concept of poverty is to have any practical cutting edge, it calls for nothing less than a new morality (Donnison, 1982). This author views poverty as a standard of living so low that it excludes people from community in which they live.

Poverty according to Ani (1997) in Adegbite and Akintola (2002) can be considered as a condition of life characterized by malnutrition, diseases, illiteracy, low life expectancy and high infant mortality beyond expectation of

human decency. It is a state of want, needs, deprivation, low esteem and lack of actualization for self-development.

When defined by standard measures of income and expenditure of households, poverty is the inability of any household to attain a level of income necessary to purchase the various goods and services considered by those in the reference group of that household, to be sufficient for living (Nweze, 2001). In terms of non-material/intangible assets, poverty can be seen as lack of adequate access to optimum health services, potable water supply and other social amenities; vulnerability to risks and other factors of infection, lack of enough and appropriate nutrition etc .Two very broad concepts of poverty are being utilized today by statistical agencies and researchers throughout the world, responding to different concerns. One is the concept of absolute poverty, understood as the minimum set of resources a person needs to survive. The other is the concept of relative poverty, a measurement of the resources and living conditions of parts of the population in relation to others. Absolute poverty is a matter of acute deprivation, hunger, premature death and sufferings while relative poverty is clearly a matter of social equity (Schwartzman, 1998).

Absolute poverty approach according to Fusco (2003), is a lack of income in order to satisfy the essential requirements for physiological survival. In the case of the relative approach to poverty, poverty is lack of income in order to reach the average standard of living in the society in which one lives. Absolute poverty is the state of a part of the population that is unable to satisfy essential needs for maintaining their lives whereas relative poverty is the state of a part of the population living in conditions below the average level of the community (Nguyet, 2003).

However, Eva and Jackie (1998) were of the view that all definitions of poverty may be fitted into one of the following categories:

i.   poverty is having less than objectively defined, *absolute* minimum.

ii.   Poverty is having less than others in society, in *relative* terms.

iii.   Poverty is *feeling* you do not have enough to get along.

Poverty according to the first category of definitions is absolute, and according to the second category it is relative. Poverty according to the third

category is a mixture of absolute and relative poverty which is split into budget standards method and income proxy measure.

The table below is a summary of Eva and Jackie's (1998) approach to defining poverty.

Table 2.1: Defining Poverty

Approach	Concept	Criticisms
Absolute poverty	"minimum subsistence"	(1) it disregards the social needs of human beings. (2) The determination of necessities remains controversial (3) It is difficult to quantify the necessities for existence.
Relative poverty	An indicator relative to the value of national income	(1) some fixed proportion of the population is always regarded as poor. (2) The poverty figures cannot reveal the quality of life of the poor
Budget Standards	"minimum subsistence" plus "basic minimums for social lives"	(1) the choice of necessities remains controversial (2) subjective judgement is involved in updating the needs (3) the work of updating an expenditure budget is huge and costly.
Income proxy	Consumption pattern, that is, the competition between choice and need is dependent upon the level of income.	(1) Consumption pattern changes with social development (2) the work of updating the relevant data requires huge resources.

Source: *Eva and Jackie, 1998.*

In terms of the geographical dimension, poverty is of two types: rural and urban poverty. Rural poverty in traditional economies is very different from urban poverty in large metropolitan areas (Schartzman, 1998). In the rural

areas, rural dwellers are under-served in terms of social and economic services like welfare and other forms of amenities such as trade and industry, electricity and pipe-borne water. Absence of these makes them more prone to poverty. Their major means of information dissemination is through jingles and town criers. They fetch water in unprotected streams. A poor man finds it difficult to pay normal income tax, children's school fees and to entertain visitors. He travels long distances on foot to fetch water and firewoods. He lives in mud houses in a filthy environment with his domestic animals sharing the apartments in the same house. Rural dwellers use raw materials in pure state for their construction like using straws or thatch or palm leaves to prepare their roof. They fetch water with mud or clay pots or calabash (Olaitan et al, 2000).

In the Urban areas where there are some amenities like roads, pipe-bone water, concrete buildings, electricity, education, some of the inhabitants still live in slums without access to modern facilities. They fetch water from shallow wells because they have been marginalized. They struggle to meet the basic needs of life just like the rural dwellers at the expense of the government in order to survive (Olaitan et al, 2000).

For the purpose of this study, poverty is defined as state of part of the population living below the acceptable minimum living standard of the society. In other words, the poor are those whose income fall below the acceptable threshold. However, information on other poverty indicators will be elicited from the respondents.

2.1.1 Types of Poverty

The following are common types of poverty as enumerated by Olaitan et al, (2000) and Schwartzman (1998)

1. **Intellectual Poverty:** this is the inability of an individual to use his power of the mind to reason and acquire knowledge for active participation in the society.

2. **Economic Poverty:** the lack of attention to coherent policy formulation with policy-making machinery and without providing the enabling environment, to boost productive activities and economic prosperity of a nation. These are as a result of the government not being able to secure

sustainable growth in the economy with equal distribution of basic necessities of life. The individual that is economically poor has low or zero income to acquire basic needs such as housing, means of transport, payment for water and electricity bills. The individual is always dependent on others for basic needs of life.

3. **Political Poverty:** This involves government's inability to continue empowerment in a transparent democracy because she could not explain her policy and lacks the ability to monitor and evaluate her programmes or projects. The individual that is politically poor is one that lacks diplomacy and articulation in convincing people in his or her constituency about his ideas, values, aspirations for the people in a well-defined manifesto. The individual believes in using thugs and money to acquire position at election in a democracy.

4. **Technological Poverty:** This is the practice of using obsolete technology, which will give rise to low productivity, low consumption and initiatives and low institutional capacity building. An individual that is technologically poor depends on the consumption of other people's technology without any initiatives of developing his or her own or has phobia of developing any technology.

5. **Social Poverty:** It is a development that does not involve active participation of the people, their choices and opportunities in decisions that affect their lives like: improving social indicators, enhancing G.N.P. per capita for the citizenry and; improving their human development index (HDI). The individual who is involved in social poverty is dictatorial, autocratic or with a laissez faire attitude toward development. They make the society unfree, anti social, and also with the use of monitors to suppress social acts.

6. **Managerial Poverty:** This is the lack of tactful management and strategic control of mission and vision statements of an organization or business. Therefore, an individual that is managerially poor lacks the autonomy and accountability of management. On the part of the individual, instead of organizing and controlling institution or organization, the individual is engaged in fraudulent and corrupt

practices such as inclusion and claiming ghost workers entitlement, kick backs on contracts award and fixing and collecting interests on institution's or company's fund at the expense of the company's or institution's growth.

2.1.2 Causes and Consequences of Poverty

According to World Bank (2000), one route for investigating the causes of poverty is to examine the dimensions highlighted by poor people and these include lack of income and assets to attain basic necessities (food, shelter, clothing and acceptable levels of health and education); sense of voicelessness and powerlessness in the state and society; and vulnerability to adverse shocks linked to inability to cope with them.

Jordan (2004) noted that causes of poverty could be structural/economic or cultural. The structural causes of poverty manifests itself in unemployment, low income and income inequality while cultural causes include rising rates of divorce, female headed single parent families, teen pregnancy, drug/alcohol abuse and criminal activities. Schwartzman (1998) also identified different causes of poverty associated with demographic conditions, such as family size, created by unemployment; caused by poor quality jobs; by lack of education; by social discrimination, by lack of "social capital", such as family and community organizations and networks; by economic changes, climate changes, natural catastrophes, and war.

In Nigeria, it has been identified that lack of access to income generating opportunities, family system, lack of pragmatism in national education and usage, rural-urban drift and poor policy statement causes poverty (Olaitan et al, 2000; Ajakaiye and Adeyeye, 2002). Moreover, Yusuf (1999) and UNDP (2004) reported that the dominance of oil sector and the consequent neglect of the agricultural sector in terms of policy responses result in declining productivity, growth and competitiveness and increased poverty. Further more, Nwaobi (2003) noted that failure to adequately implement programmes geared towards the provision of master plans for future expansion and better physical facilities such as adequate water supply, housing, sewage, electricity and efficient transport and communications network including the establishment of

necessary institutions to ensure their maintenance can be seen as the precursor to most of the present causes of poverty in Nigeria. According to Francis et al (2002), local peoples perceptions of main causes of poverty include: unemployment, poor environment, lack of capital, lack of farm inputs, poor roads, inefficient transportation system, poor crop yields, lack of food, over population, ill health, conflicts, corruption, poor and unstable output prices and lack of health care services.

The consequences of poverty are numerous. They include prostitution, inefficient and inadequate food production, exposure to risks like corruption, robbery, street life, increased unemployment, malnutrition, low per capita income, overcrowded living conditions, low level of education, human degradation, short life span, high infant mortality, fraud, and migration (Olaitan et al 2000). In support of the above, Schwartzman (1998) noted that poverty particularly when associated with war and economic disorder, leads to social unrest, national and international migration and threatens the life style of those who are better off. Poverty equally reduces farmers ability to bear risk and are thus less able to invest in higher income generating activities associated with high risk. (Mosley and Verschoor, 2003; Fafchamps, 1997).

2.1.3 Poverty Incidence in Nigeria

Poverty is a general phenomenon in Nigeria. It is a common problem which cannot be easily wiped off except available basic needs and resources are acquired and eventually distributed among the citizens to alleviate them, and this requires some concerted effort by the government and individuals to shift the status to a more positive direction through training, work and opportunities (Olaitan et al, 2000).

The Nigerian poverty profile indicates that the proportion of the poor rose from 28.1 percent (18 million people) in 1980 to 46.3 percent (35 million people) in 1985. This dropped to 42.7 percent in 1992 but catapulted to 70 percent (79 million people) in 1999 (table 2.2). The poverty indicator used was low income which tends to be at its worst in the rural areas due to malnutrition, lack of education, low life expectancy and sub-standard housing.

Table 2.2: Trends in poverty level in Nigeria between 1980-1999

Year	Poverty level (%)	Estimated total population (million)	Total population in poverty (million)
1980	28.1	65	18.3
1985	46.3	75	34.7
1992	42.7	91.5	39.2
1996	65.6	102.3	67.1
1999	70.0	112.8	79

Source: *FOS/World Bank, 1999 Poverty Profile for Nigeria*

It is evident from the statistics above that Nigeria is a poor nation because a majority of her citizens live below an acceptable per capita income.

In Nigeria the United Nations Development Programme (UNDP) Human Development Index value fluctuated within the range of 0.348 in 1992 and 0.389 in 1993, remained at 0.384 between 1994 to 1996 but rose marginally to about 0.393 in 1997 and 1998. The low value of the HDI for Nigeria is a strong indicator that poverty in its entire ramification is a major problem in the country (CBN, 1999). Poverty in Nigeria is pervasive; more than 45% of Nigerians are living below poverty line, while about 80% of those affected are living in the rural areas of the country (UNDP, 1998). Moreover, recent report by UNDP (2004) indicates that in 2001, the HDI ranks Nigeria 152nd out of 175 countries and that over 70% of the population lived below the international income poverty line of $1 a day

Before the discovery of oil, Nigeria's economy was primarily agricultural and despite its decreased role as a component of GDP, the sector continues to employ about 72% of the labour force. It is not surprising then that 68 percent of the extreme poor are dependent on agriculture for their livelihoods. Most are mainly self employed or family workers and live in regions with poor infrastructure, poor access to services, unfavourable agro-climatic conditions or all three (FOS, 1999).

Despite several nationally co-ordinated programmes for alleviating poverty in Nigeria such as Green Revolution, Operation Feed the Nation, National Agricultural and Development Authority, Directorate of Food, Roads and Rural infrastructure, National Poverty Eradication Programme etc, the

population of the poor has continued to rise in Nigeria as shown in table 2.2 above.

2.2   Empirical Measures of Poverty

Just as defining poverty has been debatable, measuring poverty is also fraught with disagreements and difficulties (Eva and Jackie, 1998). According to Maxwell (1999), different models of poverty imply different indicators. Money metric models require information on income or consumption, vulnerability models use indicators of wealth and exposure to risk, as well as income; models concerned with capability and functioning present indicators of life expectancy or educational achievement; models of well-being or social exclusion include measures like the degree of social support. Some indicators are inherently more quantifiable than others, and more decomposable in the sense that they can be subjected to statistical manipulations.

2.2.1 Money Metric Models (Traditional Approach)

Eva and Jackie (1998) noted that income is always taken as a single indicator to measure poverty because total consumption of basic needs (e.g food, housing and clothing) and essential needs (e.g transportation and social activities) are difficult to quantify implying that income is taken as a proxy for living standards. They however, suggested that if income is used as a proxy for consumption, the reference period should capture permanent rather than transitory living standards as this would give a closer match than an indicator using current income and likewise indicators from annual income should be a better one than one derived from income in a week or a month.

Income and consumption poverty have conventionally been measured using the following measures namely the head count ratio, the poverty gap, the Foster-Greer-Thorbecke (FGT) measures, the Fuzzy Monetary (FM) measure and the sen index (Fusco, 2003; Lamin, 2000; Datt 1998 and Ravallion 1994).

(1)   The Head Count Ratio (H)

This is the simplest and most widely used measure of poverty. It indicates the proportion of poor people in the studied population and it is computed by taking the ratio between the number of poor units determined in the identification step and the total population. With z, the poverty line, yi, the

income of household i (if i is poor then yi<z), n the total population, q the total number of people earning an income level below z, Head count index (H) is specified as:

H = q/n

In cases when the income distribution follows a continuous probability density function over the random variable income y, the Head count ratio is defined as:

$$H = \int_o^q f(y)dy = F(Z)$$

Where, H = F(Z) is the distribution function up to income level z.

This index, according to Fusco (2003) provides a simple quantitative information about the incidence or prevalence of poverty in a given society. It is useful and often referred to because it is easily understood. Its main weakness is that it does not take into account the intensity of poverty. For example in a situation where a poor gets poorer, the Head Count Ratio does not change (Monotonicity axiom). In support of this Eva and Jackie (1998) opined that head count index alone cannot reveal the extent of poverty of individuals or household i.e. it does not tell how far they are below the poverty line.

(2)   The Poverty Gap (PG)

This measure overcomes the draw back of head count index. It measures the intensity (or deepness) of poverty. The poverty gap is the aggregate poverty deficit of the poor relative to the poverty line, i.e., it is the mean distance of the poverty line for the whole population, expressed as a percentage of the threshold value (Fusco, 2003 and Lamin, 2000). It is given as

$$PG = \frac{1}{n}\sum_{i=1}^{q}(\frac{z - yi}{z})$$

For the discrete case and, for a continuous case, it is:

$$PG = \int_o^z \frac{(z - y)}{z} f(y)dy = F(z)\frac{(z - \mu^*)}{z}$$

μ^* is the mean income of the poor.

The Equation for continuous case can also be written as:

PG = I.H

Where I is the income – gap ratio, defined by:

$I = (z - y_q)/z$

Where y_q is the mean income of the poor below the poverty line; H is as defined earlier.

Here, in the case of a poor getting poorer (or richer but still below the poverty line) whereas the incidence of poverty (H) would be unchanged, the depth (PG) would change. The policy implications derived from income measures can easily be found through the poverty gap because it gives a clear idea of the cost of eradicating poverty i.e. the additional quantity of resources that would normally be needed by the poor in order to reach the poverty line (Fusco, 2003).

Lamin (2000) noted that one draw back of the poverty gap is that it may not convincingly capture differences in the severity of poverty as it cannot take account of the transfer from the poor to the non-poor (transfer axiom).

(3)   Sen Index

This gathers together in the same scalar the information concerning the incidence of poverty, the intensity of poverty and the inequalities between the poor. Doing this, it respects the monotonicity and transfer axioms (Fusco 2003) and it is given by:

$Ps = H [(I + K (1 - I) Gp]$

with Gp, the Gini coefficient between the poor; I, the income Gap, $I = 1 - y_q/Z$, where y_q is the mean income of the poor, and $K = q/(q + 1)$.

If there is no inequality between the poor we have Gp = 0 and then Ps = PG.

(4) The Foster-Greer-Thorbecke (FGT) Measure of Poverty

The FGT class of poverty measures has some desirable properties (such as additive decomposability), and they include some widely used poverty measures (such as the head-count and the poverty gap measures). The FGT poverty index is given by:

$$P_\alpha(y,z) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z-y_i}{z}\right)^{\alpha}$$

Where α is a non negative parameter; z is the poverty line, and the distribution is ordered such that $y_i \leq z$ if and only if $i \leq q$; n is total number of households in population; q is the number of poor households and y is household income, $z-y_i$ is the gap between the poverty line and the income for each poor individual. For $\alpha = 0$, P(y,z) reduces to Head count ratio which indicates the proportion of the population below the poverty line. The higher the index the greater the proportion of the individuals or households who are poor. It is given as

$$P_O = \frac{q}{n}$$

Similarly for $\alpha = 1$, it reduces to the poverty gap measure (depth of poverty) which shows the average gap between the expenditure or income of the poor individual or household and the poverty line. The higher the index the greater the poverty gap and it is given as:

$$P_1 = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{Z - y_i}{Z} \right)$$

However, a complex measure reflecting differences in inequality among the poor is obtained by setting $\alpha > 1$; an example is the squared poverty-gap index, SPG or P_2 (Ravallion, 1994; Lamin, 2000 and Datt, 1998). P_2, the severity of poverty index, or the square of the gap of each poor individual from the poverty line is more sensitive to the most poor persons in society by giving them a higher weight in calculating the depth of poverty. This means that the further away a person is from the poverty line, the higher the value of the P_2 index. The index will give a smaller weight for persons just below the poverty line than those much below. It is given as

$$P_2 = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{Z - y_i}{Z} \right)^2$$

Datt (1998) added that for a continuous case, FGT poverty measures are defined as:

$$P_\alpha = \int_0^z \left(\frac{z - x}{z} \right)^\alpha f(x)dx \qquad \alpha \geq 0$$

where x is the household consumption expenditure, f(x) is its density (roughly the proportion of the population consuming x), z denotes the poverty line and $\propto$ is a non negative parameter.

FGT measure of poverty satisfies the monotonicity axiom for $\propto = 0$, the transfer axiom for $\propto = 1$ and transfer sensitivity axiom for $\propto = 2$ and is justified by a relative deprivation concept of poverty (Lamin, 2000). The FGT measure will be used in this study for measuring poverty and consideration will be given to $\propto = 0$ and 1 which indicates the head count index and poverty gap respectively.

(5)   Fuzzy Monetary (FM) Measure

The fuzzy approach of measuring poverty was developed because well-being of individuals and/or household is a matter of degree; the division of the population into the dichotomy of the poor and the non-poor seems to be an over simplification, since poverty is not a simple attribute that characterizes an individual in terms of its presence or absence (Betti et al, 2000).

The monetary variable utilized for the FM method consist in the net equivalent household income Zit; making use of the concept of fuzzy set theory, the degree of deprivation of any household i at any period t is defined as the membership function to the fuzzy set of the poor;

$$\mu \, (Zit) = [1 - F(Zit)]^{\propto t} = l_{it}^{FM} \quad i = 1, \ldots, N_t = 0, 1, \ldots, T$$

where F(.) is the household cumulative distribution function according to the equivalent income. Parameters $\propto t$ are determined so that the membership function means are not merely equal to 0.5, but are equal to the proportion of poor units according to the traditional approach (head count ratio, H).

In summary, the main advantages of the traditional measures of poverty are from a practical order and lies in the simplicity of measuring them. They can be useful in counting the poor people and targeting a population at economic risk. Concerning the anti-poverty strategy, these measures based on income give information on how transfer policy could be implemented to allow poor people to reach the poverty line. These policies are useful because they can alleviate poverty but in the short term (Fusco, 2003).

Fusco (2003) went further to say that when poverty is taken to be multidimensional in its causes and consequences, the problem is that there is no guarantee that an economic answer to the economic dimension problem would reach the other dimensions and that it would allow poor people to leave persistently from their situations of poverty.

2.2.2 Multidimensional Approach to Measurement of Poverty

The multidimensional aspects of the phenomenon of poverty and living condition are not taken into account in the traditional approach to poverty analysis that considers only the monetary indicators (ie income or consumption expenditure). According to Fusco (2003), the theory of fuzzy sets has been introduced by Cerioli and Zani (1990) and developed by Cheli and Lemmi (1995) in order to overcome some limitations of the traditional approach and to define multidimensional fuzzy poverty measures.

This approach gives information on how to implement a structural socio-economic policy. It clearly improves one's understanding of the overall phenomenon, dealing with it as a whole and not through a single indicator. However, this gain in terms of understanding has its counterparts as it increases the difficulty to measure poverty (Fusco, 2003).

Fuzzy Sets and Functioning

Fusco (2003) and Betti et al (2000) derived two ratios of deprivation and functionings:

(1) a multidimensional ratio of deprivation or functionings for each individual i and

(2) a ratio of deprivation or functionings according to each dimension (indicators) of poverty. The dimensions include housing conditions, education, material control over one's environment, social interaction and environment, bodily health, satisfaction with one's situation and economic resources. Each of these dimensions is represented by a set of indicators.

1. Fuzzy Ratio of Each Household:

(a) Multiple Deprivation Index

The weighted average of each dimension membership degree μ_{kj} is given by

$$\mu_A(i) = \frac{\sum_{j=1}^{m} \mu_{kij} w_{kij}}{\sum_{j=1}^{m} w_{kij}}$$

Where μ_A is the membership function, A is the subset of the poor and μ_{kj} is the degree of membership of individual i(i = 1...n) relative to indicator kj(j=1...m); w_{kj} is the weight of indicator k_j and it is defined as

$$w_{kij} = \frac{1}{In(F(K_{ij}))}$$

where $F(K_{ij})$ represents the rate of individuals deprived in k_j; F is the subset that defines the position of each individual according to the degree of achievement of the functionings

b. Functionings Ratio

The computation is the same as above, making the weighted average of each dimension membership degree μ_{Hj}:

$$\mu_F(i) = \frac{\sum_{j=1}^{m} \mu_{Hij} w_{Hij}}{\sum_{j=1}^{m} w_{Hij}}$$

with $w_{Hij} = \dfrac{1}{In(F(H_{ij}))}$

Where μ_{Hj} is the degree of membership with respect to functionings H_j. This ratio can stand for the well being of individual i (Fusco, 2003).

2.   Fuzzy Ratio of the Population According to Each Dimension (indicators)

a. Deprivation Index

This ratio contains basic information that political decision makers need for the design of structural socioeconomic policies aimed at the steady abatement of the main causes of poverty (Dagum, 2002). It simply consists in

the mean through the population of the membership functions for the dimension K_j and expressed as

$$\mu_A(k_j) = \frac{\sum_{i=1}^{n} n_{ij}\mu_{kj}}{\sum_{i=1}^{n} n_{ij}}$$

It is a unidimensional ratio because it talks about one dimension i and a multidimensional ratio because it is constituted of several variables (Fusco, 2003).

(b) Functionings Ratio

This is given as

$$\mu_F(H_j) = \frac{\sum_{i=1}^{n} n_{ij}\mu_{Hj}}{\sum_{i=1}^{n} n_{ij}}$$

2.2.3 Perceived Vulnerability

Mosley and Verschoor (2003) measured a state of mind brought about by chronic poverty using an index of perceived vulnerability. The index uses scores that reflect respondent's degree of agreement with a number of statements about themselves. The statements fall into four broad categories namely: memories and expectations of poverty throughout their life time as well as that of their children; short-term income dynamics expectations; perceived risk of potentially high return farm activities; and self-respect and perceived own status. The higher the index, the higher is someone's perceived vulnerability.

Perceived vulnerability and other explanatory variables (age, gender, education, dependency ratio) were used to conduct binary logistic regressions of the risk aversion measures by Mosley and Verschoor (2003).

2.3 The Concept of Risk

Every business and every person faces risks each day, but what is risk? People have different attitudes about risk. A person's aversion to risk is a key factor in the extent to which he will try to manage the risks (USDA, 2000). Risk

in agriculture and natural resource management, as in life, is everywhere, but dealing with it systematically, whether for farmers, other natural resource managers, researchers or anyone is difficult. One reason for the difficulty is confusion and differences of opinion about what risk is and how it can be measured (Anderson and Hardaker, 2002).

In general, people often think of risk as the chance of something bad happening. Thus "bad" and "chance" are two key elements of "risks". "Bad" is the first element, and it refers to an outcome or event that is adverse, such as crop failure. "Bad" is also relative, - losing more money is worse than loosing less money. "Chance" is the second element. Risk involves uncertainty that an adverse event will occur. If something "bad" is absolutely, positively, guaranteed to happen, there is no risk involved because uncertainty is not present (USDA, 2000). According to Daramola (2000), risk is the objective doubt concerning the outcome in a given situation. It is the uncertainty as to the occurrence of an economic loss or the possibility of an unfortunate occurrence (Dickson, 1984). Olayide and Heady (1982) defined risk as variabilities or outcomes which are measurable in an empirical or quantitative manner. The outcome or variability need not be exactly predictable for any given product or output, but the probability of outcome or loss must be capable of being established for a large number of cases or observations. They further noted that empirical probabilities of outcome (or loss) for risk situations can be established either by the use of 'a priori' probabilities when the characteristics of eventuality are known before hand or by statistical probability of outcome based on large samples of cases of replications which are randomly and independently distributed.

Hill (1989) opined that risk is a situation in which the probabilities of events are known before hand. In support of this, Ronald (1986) defined risk as a situation where all possible outcomes are known for a given management decision and the probability associated with each possible outcome is also known. Risk is the chance or probability of adverse outcomes associated with an action; the greater the uncertainty, the greater the risk (Castle et al, 1987).

Risk is the doubt about future loss or the inability to predict the occurrence of loss (Crane, 1980). It is the objective doubt concerning the

outcome in a given situation; the greater the variation, the greater the risk (Greene and Barry 1987). They further noted that risk is the uncertain occurrence of hazardous peril; the unpredictability that the tendency of actual result may differ from predicted result. According to Anderson and Hardaker (2002), risk seems to be best formalized as the whole distribution of outcomes. For the purpose of this study, risk is the probability of the occurrence of an economic loss for an event. Risk is distinct from uncertainty because for risk the probability of each possible outcome is known while for uncertainty the probability in not known.

2.3.1 Sources of Risk 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, 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 risk, market risks, institutional risks, personal risks, asset risk and financial risk (Faichamps and Gavan, 1997; USDA, 2003; Olayide and Heady, 1982; Adegeye and Ditto, 1985)

(i) **Production or Yield Risk:** This 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 e.g., using machinery for which parts are no longer available), which creates another, and different, kind of risk.

Price or Market Risk: This 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 ongoing investments in feed and equipment that may not produce returns for several months or years. Due to the fact that 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.

(iii) **Institutional Risk:** This results from changes in policies and regulations that affect agriculture. This type of risk is generally manifested as unanticipated production constraints which may lead to price changes in inputs or outputs. For example changes in government rules regarding the use of pesticides (for crops) or drugs (for livestock) may alter the cost of production. Furthermore, a foreign country's decision to limit its imports (through import rules and regulations) of a certain crop may reduce that crop's price in the international market if she is a major buyer.

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. A type of institutional risk that appears to be of growing importance is contracting risk, which involves opportunistic behaviour and the reliability of contracting partners. In general institutional risks affect the structural parameters of economic decisions.

(iv) **Human or Personal Risks:** These 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 or the farmer. In addition, the changing objectives of individuals involved in the farming enterprise may have significant effects on the long run performance of the operation.

(v) **Asset Risk:** This is also common to all business and involves theft, fire or other loss or damage to equipment, buildings and livestock.

(vi) **Financial Risk:** 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 hundred

percent owner financed, the operator's capital is still exposed to the probability of losing equity or networth.

2.3.2 Consequences of Risk

The economic consequences of risk has to do with reduction in labour supply to agriculture, reduction in agricultural productivity and in extreme conditions, outright desertion of fertile lands by the people and complete collapse of some firms or farms (Ijere, 1991). Smith (1994) reported that drought is a normal pattern of life for some farmers. In 1991 and 1992 a majority of farmers in Northern Nigeria (Maiduguri, Sokoto, etc) suffered a major drought, a complete crop failure and depletion of family food reserves.

Nwoke (1990) reported that the economic liabilities of risks are quite enormous; farmers who produce entirely for household consumption and who do not purchase inputs incur only one risk namely, that the harvest may fail as a result of poor weather condition. Risk poses a serious threat to both farms and agro industries. All risks – physical, market, natural – are associated with negative effects of one form or another. Thus the occurrence of these risks creates pitfalls ranging from reduced agricultural productivity, reduced labour supply, reduced profit margin and/or complete collapse of the farm enterprise among others.

2.4   Risk Attitudes of Farmers

The various types of risk give rise to uncertainty in the mind of the farmers regarding their ability to predict the future. The degree of uncertainty, the consequences of the various possible outcomes and the personality of the individuals will determine how best to behave under the circumstance and what strategies to adopt to minimize the effects of risks.

Most farmers are generally thought to be risk averse. That is, given for example a choice between a certain ₦50, or the equal chance of receiving an uncertain ₦100 or nothing they will always choose the ₦50, and there will be sums of money less than ₦50 which will be chosen in preference to an equal chance of ₦100 or nothing. The implication of this is that a farmer may not aim for the production plan with the highest expected profit if this profit is associated

with a wide range of alternative profit outcomes; he may instead opt for a lower expected profit if this involves a narrower range of profit outcomes (Ritson, 1985). Risk averse decision rules differ from risk neutral choices because of the existence of marginal risk premium, which is the wedge between input cost and expected marginal product at the optimum level of input use (Ramaswami, 1992).

Risk averse farmers are the most cautious risk takers, but they do take some risks. They lose because they miss economic opportunities for profit. Risk neutral farmers understand they must take some chances to get ahead, but recognise that there are degrees of risk in every situation. Before making a decision or taking action they gather information and analyse the odds. They try to be realistic and recognise the risks, and try to reduce risks to acceptable levels. Risk lovers are individuals who enjoy risks as challenging and exciting and look for the chance to take risks. Many farmers may be in this category with respect to their marketing plans. As long as financial survival is not at stake, they may enjoy the adventure of playing the market. Many speculators are in this category. Some close their eyes to risk, ignore facts, and go ahead and commonly fail because they refuse to take precaution (Alabama Agric & Mechanical University, 2003).

Producers' attitude toward risk is very important in input allocation decisions, and hence in output supply (Kumbhakar, 2002). According to Roosen and Hennessy (2002), use of inputs such as pesticides and nitrogen which are known to run off into water supply have been suggested to be causal factor in cancer of the stomach and as such suggested that in crop production, risk averters should use less of nitrogen than risk-neutral producers. Leathers and Quiggin (1991) are also of the view that the risk averse producers will use more of risk-reducing input and less of a risk increasing input than will a risk-neutral producer. However, Chambers and Quiggin (2001) observed that pure-risk effect would push a farmer to use more risk substitutes like pesticides. Ramaswami (1999) in Chambers and Quiggin (2001) also showed that if an input is risk reducing in this sense, and preferences are expected utility preferences exhibiting non-increasing absolute risk aversion, its use will fall as a result of introduction of crop insurance.

A major impediment to the adoption of new production techniques especially high yielding varieties of seeds, chemical fertilizers and pesticides which are primary means of "getting agriculture moving" and raising rural incomes is the well documented risk aversion on the part of rural decision makers in developing countries (Lamb 2003 and Binswanger, 1980).

The adjustment of a farmer's human capital out of agriculture is not always an active decision. Forced adjustment occurs when farm production does not cover the minimal, necessary costs. Without this risk of forced adjustments, or failure, the farmer would simply compare the expected utility of farming with the utility of leaving farming and make the optimal discrete decision to continue. Instead, the risk of failure leads to seemingly inefficient production decisions (Foster and Rausser, 1991). These authors further observed that where there is a difference between on-farm and off-farm returns to a farmer's human capital, under risk of failure, the use of non-cash draining inputs may increase with a decrease in output price. Producers' circumstances such as debt-to-asset ratio, farm size, level of education etc affects his perceptions of risk (USDA, 2003). Risk attitude simply means the way one thinks or feels about and also acts or reacts to risk situations.

2.5   Poverty and Risk Attitudes

A state of mind brought about by poverty reduces one's willingness to undertake risky investment that may offer an escape from poverty (Mosley and Verschoor, 2003). Not only is risk higher in poor rural economies, but poor people are also less able to deal with risk. Apart from localized efforts, they are largely left to their own devices as far as social care is concerned. Low assets also make it difficult to absorb shocks. Poverty is thus not only associated with higher ambivalent risk; it also reduces people's capacity to absorb shock (Fafchamps, 1999). Rosenzweig and Binswanger (1993) show that farmers in more risky areas deviate more from the optimal portfolio of assets, and that this deviation is worse among poorer farmers than wealthier ones. Lamb (2003) noted that poorer farmers are likely more risk averse than wealthy farmers and as such the effects of risk are likely even more important for them.

The idea of vicious circle 'driven' by risk aversion has obvious distributional implications: for if the poor do not invest and the rich do, gains in enterprise income will be restricted to the rich with the implication of growing inequality over time (Weeks, 1972 in Mosley and Verschoor, 2003). According to Mosley and Verschoor (2003), to understand the dynamics of poverty and inequality, there is need to understand attitudes to risk, how they are distributed between individuals and if possible what influences, policy etc. have on those attitudes (Fig I).
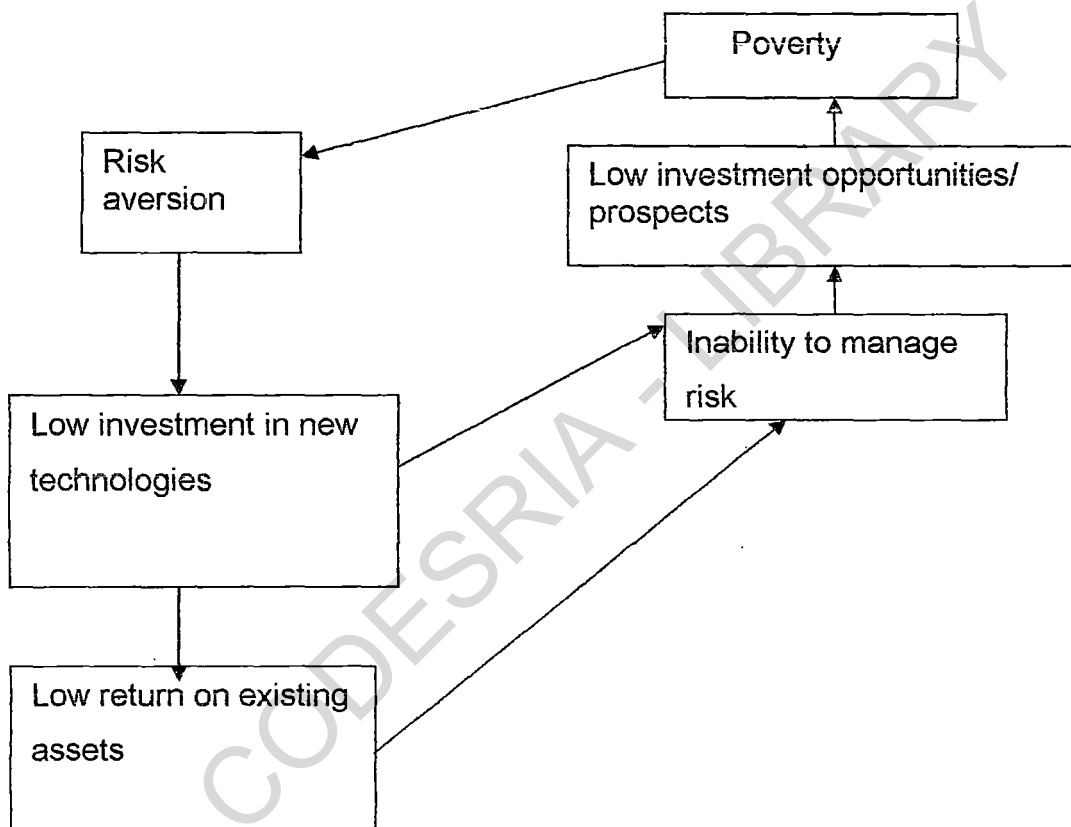
Figure 1: Vicious circles of poverty' based on risk-aversion and inability to manage risk

Source: *Mosley and Verschoor (2003)*

A life history marked by material hardship and defencelessness, marked by finding oneself at the mercy of circumstances, contributes to an outlook in life that Psychologists call an 'external locus of control', which is well-known to hinder predisposition to entrepreneurship (Mosley and Verschoor, 2003). Further, in their research on the relationships between small farmers' income

poverty, their (human, physical and social) capital buffer, and their ability to defend themselves against idiosyncratic shocks, Mosley and Verschoor suggested that the vicious circle of poverty argument should be stated in terms of probabilities: income poor farmers are more likely to be vulnerable in the double sense of being both asset poor and deriving income from sources exposed to a large degree of covariance risk, and would therefore be less likely to take the risks associated with the acquisition of assets.

Lipton (1968) in his essay on 'The Theory of the Optimising Peasant', argued that small farmers, rather than seeking to equalize the value of expected marginal products of factors of production, would practice a 'survival algorithm' – a decision rule which has a high chance of keeping the likelihood of the farm household intact – in the process sacrificing efficiency in resource allocation. The poorer the household, Lipton speculated, the more urgent the need to protect against risk in this way and the higher one's risk 'premium', or the subjective value attached to protection against risk. In support of his view Lipton cites Kalecki (1954) who noted that the poorer one is, the less will be the assets which are available to protect one against catastrophe, and hence the more risk averse one's attitude is likely to be.

Farmers in different financial situations might place different weights on the importance of intra years versus long run periodic risk. Farmers under pressure to meet short-run debt payments might make decisions based primarily on aversion to intra year risk even though this might increase the variance of the long-run periodic return resulting in suboptimal total risk management. On the other hand, farmers with a more secure finance may manage with an eye toward the total risk associated with long run periodic return. Thus the appropriate treatment of risk in a temporal setting depends upon the farmer's specific circumstance (Krautkraemer et al, 1992).

Mosley and Verschoor (2003) were of the view that the idea that risk aversion would increase with the level of poverty was assumed rather than measured and that once measurement began, it exposed the unexpected. In their gamble experiment in rural Uganda, rural Andhra Pradish, India and rural Ethiopia, replicating Biswanger's regressions they found that risk aversion measures are largely unresponsive to income and wealth. According to them

not all poor people are especially risk averse but only those whose life-history is marked by chronic poverty and therefore perceive themselves to be vulnerable and find themselves unable to manage risk.

Also in contradiction of the intuition of Lipton and many others, embodied in Figure 1 that risk aversion would increase with the level of poverty Binswanger (1980; 1981) found that experimentally obtained measures of risk aversion using constant partial risk aversion function are unresponsive to income and wealth. Binswanger inferred that differences in behaviour – in particular, reluctance to invest in modern inputs – were due rather to limitations on credit or on access to modern inputs.

However, when Mosley and Verschoor (2003) employed a design for survival (formally expressed as a violation of the expected utility independence axiom) on the part of asset poor small farmers, their findings were precisely similar to that of Lipton's survival algorithm i.e. asset – poor small farmers avoid prospects in which a probability of failure looms large.

2.6   Risk Aversion Strategies of Poor Rural Farmers

A person's aversion to risk is a key factor in the extent to which he will try to manage his risks (USDA, 2000). Due to the multiple sources of risk, comprehensive strategies that integrate several responses to variability are often necessary for effective risk management. The particular combination used by the individual farmer will depend on the individual's circumstances; type of risk faced, and risk attitudes. Some risk responses act primarily to reduce the chance that an adverse event will occur while other responses have the effect of providing protection against adverse consequences should the unfavourable event occur. Farmers have many different ways to implement this principle risk response (Alabama Agric & Mechanical University, 2003).

Many authors have documented various risk coping strategies. A conceptual summary of such strategies as documented by Fafchamps (1999); Rosenzweig and Shaban (1993) in Lamb (2003); Foster and Rausser (1991); Ritson (1985), Lamb (2003); Olayide and Heady (1982); Adegeye and Dittoh (1985) and USDA (2003) are outlined below.

(i) Selecting and Modifying the Environment: One way poor societies can reduce risk is locating themselves in areas where parasites infestation is low. Patterns of settlement reflect the incidence of particular human and livestock illness. Trypanosomiasis, a livestock disease carried by tsetse fly, makes it difficult if not impossible to keep domestic animals in much of the humid and semi-humid areas of Africa. This undoubtedly contributed to the higher concentration of African livestock in semi-arid areas where livestock could be raised. Increased population density in the former forest zone of Nigeria has led to a reduction in forest cover and to a concomitant decrease of tsetse infestation, hence shifting livestock raising boundaries hundreds of kilometers southward.

The threat imposed by proximity to wildlife can also be tackled directly. Hunting is undertaken not only to collect bush meat but also to get rid of pests. Certain traditional practices, such as burning field vegetation and pastures, can similarly be understood as ways of controlling rodents and snakes. Even when they do not actively campaign to get rid of wildlife, people protect themselves, their crops and animals from it. Farmers often keep their livestock inside house at night for fear of hyenas, and they camp in their fields to chase away birds and monkeys.

(ii) Diversification: Rural inhabitants often seek to minimize their exposure to risk by diversifying their portfolio of income generating activities. In areas with less extreme climatic conditions, for instance, farmers often plant different crops, or several varieties of the same crop to obtain a more stable output. Intercropping is often partially justified by risk considerations as well. Similarly, livestock producers typically combine different species of animals into single herd to take advantage of differences in their resistance to droughts. Herders also split their herds to hedge against spatial differences in rainfall. Farmers also practice mixed farming (combination of crop and livestock) in order to maintain a stable income. Diversification is also achieved by combining farm and non-farm activities within a single household.

(iii) Flexibility: Replanting is a good example of the role of flexibility in coping with risk. Concerns for flexibility explains why rural farmers resist technological innovations that demand a strict respect of planting and

harvesting dates as this reduces their capacity to adjust to external events considering their limited manpower. It also explains why rural farmers keep their cash savings at home instead of in the bank because it is instantly available if needed. In semi arid areas with purely rain fed agriculture where weeding is the most time-consuming agricultural task and crop performance is largely a function of the care and timeliness with which weeding is conducted, weeding however is performed half way through the rainy season, after farmers have gained valuable information about annual rainfall. Shifting resources from one enterprise to another fairly readily is also a form of flexibility.

(iv) Liquidating Productive Assets: For an individual hit by an insurmountable shock, one obvious way to handle the situation is to liquidate productive assets in order to buy food, pay the rent, or take a child to the hospital. However, this is likely to have a negative impact on future earnings. Rosenzweig and Wolpin (1993) in Lamb (2003) show that sales of farm assets such as land, livestock, oxen, bullocks, farm tools, farm buildings, are used to smooth consumption by farmers whose incomes are lowered by a negative production shock. This is also a form of the flexibility principle.

(v) Reducing Consumption to keep Productive Assets: Poor rural farmers often prefer to reduce their consumption rather than liquidating productive assets. Fafchamps et al (1996) in Fafchamps (1999) for instance, show that Burkinabe households hold onto their livestock even at the height of the 1984 Sahelian drought.

(vi) Precautionary Saving: Saving is one way by which households protect themselves against damaging consequences of distress sales of productive assets without having to reduce consumption. In anticipation of future shocks, households may build up reserves in form of food stocks, cash, gold and jewelry and provided a bank is close by, deposits on savings and checking accounts that can be withdrawn in times of need (Lim and Townsend, 1994; Foster and Rosenzweig, 1997 in Fafchamps, 1999).

(vii) Borrowing: Though it is true that asset accumulation can serve to smooth consumption, when faced with a sufficiently long series of bad income and utility shocks, individuals will nevertheless run out of assets and will no longer be able to absorb shocks by liquidating assets. One conceivable way out

of this quandary is to let households' asset position become negative, that is, to let households borrow (Hall, 1978) in Fafchamps (1999). Carol and Fafchamps (1999) have shown, however, that credit constraints are unavoidable if credit contracts are strict, that is, if creditors insist on repayment under any circumstance.

(viii) Risk Sharing: The risk increasing nature of modern inputs exacerbates the effect of risk aversion on production choices. Rosenzweig and Shaban in Lamb (2003) show that farmers use share-tenancy contracts to spread the risk of new seeds when they are first introduced and their cultivation properties are still uncertain.

(ix)   Agricultural Insurance: There are several different types of insurance that will reduce production and financial risks. Formal insurance can be obtained from insurance company to cover many different types of risk, which, could seriously impact on the farm business equity and survival. The common types of insurance available to farmers include life insurance, property insurance, risk crop and livestock insurance. Farmers pay a cost called premium to obtain the indemnity for the insured risk.

Farmers engage in production on contractual basis. They contract for both prices and costs in advance. As a result they may receive a lower return, when averaged over a period of years, but they reduce the uncertainty over the monetary value of their production in the coming year (Adegeye and Dittoh, 1985). They further reported that under price uncertainty, farmers particularly grain producers observe the movement of prices. If prices are likely to rise, they tend to store more of their produce and when prices are likely to fall they store less. Aken-Ova (1988) observed that some farmers even go to the extent of dedicating their farms to 'Echi' or gods for protection from natural hazards and strongly believe that the 'Echi' will improve the yield.

Farmers have many options in managing agricultural risks. They can adjust the enterprise mix (diversify) or the financial structure of the farm (mix of debt and equity capital). In addition, farmers have access to various tools such as insurance and hedging that can help reduce their farm level risks. Indeed, most producers combine the use of many different strategies and tools (USDA, 2003).

2.7   Empirical Measures of Farmers Risk Attitudes

Field investigations have been conducted in the past by researchers aimed at estimating the attitudes of farmers towards risk. A study of the various works indicates the use of different approaches, which include

(1) the interview approach;

(2) the experimental approach;

(3) the observed economic behaviour approach;

(4) multi item scale approach

2.7.1 Interview Approach

This is a direct approach to the measurement and explanation of risk aversion developed by Von Neumann and Morgenstern (1947). In the direct approach the subject is asked to make decisions in reaction to a large number of randomly arranged hypothetical bets and insurance schemes. According to Moscardi and de Janvry (1977) this approach has serious difficulties resulting from the fact that the subjects have different degrees of utility or disutility for gambling (the very method used to reveal their preferences). Moreover, the concepts of probability are by no means intuitively obvious and the method is very time consuming to administer (Lin et al, 1974 in Moscardi & de Janvry, 1977).

Dillon and Scandizzo (1978) used two sets of simple yet reasonably realistic mind experiments involving the choice between risky and sure farm alternatives to assess risk attitudes of sixty six (66) small farm owners and sixty four (64) sharecroppers in North East Brazil. In the first set, the farmer's total income was uncertain but his subsistence need was assured; in the second set, his subsistence requirement was also at risk. The survey involved extensive set of socioeconomic questions to which Dillon and Scandizzo were able to append their risk attitude questions together with a small set of questions regarding yield probabilities, ethical attitudes to gambling, and the use of omens in farm decisions. These questions formed the basis of their empirical analysis and were geared towards finding the certainty equivalents of risky prospects involving stated probabilities. Both types of risky prospects involved only two possible outcomes whose probabilities were specified as invariant frequencies. The pay off of the better outcome in the risky prospect and/or of its alternative sure prospect was progressively changed until the subject expressed indifference between the risky prospect and the sure prospect – at which point the sure prospect is the certainty equivalent of the risky prospect.

Depending on whether the farmer's certainty equivalent is greater than, equal to, or less than the expected value of the risky prospect, each sample farmer was classified as risk preferring, risk neutral or risk averse.

The sample distributions of risk attitude coefficients α, β and γ of the mean standard deviation, mean variance, and exponential utility functions respectively were specified as

(1) $U = E + \alpha V^{1/2}$

(2) $U = E + \beta(E^2 + V)$

(3) $U = \int_{-\infty}^{\infty}(1-e^{\gamma x})(1-e^{\gamma})^{-1}f(x)dx$

If $\gamma \neq o$ and $= E$ otherwise,

Where x is a risky prospect with probability distribution f(x), mean E, and variance v; α, β and γ are risk attitude coefficients.

For all three utility functions, estimation of the farmers risk attitudes was based on solution of the relationship that utility of a risky prospect is equal to utility of its certainty equivalent [the certainty equivalent of a gamble is a certain sum of money such that the decision-maker will be indifferent between the certainty and the gamble (Hill, 1989)]. Their result showed that most but not all peasants were risk averse and that it is possible to elicit meaningful information on peasant attitudes pertinent to rural development through simple but purposive questioning.

In a like manner Torkamani and Rahimi (2001) evaluated farmer's risk attitudes in West Azarbaijan using alternative functional forms. The subjective utility of different levels of income was elicited by a direct elicitation method specifically the Equally Likely certainty Equivalent (ELCE) approach in which the decision-maker was asked to choose between two-state risky prospects with equal probability of 0.5 for each state. The ELCE method avoids bias caused by probability preferences, which could be confronted when using ordinary Von Neumann-Morgenstern model. However, it still has the difficulty that the subject is forced to select between a certain and a lottery.

The models employed are stated as follows:

(1)   Quadratic Utility Function:

This was expressed as:

$$U = a + bM + cM^2 \qquad b>0, \; c<0$$

Where U is utility and M is the monetary measure. The properties of this functional form are (i) when combined with linear profit functions, it generates quadratic expected utility functions that are easily maximized using ordinary programming routines; and (ii) it is easily fitted using Ordinary Least Square (OLS) to utility questionnaire data. The second derivative of the function is 2c.

The absolute risk aversion coefficient for quadratic utility function is:

$$Ra = 2c/(b + 2c \, M)$$

This coefficient rises with an increase in the money measure i.e., an increase in wealth causes an increase in risk aversion, a conclusion which is not very realistic in actual world (Torkamani and Rahimi, 2001). The absolute risk aversion coefficient is simply the ratio of the second to the first derivative of the function.

(2)   Cubic Utility Function:

This was expressed as:

$$U = a + bM + cM^2 + dM^3$$

Where a, b, c, and d are parameters. The second derivative is given by $2c + 6dM$, the sign of which depends on the sign and magnitude of the parameter c, d, and the level of money measure, M. The Arrow-Pratt absolute risk aversion coefficient for cubic utility function is:

$$Ra = -\left\{ (2c + 6dM) \, /(b + 2cM + 3dM^2) \right\}$$

Ra can thus be either positive or negative depending on the parameter values and income (wealth) at which the equation of Ra is evaluated. Increasing and decreasing marginal utility are both possible in cubic utility function.

(3)   Exponential Utility Function:

This was given as:

$$U = a - be^{-\lambda M} \qquad \text{for } a, b, \lambda > 0$$

Where e is the base of natural logarithms. The second derivative of this function is

$-\lambda^2 b e^{-\lambda M} < 0$

Implying a diminishing marginal utility. The Arrow-Pratt absolute risk aversion coefficient, Ra is equal to λ, which is positive and constant (argued as one of its major limitations)

(4)   Expo – Power Utility Function:

This was specified as:

$U = a - \exp(-\beta M^{\alpha}) \quad \alpha \neq 0, \beta \neq 0, \alpha\beta > 0$

The Arrow-Pratt coefficient of absolute risk aversion was given by:

$Ra = \left\{ 1 - \alpha + \alpha\beta M^{\alpha}/M \right\}$

Under its parameter restriction, this function exhibits decreasing absolute risk aversion if $\alpha < 1$, constant absolute risk aversion if $\alpha = 1$, and increasing absolute risk aversion if $\alpha > 1$. Expo – power utility function is a flexible form and does not impose any predetermined risk preference structure on risk attitudes.

After the elicitation of subjective utilities for the twenty respondents in the study, all four functional forms were estimated for each farmer and the related absolute risk aversion coefficients were determined. The results showed that the quadratic utility function classified 15 farmers as risk averse and five farmers as risk preferring at the income mid point. The cubic utility function classified 13 farmers as risk averse and 7 farmers as risk preferring. The exponential and expo-power utility functions classified all farmers as risk averse.

2.7.2 Experimental Approach

Results obtained from the interview method during which hypothetical gambles were presented to respondents have raised a lot of controversy (Fleischer, 1985). To minimize the level of distortion arising from the use of directly elicited utility (DEU) methods, Binswanger (1980) determined risk attitudes of 240 Indian farmers using an experimental gambling approach with

pay offs which at their maximum, exceeded monthly incomes of unskilled labourers.

To obtain unique measures of partial risk aversion associated with the indifference points between two alternatives, Binswanger (1980) used a constant partial risk aversion function of the form

$U = (1 - S)M^{1-s}$

Where U is partial risk aversion utility, M is the certainty equivalent of a new prospect and S is the partial risk aversion coefficient.

In this approach, individuals were to select a preferred game from a set of eight. The games were structured in the mean variance framework with higher expected returns obtainable at the cost of higher variances. The worst possible outcome of any game was a zero gain, and it thus involved gifts to the respondents. The subjects were not confronted with any budget constraint that would rule out their choices. In order to simulate actual decision making, individuals were given long periods for reflection and opportunities for consultation with relatives and friends.

Gambles were played at half rupee, five rupee, fifty rupee levels and a hypothetical game played at five hundred rupee level. The results indicated that at low pay off levels, risk aversion was fairly widely distributed from intermediate levels to risk neutrality. At pay off levels in the neighbourhood of monthly labour incomes or small agricultural investments, risk aversion was highly concentrated at the intermediate and moderate levels (Binswanger, 1980).

Mosley and Verschoor (2003) used the method proposed by Binswanger (1980) in which risk attitudes were derived from observation of actual behaviour under experimental conditions with real money being paid to the subjects of the experiment, if the gambles (involving coloured marbles and coloured bags) made in the laboratory turn out successful. The study was carried out in Uganda, Ethiopia and India. In addition to the lotteries, the participants were asked two hypothetical questions that elicited certainty equivalents.

Using Arrow-Pratt's approximation, Mosley and Verschoor (2003) deduced a measure of risk aversion,?, equal to minus the second divided by

the first order derivative of the utility function by developing Taylor expansion of U(W - ?) and U(W + Z -?) around U(W) and solving for ?

? = (aZ - ?)/?² /2 + aZ² / 2 − a ? Z).

Where U(W) is the concave utility function of wealth, Z is the prize of the lottery, a is the probability of winning the prize and ? the reservation prize. Then risk attitudes were calculated from Willingness to Accept (WTA) questions with the help of the Arrow-Pratt measure of absolute risk aversion, which assumes the validity of expected utility (EU) theory. Given the extent to which EU was violated in their sample, a measure of risk aversion that does not hinge on its validity was preferred. Thus they developed a simple, theory free, intuitively plausible measure of risk aversion based on the number of times participants in their experiment, when given the choice between two lotteries, say they preferred the risky to the safe lottery. Their risk aversion measures took the value of one (1) for participants who preferred risky lotteries least frequently and zero (0) otherwise.

2.7.3 Observed Economic Behaviour Approach

This is an indirect approach to the measurement and explanation of risk aversion introduced as an alternative to the direct approach. The indirect approach is easier to handle empirically than the direct approach and thus makes it possible to manipulate large samples of peasants. The results, however, are fully conditional on how well the model specified describes peasant behaviour (Moscardi and de Janvry, 1977). The method is also costly because it requires gathering of complex information.

Moscardi and de Janvry (1977) used this method to determine the attitudes of forty five (45) farmers in the Puebla region of Mexico. Risk was introduced in a model of safety-first rule proposed by Kataoka (1963). According to this rule, an important motivating force of the decision maker in managing the productive resources that he controls, and in particular, in choosing among technological options is the security of generating returns large enough to cover subsistence needs. They argued that given a production technology, the risk associated with production, and market conditions, the observed level of factor use reveals the underlying degree of risk aversion.

Following Kataoka specification of safety-first rules the starting point is:

Maximize d subject to Pr ($r \leq d$) $\leq \alpha$, where d is the subsistence or disaster net income level, r is the random net income, and α is the accepted probability of disaster.

Moscardi and de Janvry (1977) assumed that α is dependent upon a vector of variables, S, that represent the household's socioeconomic characteristic such that

$\alpha = \alpha$ (S)

By assuming that the mean μ and the standard deviation σ of r were known, a certainty equivalent of the safety-first model was obtained by maximizing the upper bound of the disaster level. Then the model becomes

Max $V(\mu, \sigma) = \mu - \kappa\sigma$ for $\kappa = \kappa$ (s) ....(1)

Where κ is the marginal rate of substitution between expected net income and risk, i.e., the measure of risk aversion.

It was assumed that the randomness of net income derives from yield uncertainty and also that the relationship between inputs (vector X) and yield (Y) was represented by a generalized power production function

$Y = A \prod_i X_i^{fi(x)} e^u$

For a given production function, a given coefficient of variation of yield ($\theta = \sigma y/\mu y$), a given set of factor prices (Pi), and a given product price (P), the preference order (1) was maximized with respect to the input levels. The resulting first order conditions were

$$pfi\frac{E(Y)}{Xi} = \frac{p_i}{1 - \theta k(s)} \quad \text{.. (2)}$$

Where fi is the elasticity of production of the ith input. In equation (2), the left hand side is the expected value of the marginal productivity of the ith input. On the right hand side, the price of the ith input is compounded by a risk factor that is a function of socioeconomic characteristics of the peasant household. In this present study, a set of poverty characteristics of the household will also be included in defining k.

From the model, the value of the risk aversion parameter k was deduced from the observed levels of product and inputs by solving equation (2).

$$k(s) = \frac{1}{\theta}(1 - \frac{PiXi}{Pfi\mu_Y}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(3)$$

Results obtained by Moscardi and de Janvry showed that risk aversion was indeed responsible for substantial differences between the demand for fertilizer without risk and actual demand. According to the study any of the inputs could be used to monitor risk behaviour in a non-iterative method. This is because no mathematical approach can isolate the influence of inputs on risk behaviour when all inputs are entered in the equation. The farmers were classified as either; low risk averse if 0<k <0.4; intermediate risk averse $0.4 \le k \le 1.2$ and high risk averse if $1.2 < k < 2.0$. This model will be employed in the present study in analyzing risk attitudes of the farmers in the study area.

2.7.4 Multi Item Scale Approach

Guttman, Likert, and Thurstone and Chave proposed different multi-item scaling procedures. Likert procedure has performed well with respect to reliability and validity (Pennings and Garcia, 2001). Pennings and Garcia (2001) in addition to Expected Utility framework employed multi-item approach in estimating risk attitudes of 373 Dutch farmers faced with price fluctuation. Farmers were asked to indicate on a Likert scale from −4 ("I strongly disagree") to 4 ("I strongly agree") the extent to which they agreed with the seven items (statements) presented to them. The statements were: "When selling my hogs, I prefer financial certainty to financial uncertainty; I am willing to take higher financial risks in order to realize higher average returns; I like taking financial risks; when selling my hogs I am willing to take higher financial risks in order to realize higher average returns; I like playing it safe; with respect to the conduct of the business, I am risk averse; with respect to the conduct of business, I prefer certainty to uncertainty". The first four items were classified as scale one while the last three made up scale two.

Based on these risk attitude scales, the sample was divided into risk averse farmers and risk seeking farmers. The split was based on the average sum of the score on the items of the two scales. Farmers who had a negative sum score were risk seeking. Farmers who had a positive sum score were risk averse. Farmers who had a sum score of zero were risk neutral.

Their result showed that based on scale 2 classification, more farmers exhibited risk-seeking behaviour than risk averse behaviour while for scale 1 more farmers exhibited risk-averse behaviour than risk-seeking behaviour. We will use this multi-item scale in addition to the observed economic behaviour approach in this study to measure farmers risk aversion coefficient according to their differing poverty or socioeconomic levels.

CHAPTER THREE
METHODOLOGY

3.1   Study Area

The study area is Benue state. The state is located in the middle Belt of Nigeria, approximately between latitudes 6.3^oN to 8.1^oN and longitude 8^oE to 10^oE. The state shares boundary with five states namely Nassarawa to the North, Taraba to the East, Cross River to the South-East, Enugu to the South-West, and Kogi to the West. The South Eastern part of the state also shares boundary with the Republic of Cameroon. She is blessed with two major rivers namely River Benue and river Kastina-Ala (BNARDA, 1998; 2000).

Benue state has a total land area of about 32,866.25 square kilometers. According to the 1991 census, the state has a population of about 2,753, 077 million consisting of 1,368,965 males and 1,384,112 females (NPC, 1991). She is referred to as the 'food basket of the nation' because of the abundance of agricultural resources in the state. About 80.1% of the state's population is estimated to be directly involved in subsistence agriculture. The state is a major producer of food crops such as yam, beniseed, rice, maize and sorghum. She is also the only notable producer of soybeans in the country. Tree crops such as cashew, mango, citrus and coconut also grow well in the state. Other crops she produces are cassava, millet, sweet potatoes and beans. The livestock resources include goats, poultry, sheep and pigs, which are traditionally reared on free range by small holder farmers. The state also has the potentials for fisheries development. Benue state consists of 23 local government area and is broadly divided into three (3) agricultural zones namely A, B and C (BNARDA, 1998) with their component local government areas as follows:

(i)   Zone A: Consisting of Kastina-Ala, Kwande, Ukum, Vandeikya, Ushongo, Konshisha and Logo.

(ii)   Zone B: consisting of Gboko, Gwer, Gwer West, Makurdi, Buruku, Guma and Tarka.

(iii)   Zone C: consisting of Ado, Oju, Agatu, Apa, Obi, Ogbadibo, Ohimini, Otukpo and Okpokwu(see figure 2).

FIGURE 2 MAP OF BENUE STATE SHOWING (23) LOCAL GOVERNMENT COUNCILS
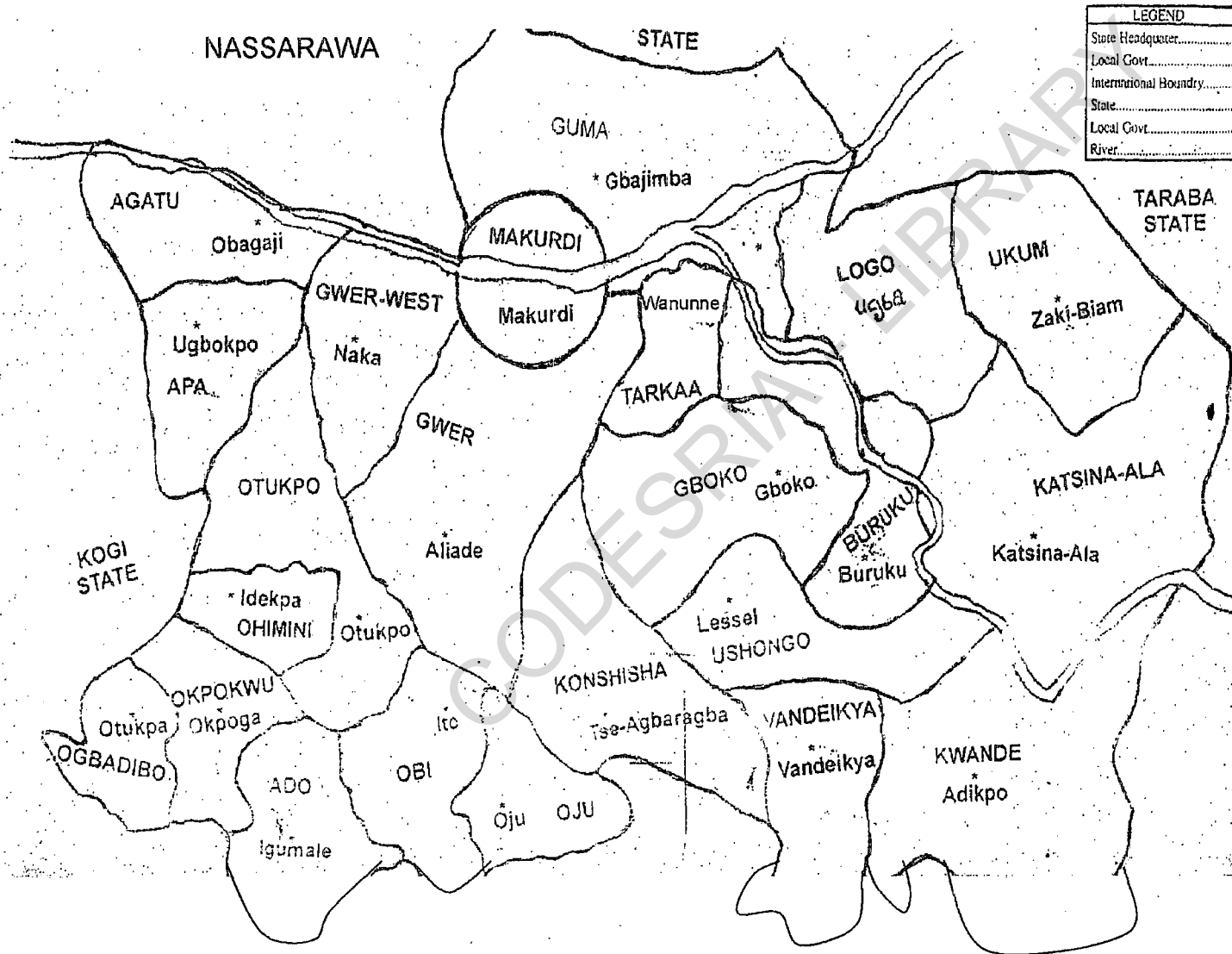
3.2   Sampling Procedure

A multi stage sampling techniques was employed in the selection of the respondents. Firstly, zone B was purposively selected for its predominance in rice-growing. This is because rice-growing is prone to several production and price risks. Then Makurdi and Guma local governments were randomly selected from the zone. Next, a list of the districts in the local government areas was compiled and six districts were randomly selected from each local government. Then ten (10) farm households were randomly selected from each district, to make a total of 120 farmers for the study. The sampling frame was prepared with the assistance of key informants from the districts. Rice enterprise is considered in this study, as the crop that reveals farmers' attitude towards risk because of its response to the fertilizer technology. The distribution of respondents by districts is shown in table 3.1.

Table 3.1: Distribution of Respondents by Districts

L.G.A	District	Number
Makurdi	Mbawa	10
	Agan	10
	Northbank	10
	Ikyoondu	10
	Wailomayo	10
	Ugondo	10
Guma	Mbabawa	10
	Mbabai	10
	Mbadwen	10
	Mbagwen	10
	Abinsi	10
	Sagher	10
Total	12	120

Source: Field Data, 2004

3.3   Data Collection

Data were collected from both primary and secondary sources. The primary source involved the use of semi-structured questionnaire. Data on quantities and prices of rice, input use, outputs, cultivation of other crops, respondents socio-economic characteristics such as level of education, income, farm size, off farm sources of income, sources of farm credit, contact

with extension agents, family size, experience in gambling and poverty characteristics were collected.

The secondary sources were published books, journals and reports.

3.4   Data Analysis

Objectives 3 and 5 were realized using descriptive statistics such as percentages, means, standard deviation and frequencies. The farmers were post-stratified into four poverty groups. The grouping was based on the range of their incomes. Objective 2 was realized using the Foster, Greer and Thorbecke (FGT) poverty measures. Objective 4 was realized using two risk attitude measures namely the safety – first model proposed by Kataoka (1963) and the Likert scale whereby a set of questions were constructed and indexed for analyzing farmer's attitude to production and price risk respectively. Objective 6 was realized using a multiple regression analysis.

Hypotheses 1 and 3 were tested using chi-square distribution while hypotheses 2 and 4 were tested using the F-ratio and t-test respectively.

3.5   Model Specification

3.5.1 Foster-Greer-Thorbecke (FGT) Poverty Measures

Although a large literature on approaches to poverty measurements exists, however, the chosen measure of poverty must be able to capture a range of value judgments on the extent and significance of poverty, at the same time it must be easy to handle and interpret. One set of measure that have been found to be appropriate are those proposed by Foster, Greer, and Thorbecke (1984). The model is specified as:

$$P\alpha = \frac{1}{n}\sum_{i=1}^{q}\left(1-\frac{yi}{z}\right)^{\alpha} \quad \dots\dots\dots\dots 3.1$$

Where P is the poverty index, α is a non-negative parameter, which takes the value 0, 1 and 2 and indicates the head count ratio, the poverty gap and the squared poverty gap respectively. n is total number of farmers; q is the number of poor farm households; z is the poverty line relevant to a given income unit and y_i is the farm household per capita income. In this study $\alpha = 0$ and 1 were considered and they are given as

$$P_0 = \frac{q}{n} \qquad \text{and}$$

$$P_1 = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{Z - y_i}{Z} \right)$$

3.5.2 Estimation of Risk Attitude Coefficient Using the Safety-First Model

A production function of the implicit form

$Y = f(x_1, x_2, \ldots, x_n; U)$ was fitted where

Y = Yield of crop

X's = factor inputs

U = random term

The explicit equation used is a generalized power production function (Cobb-Douglas) and is expressed as

$$Y = aX_1{}^{b1} X_2{}^{b2} X_3{}^{b3} X_4{}^{b4} X_5{}^{b5} X_6{}^{b6} e^u \quad\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2$$

Where

Y = rice yield (kg/ha)

a = intercept of the equation

X_1 = fertilizer (NPK) use (kg/ha)

X_2 = planting material (seeds) in kg/ha

X_3 = farm size (ha)

X_4 = labour (man-days/ha)

X_5 = cost of herbicides/pesticides (₦/ha)

X_6 = cost of equipment (depreciation value ₦/ha)

b's = partial regression coefficient

e = error term

The double log form of Cobb-Douglas function was used in the estimation as evidenced from literature (Moscardi and de Janvry, 1997). The log transformation of equation 3.2 is given as:

$\log Y = a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6$. From equation (3.2) the marginal productivity of input of interest (X_1) i.e. fertilizer (NPK) is derived as $b_1 Y/X_1$.

Any other input could have been used to estimate the risk attitude coefficient. However, for the purpose of this study fertilizer was selected

considering that it is agronomically an important input for increasing rice yield. The elasticity of production of input of fertilizer which is same as its coefficient together with the coefficient of variation of yield, product and factor prices were used to estimate a value of K for each farmer using the relationship:

$$K(s) = \frac{1}{\theta}\left(1 - \frac{PiXi}{Pfi\mu y}\right) \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.3$$

Where

K(s) = risk parameter

θ = coefficient of variation of yield

Pi = factor price (fertilizer price/kg)

Xi = Input level (NPK/ha)

μy = mean yield of rice

fi = elasticity of production of fertilizer input

P = price of output of rice/kg

      The coefficient of variation of yield, θ was calculated from time series data on rice yield from the study area (Appendix 1)

$$\theta = \sigma y / \mu y \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.4$$

where

σy = standard deviation

μy = mean yield

      The input and product prices used were the prevailing market price at the time of survey.

      The farmers were classified into four (4) groups on the basis of the risk parameter k as follows (Moscardi and de Janvry, 1977): risk preferring if k<0, low risk averse if 0<k<0.4, intermediate risk averse if $0.4 \le k \le 1.2$ and high risk averse if 1.2 <k <2.0

3.5.3 Regression Analysis

      A regression analysis was estimated to establish the effect of poverty and other socioeconomic variables on farmer's attitude to yield variability or risk (k). The implicit form of the equation is given as:

K = f(AG, HHS, EDN, OFI, EA, L, SG, HC, DG, BH, DAB, S, P_1, P_2, P_3, U)

Where

K = risk attitude parameter

AG = Farmer's age (in years) $\equiv Z_1$

HHS = Household size $\equiv Z_2$

EDN = Educational level of the farmer (in years) $\equiv Z_3$

OFI = Off farm income (₦) $\equiv Z_4$

EA = Number of contacts with extension agents in the relevant period $\equiv Z_5$

L = Land under control (in ha) $\equiv Z_6$

SG = Membership in a solidarity group (1 for member and 0 otherwise) $\equiv Z_7$

HC = Housing condition score $\equiv Z_8$

DG = Possessing durable assets score $\equiv Z_9$

BH = Bodily health score $\equiv Z_{10}$

DAB = Degree of accessibility to basic amenities $\equiv Z_{11}$

S = Sex $\equiv Z_{12}$

P_1 = Farmers in poverty level 1, else 0 $\equiv Z_{13}$

P_2 = Farmers in poverty level 2, else 0 $\equiv Z_{14}$

P_3 = Farmers in poverty level 3, else 0 $\equiv Z_{15}$

U = random term

A one-stage regression was carried out using three functional forms, namely the double log function, linear function and semi-log function. The explicit equations are:

1. Linear: $K = b_0 + b_1 z_1 + b_2 z_2 + b_3 z_3 + b_4 z_4 + b_5 z_5 + b_6 z_6 + b_7 z_7 + b_8 z_8 + b_9 z_9 + b_{10} z_{10} + b_{11} z_{11} + b_{12} z_{12} + b_{13} z_{13} + b_{14} z_{14} + b_{15} z_{15} + e$

2. Semi-log: $K = b_0 + b_1 \log z_1 + b_2 \log z_2 + b_3 \log z_3 + b_4 \log z_4 + b_5 \log z_5 + b_6 \log z_6 + b_7 \log z_7 + b_8 \log z_8 + b_9 \log z_9 + b_{10} \log z_{10} + b_{11} \log z_{11} + b_{12} \log z_{12} + b_{13} \log z_{13} + b_{14} \log z_{14} + b_{15} \log z_{15} + e$

3. Double log: $\log K = b_0 + b_1 \log z_1 + b_2 \log z_2 + b_3 \log z_3 + b_4 \log z_4 + b_5 \log z_5 + b_6 \log z_6 + b_7 \log z_7 + b_8 \log z_8 + b_9 \log z_9 + b_{10} \log z_{10} + b_{11} \log z_{11} + b_{12} \log z_{12} + b_{13} \log z_{13} + b_{14} \log z_{14} + b_{15} \log z_{15} + e$

Where

b_0 = intercept of the equation

bi's = coefficients of the independent variable

e = error term

CHAPTER FOUR
RESULTS AND DISCUSSION

This chapter is concerned with the presentation and discussion of findings from the study in line with the research problems, objectives and methodology. It is subdivided into six sections namely:

(a) Socioeconomic characteristics of the respondents;

(b) Poverty situation of respondents;

(c) Risk situations and poverty levels of respondents;

(d) Risk management strategies and poverty levels;

(e) Risk attitudes of respondents; and

(f) Risk aversion and poverty levels of respondents

4.1   Socio-Economic Characteristics of the Respondents

Various socio-economic characteristics of the farmers were studied. These included sex of the household head, age, level of formal education of the household head, household size, household per capita income, land holding, types of crops grown, types of livestock reared, non-farm income generating activities, membership in a solidarity group etc. These are discussed successively below.

4.1.1 Sex of Respondents

One hundred and thirteen (113) representing about 94 percent out of 120 respondents were males while 7 (5.83%) were females. The females interviewed for the study were household heads. This result is presented in table 4.1.

Table 4.1:   Distribution of Respondents by Sex

Sex	Frequency	Percentage
Male	113	94.17
Female	7	5.83
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

4.1.2 Age of Respondents

The age distribution of farmers in the study area is shown in table 4.2. The average age of respondents was 43.7 years.

Table 4.2:   Age Distribution of Respondents

Class of Age (Years)	Frequency	Percentage
≤ 15	0	0
16-30	16	13.33
31-45	55	45.83
46-60	40	33.33
>60	9	7.50
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

The table shows that majority of the respondents (45.83%) fell within the age range of 31-45 years. The age range with least (7.5%) respondents is that of above 60 years. The implication of this distribution is that majority of the farmers are adults, only few (13.3%) are youths. This situation is not uncommon in the Nigerian agricultural sector.

4.1.3 Household Size of Respondents

The result of this analysis is presented in table 4.3. The result shows that the mean household size in the area was 7.6. A majority of the respondents (54%) fell within the range of 6-10 household size while the range 21-25 had the least that is two respondents representing 1.67%. About 84 percent of the household had less than 11 members.

Table 4.3   Distribution of Respondents by Household size

Size	Frequency	Percentage
1-5	36	30.0
6-10	65	54.17
11-15	13	10.83
16-20	4	3.33
21-25	2	1.67
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

4.1.4 Educational Level of Respondents

Result shows that the average number of years of schooling was 5.5 years indicating attendance at primary school. This result is presented in table 4.4. A majority of the respondents (42.5%) have not attended any formal educational institution. This portrays a high rate of illiteracy that is prevalent in the farming communities.

Table 4.4   Distribution of Respondents by Level of Formal Education

Years of Schooling	Frequency	Percentage
0	51	42.5
1-6	12	10.0
7-12	44	36.67
13-18	13	10.83
Total	120	100.0

Source: *Field Survey Data, 2004.*

4.1.5 Income of Respondents

Table 4.5 shows the distribution of respondents by household per capita income. The income figures reflect total value of production and off-farm earnings. The mean annual household per capita income was ₦32,491.67. Majority of the households (35.8%) fell within the range of ₦ 20,000 – ₦40,000 per annum while the lowest (0.8%) fell within the range of ₦80,000 and above. About 7 percent earn more than ₦60,000 per annum.

Table 4.5 Distribution of Respondents by Household Per Capita Income

Income (N)	Frequency	Percentage
0 – 20, 000	29	24.17
20,000 – 40,000	43	35.83
40,000 - 60,000	40	33.33
60,000 – 80,000	7	5.83
80,000 – 100,000	1	0.83
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

4.1.6 Landholding of Respondents

Land is one of the vital factors of production in agriculture. It is a measure of ones wealth and has implications for escaping poverty as it proxies household's abilities to respond to economic changes. According to Moscardi and de Janvry (1977), more land makes it possible to spread out risks by cultivating more than one crop or the same crop under different technologies. Also more land often implies different plots at various locations on different kinds of soils and under different climatic conditions. Thus, it is expected that having more land under control permit the farmer to bear higher risks. In this study land holding refers to the total land under the control of the farmer irrespective of the tenurial arrangement (Moscardi and de Janvry, 1977). It includes both fallow and cultivated land under the respondents' control at the time of survey.

The result of the distribution of respondents by landholding is presented in table 4.6. The mean landholding of the respondents was 4.8 hectares.

Table 4.6   Distribution of Respondents by Landholding and Type of Land Tenure.

Size of Holdings (Ha)	1-5	5-9	>9	Total	Percent	mean
Complete ownership	39	25	12	76	63.33	5.56
Complete rent	11	14	0	25	20.83	2.66
Part-owned/Part-rent	13	4	2	19	15.83	4.45
Total	63	43	14	120	100.0	4.78
Percent	52.5	35.83	11.67	100.0		

Source: *Field Survey Data, 2004.*

Majority of the farmers (52.5%) are small scale farmers with land size of less than five hectares. About 63 percent of the respondents completely own their farm land and a greater portion of this land are within the range of 1-5 hectares. About 21% completely rented and 16% partly owned/partly rented their farm land.

4.1.7 Types of Crops Cultivated

Farmers seek to minimize their exposure to risk by diversifying their portfolio of income generating activities. Cultivation of different types of crops is one form of diversification and this ensures a more stable output. Table 4.7 shows the distribution of respondents by types of crops grown.

Table 4.7   Distribution of Respondents by Types of Crops Cultivated

Crops	Frequency	Percentage *
Rice	120	100.0
Maize	102	85.0
Sorghum	84	70.0
Yam	78	65.0
Soybean	38	31.67
Cassava	85	70.83
Others	29	24.17

Source: *Field Survey Data, 2004.*
*   Multiple responses were recorded

The result shows that all the respondents grew rice. This was followed by maize (85%), cassava (70.83%) while the least crops cultivated by respondents and classified under others were groundnut, beniseed, millet and mellon. The distribution shows that most of the farmers are grain producers and the reason may not be far from the fact that in the study area, grains are produced mainly for sale while crops such as cassava and yam are mainly for home consumption.

4.1.8 Fish and Livestock Enterprises of Respondents

The combination of crop and livestock enterprises (mixed farming) is another form of diversification, a risk management strategy that ensures that farmers maintain a stable income. Sale of farm assets such as livestock, bullocks, oxen etc; are used to smooth consumption by farmers whose incomes are lowered by a negative production shock (Lamb, 2003). Thus it is not uncommon for small-scale farmers to engage in both crop and livestock farming.

A majority (75%) of the respondents reared local poultry on a free-range basis. The least enterprise engaged by the respondents was fishery (1.67%) as presented in table 4.8. Whereas rearing of poultry on a free range demands less of the farmer's time, other livestock and fish enterprises require a good portion of the farmers time and this could be the reason for greater involvement in poultry production, more so as livestock production may be secondary to crop production among these farmers.

Table 4.8   Distribution of Respondents by Fish and Livestock Enterprises

Livestock	Frequency	Percentage *
Goat	41	34.17
Pig	13	10.83
Sheep	16	13.33
Poultry	90	75.0
Fishery	2	1.67

Source: *Field Survey Data, 2004.*

*   Multiple responses were recorded

4.1.9 Sources of Farm Capital

Availability and provision of credit facilities are indispensable means of achieving a sustained increase in agricultural output and increased income for the farmers. This is because technical progress requires investment and increased spending on means of production. In an agricultural sector oriented towards subsistence, these expenses can seldom be financed without credit facilities. Therefore, farmer's ability to invest hinges on continued access to credit. Table 4.9 shows the distribution of respondents by source of farm credit.

Table 4.9 Distribution of Respondents by Major Source of Farm Capital.

Source	Number	Percentage
Personal savings	82	68.33
Banks	1	0.83
Money lenders	10	8.33
Cooperatives	7	5.83
Friends/relations	20	16.67
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

A majority of the respondents (68.33%) raised the capital for their farm through personal savings while only one percent sourced farm credit from the bank. The situation shows that banks are yet to extend their loan facilities to small scale farmers on attractive conditions. Hence farmers continued dependence on their meager savings resulting in low productivity which is characteristic of small scale farmers in Nigeria. This result is consistent with the findings of Chukwuji (1991) that 100%, 18.1%, 75.86% and 18.1% of respondents sourced their fund from personal savings, friends/relatives, informal sources and formal sources respectively. It is also consistent with the finding of Obioha (1995) that about 63% of the sampled farmers obtained credit from non-formal sources.

4.1.10 Farm Tools Owned by Respondents

The respondents in the area did not show a different trend from what is well known and documented of farmers in Nigeria with respect to use of crude farm equipment. Table 4.10 shows the distribution of respondents by type of farm tools owned and used.

Table 4.10 Distribution of Respondents by Farm Tools Owned

Farm Tools	Frequency	Percentage *
Matchet	120	100.0
Hoe	120	100.0
Spade/shovel	13	10.83
Head pan	70	58.33
Rake	34	28.33
Sprayer	2	1.67
Sickle	30	25.0
Wheelbarrow	65	57.17

Source: *Field Survey Data, 2004.*

* Multiple responses were recorded.

Matchet and hoe were the most widely used farm tools by the respondents in the area. Only two (1.67%) of the farmers owned sprayer. This shows the poor state of farming technology in the area. The resultant effect of this situation is decreased productivity.

4.1.11 Non-Farm Income Activities of Respondents

In reality, rural dwellers are not only farmers especially in subsistence agriculture. Farmers usually also engage in other secondary economic activities. Engagement in non-farm income activities is known to be a form of risk management strategy as it supplements family farm income, resulting in willingness to invest more in agriculture. The importance of off-farm income as a component of family income increases as farm size becomes smaller, family size larger, and agronomic conditions more marginal. Thus off-farm income boosts the economic status of the farmer giving him a higher capacity to assume risk in agricultural production. The result of the distribution of

respondents by non-farm income generating activities is presented in table 4.11.

Table 4.11 Non-Farm Income Generating Activities of Respondents

Non-farm Activity	Frequency	Percentage
Public service	23	19.17
Trading	26	21.67
Transportation	5	4.17
Artisan/craftwork	12	10.0
Traditional healing	4	3.33
Others	2	1.67
None	48	40.0
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

Analysis shows that 40 percent of the respondents were not engaged in any non-farm income generating activity. However, about 22% engaged in part-time trading, 19.17% were public servants, 10% were artisans, others which included night guards in individual houses and or private establishments were only 1.67%. This implies that 60% of the farmers were engaged in non-farm activities supporting the findings of Moscardi and de Janvry (1977) who reported that 65% of the households sampled earned off-farm income. Generally, the availability of other sources of income reduces the probability of falling into poverty and increases the willingness to bear risk.

4.1.12 Respondents Participation in Insurance Scheme and Gambling

Gambling could be associated with risk behaviours. Gambling (pool, lottery, betting etc) is evidence of an individuals willingness to take risks. Analysis of the data shows that none of the respondents had ever been involved in any form of gambling. On basis of this finding it is tempting to regard the respondents as risk averse, but this conclusion requires an understanding of the socio-cultural perception of gamblers in the area, which is well beyond the scope of this study.

Insurance scheme is a form of institutional risk management strategy. It is capable of reducing risk for farmers if well developed. The study reveals that none of the respondents participated in agricultural insurance scheme. Moreover, only four (4.33%) out of 120 respondents were aware of the scheme. This situation points to the fact that the scheme may not have been well developed as to cover farmers risk thus defeating its aims and objectives.

4.1.13 Membership Of a Solidarity Group

Membership of a solidarity group enhances farmers access to credit and other production inputs such as chemicals, fertilizer, seeds etc. It also enhances access to technological innovation. It also improves the social capital of the farmer for coping with risks. In the study area farmers either belong to cooperatives or other organised farmer groups such as Rice farmers group, yam farmers group, cassava farmers group, etc. Table 4.12 shows the distribution of respondents by membership of a solidarity group.

Table 4.12   Distribution of Respondents by Membership of a Solidarity Group

Membership	Frequency	Percentage
Yes	13	10.83
No	107	89.17
Total	**120**	**100.0**

Source: *Field Survey Data, 2004.*

The analysis shows that only 11% of the respondents were members of a solidarity group. This implies that majority of the farmers will have limited access to farm credit and extension services.

4.2 Poverty Situation of Respondents

The Foster, Greer and Thorbecke model employed in this study for measuring poverty requires the definition of a poverty line. The international poverty line of US$ I per day per person is adopted for this study. This will translate to ₦46,519.2 per annum at the exchange rate of ₦129.22 per dollar (this was the prevailing rate during the period of the survey). Thus, any farm

household whose per capita income per annum falls below ₦46,519.2 is considered poor.

The result shows that the headcount ratio (P_o) is 78.33% implying that about 78 per cent of the respondents in the area were poor. This supports the current USDA (2004) publication that over 70% of Nigerians live below the international income poverty line of US$1 dollar per day while the poverty gap (P_i), that is the mean distance of the income of poor households from the poverty line was 42.5%. This gives approximately ₦19,800 below the poverty line.

The farmers are further classified into four poverty levels on the basis of their income in relation to the poverty line. Those whose income fall below one-third of the poverty line that is, ₦15,506 are considered "very poor"; those whose income fall between 1/3 and 2/3 of the poverty line (₦15,506 - ₦31,013) are termed "moderately poor", those whose income fall between 2/3 of the poverty line and the poverty line (₦31, 013- ₦46,519) are considered as "poor". Those whose income is greater than the poverty line are considered as a "non-poor". The result of the classification is presented in table 4.13.

Table 4.13: Distribution of Respondents by Poverty Levels

Poverty level	Frequency	Percentage
Very poor	17	14.17
Moderately poor	43	35.83
Poor	34	28.33
Non-poor	26	21.67
Total	120	100.0

Source: Field Survey Data, 2004

A greater percentage (35.83%) of the respondent fell into the moderately poor class. However, the non poor constitute 22% of the sample, implying that 78% are poor. In this study, an attempt is further made to relate poverty levels to the socio-economic characteristics of the respondents.

4.2.1a Poverty and Socioeconomic Characteristics of Respondents.

The results are presented in table 4.14a. Looking at the gender dimension, poverty incidence in male-headed households was 79.6 percent while in female-headed households it was 57.1 percent. This supports the findings of Olaniyan (2000) that poverty remained more prevalent among male-headed households probably because they contain more persons on the average than the female-headed households.

The mean age of very poor, moderately poor, poor and non-poor respondents were 46.7, 46, 42.7; and 39 years respectively. This implies that poverty level increases with increase in age, that is, older farmers are poorer than younger ones. This is consistent with the findings of FOS (1999) that there was a consistent pattern of rise in poverty with age of household head over a four-year household survey. This may be explained by the fact that younger household heads have smaller families while older heads might be expected to have larger families. Moreover, educational level of older heads may be lower than the younger heads and their work experience and skills may be inappropriate for the demands of a changing economy thereby reducing their opportunities for non-farm income generation.

Table 4.14a shows that poverty level reduces with increased in the number of years of schooling of household head. Thus the mean years of schooling for the very poor, moderately poor, poor and non-poor were 2.65, 4.07, 7.15 and 7.65 years respectively. This finding is consistent with that of FOS (1999) and Olaniyan (2000) that the level of education of the head of household has a significant influence on the probability of that household being poor. The more educated the household head, the greater the chances of wage employment and the lesser the probability of being poor. Thus improving the level of literacy is a key to poverty reduction, as it enables the beneficiary to participate more effectively in the modern economy.

Table 4.14a Distribution of Respondents by Poverty Levels and Socioeconomic Characteristics.

Variables	Class	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent
Gender	Male	17	40	33	23	113	94.17
	Female	0	3	1	3	7	5. 83
	Total	**17**	**43**	**34**	**26**	**120**	**100.0**
Age	16-20	0	6	4	6	16	13.33
	31-45	8	14	19	14	55	45.83
	46-60	7	18	9	6	40	33.33
	> 60	2	5	2	0	9	7.50
	Total	**17**	**43**	**34**	**26**	**120**	**100.0**
	Mean	46.65	46.02	42.7	39.12	43.7	
Educational Level	0	11	24	10	6	51	42.5
	1-6	2	3	4	3	12	10.0
	7-12	3	12	15	14	44	36.67
	13-18	1	4	5	3	13	10.83
	Total	**17**	**43**	**34**	**26**	**120**	**100.0**
	Mean	2:65	4.07	7.15	7.65	5.5	
Variables	Class	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent
Household size	1-5	1	6	10	19	36	30.0
	6-10	11	26	21	7	65	54.17
	11-15	1	9	3	0	13	10.83
	16-20	3	1	0	0	4	3.33
	21-25	1	1	0	0	2	1.67
	Total	**17**	**43**	**34**	**26**	**120**	**100.0**
	Mean	11.0	9.09	7.0	4.92	7.6	
Landholding	1-5	6	19	21	17	63	63.33
	5-9	7	17	11	8	43	83.83
	≥9	4	7	2	1	14	15.83
	Total	**17**	**43**	**34**	**26**	**120**	**100.0**
	Mean	5.74	5.38	4.28	3.81	4.78	
Durable Assets	0	0	3	0	2	5	4.17
	1-2	13	29	25	18	85	70.83
	3-4	3	9	6	4	22	18.83
	5-6	1	1	2	1	5	4.17
	7-8	0	1	1	1	3	2.5
	9-10	0	0	0	0	0	0
Total		**17**	**43**	**34**	**26**	**120**	**100.0**
Mean		2.0	1.91	2.06	2.08	2.01	

Source: *Field Survey Data, 2004*

In the rural areas where there is greater need for labour at family farms, the size of the household might be an asset as the household then relies on its members to supply the labour required on the farms. However, table 4.14a shows that poverty levels increased with an increase in household size. For the very poor, moderately poor, poor and non-poor, the mean household sizes were 11,9,7 and 5 respectively. This supports the findings of Olaniyan (2000) that household size is positively related to the chance of falling into poverty. This shows the quality of the household members; either many of them are not working or they are being remunerated poorly which in the totality leads to a reduction in the per capita income. Although land is a form of physical asset and as such ownership of land is expected to reduce the probability of being poor among rural farm households, however in this study poverty was found to increase as land holding increases. This could be explained by the fact that landholding in this study includes the total land under a farmer's control irrespective of the type of tenure.

Ten durable assets were presented to the respondents namely colour television, electric iron, telephone, video recorder, radio, refrigerator, car or van, motor bike, gas or electric cooker and wall clock. Result shows that the average number of durable assets possessed by the respondents was 2. About 71% of the respondents possessed assets between the range of 1-2, 4.17% possessed none of assets while no respondent possessed up to 9 items (table 4.14a). The situation depicts the poor state of the respondents. There is essentially no difference in the mean number of assets possessed by respondents in different categories. The incomes used in categorizing the poor did not include information about their wealth.

4.2.1b Poverty and Infrastructural Facilities of Respondents

The results are presented in table 4.14b. With respect to the type of dwelling place, majority of the respondents (51.67%) live in thatched mud houses while only about 19% live in cement houses. Although mud house popularly known as round hut is seen as a cultural dwelling type in the study area, however, it depicts lack of civilization and poverty. This is because the quality of dwelling place is often taken as an indicator of the economic status of

the owner/occupier of the dwelling (FOS, 1996). Table 4.14b shows that majority of the respondents that live in concrete houses are the non-poor while only 2 households belonging to the very poor live in concrete houses. Thus, the higher the poverty level, the less the probability of living in modern accommodation.

Table 4.14b Distribution of Respondents by Poverty Levels and Infrastructural Facilities.

Variables	Class	Very Poor	Moderately Poor	Poor	Non-Poor	Total
Types of Dwelling Place						
Thatched mud house	7	29	15	11	62	51.67
Mud house with zinc	8	9	12	6	35	29.17
Concrete/cement house	2	5	7	9	23	19.17
Total	17	43	34	26	120	100.0
Source of Drinking Water	0	1	1	3	4	3.33
Pipe-borne water	7	16	7	1	32	26.67
River	10	26	26	22	84	70.0
Well/bore hole						
Total	17	43	34	26	120	100.0
Toilet Facilities						
Flush/water system	0	1	2	7	10	8.33
Pit	6	15	18	12	51	42.5
Bush/no toilet	11	27	14	7	59	49.17
Total	17	43	34	26	120	100.0
Source of Light						
Electricity	1	2	5	10	18	18.15
Lantern	16	41	29	16	102	85.0
Total	17	43	34	26	120	100.0

Source: *Field Survey Data, 2004*

Poor quality housing, water and sanitation services not only indicate poor living conditions but also help to perpetuate poverty. Access to portable water affects the overall well being of households, as well as their status. Table 4.14b shows that majority of the respondents (96.7%) depend on unprotected sources of water such as rivers, well and boreholes. Only 3.3% had access to pipe borne water and 75% of the respondents that had access to pipe borne water are non-poor while none from the very poor had access.

Table 4.14b shows that most households in the area had no safe or sanitary toilets. More than 49% of the respondents had no toilets, 42.5% had pit toilet while only 8.33% had flush or water system. Seventy percent of those that had flush are non-poor. None from the very poor had flush toilet.

Access to electricity is a measure of the level of development all over the world. There is usually a positive association between the level of industrial development and the amount of electricity consumed. Furthermore, access to certain communication media through which important information can be obtained like the television, is a function of the availability of electricity. Table 4.14b shows that only 15% of the households interviewed had access to electricity, while 85% had no access and as such made use of lantern. About 56% of those whose major source of light is electricity belong to the non-poor class while only 6% belong to the very poor class.

4.2.2 Degree of Accessibility to Basic Amenities

The respondents were presented with some basic amenities and were asked to score their degree of accessibility to each item. Table 4.15 shows the result of this analysis.

Table 4.15: Distribution of Respondents by Degree of Accessibility to Basic Amenities

Amenity	Very Accessible 5	Accessible 4	Moderately Accessible 3	Less Accessible 2	Not accessible 1	Total	Mean	S.D
Potable/Safe Water	0	12	57	44	7	120	2.62	0.75
Good health services	2	15	51	45	7	120	2.67	0.83
Electricity	0	9	9	0	102	120	1.38	0.92
Education	2	19	69	29	1	120	2.93	0.71
Good sanitary facilities	0	9	39	60	12	120	2.38	0.77
Good road	9	31	16	21	43	120	2.52	1.40

Source: *Field Survey Data, 2004.*

Result shows that the mean score for potable water was 2.62 implying moderate accessibility. Good health services, education, motorable road were scored 2.67, 2.93 and 2.52 respectively indicating also moderate accessibility. The mean score for good sanitary facilities was 2.38 implying that it was less accessible while that of electricity was 1.38 implying that it was not accessible. When the basic amenities are considered as a composite variable, the mean score was 2.41 and this shows that the amenities were only less accessible to the respondents.

4.2.1 Respondents Own Perception of their Body Health

Health is both a goal of development and a means to achieve the related goals of higher labour productivity and total economic output. Fusco (2003) in constructing a multidimensional deprivation index and the functionings index in Europe used bodily health as one of the dimensions of well being. The dimension, health relied on two indicators, one objective that is, the presence or not of a chronic physical or mental health problem, illness or disability, and one about the person's own perception of his/her health which

were weighted and aggregated to construct the indexes. Scores 1-5 were assigned to degree of perception from very bad to very good. This is employed to describe the health condition of respondents in this study.

The result is presented in table 4.16. The average body health perception of respondents in the study area was 3.48 implying that farmers perceive their health condition to be fair on the basis of the scale used.

Table 4.16: Distribution of Respondents by Own Perception of Body Health

Perception	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent
Very bad (1)	0	0	0	0	0	0
Bad (2)	2	0	0	0	2	1.67
Fair (3)	8	23	20	12	63	52.5
Good (4)	7	19	13	11	50	41.67
Very good (5)	0	1	1	3	5	4.17
Total	17	43	34	26	120	100.0

Source: Field Survey Data, 2004.

Majority of the respondents (52.5%) perceived their health condition to be fair while no respondent perceived his/her health condition to be very bad. Sixty percent of those who perceived their health to be very good are the non-poor whereas none of the very poor perceived his or her's to be very good.

4.2.4 Occupancy Density Per Room

This is a measure of crowding in households. Crowding index is thus defined as the number of persons per room, that is, household size divided by number of rooms without kitchen. FOS (1996) and Fusco (2003) used this as welfare indicator. Table 4.17 shows the distribution of households by crowding index.

Table 4.17: **Distribution of Households by Occupancy Density**

Number of Persons Per Room	] 0,l]	] l,2]	] 2,3]	] 3,4]	>4	Total
Score	5	4	3	2	1	
Frequency	10	75	25	8	2	120
Percentage	8.33	62.5	20.83	6.67	1.67	100.0

Source: Field Survey Data, 2004.

Majority of the households (62.5%) fell within the range of 1-2 persons per room while only two households (1.67%) had more than four persons per room. The picture here depicts a good housing condition and could be attributed to the nature of dwelling houses that is, mainly thatched mud house in the area which is less costly to erect.

From the foregoing, the study showed that the households on average contained about 7.6 persons, with annual per capita income of N32, 491 and had a total land holding of 4.8 hectares. The household head was about 44years and had spent about 5.5 years in school. The respondents cultivated several types of crops such as rice, maize, sorghum etc and reared livestock such as poultry, goat, sheep etc as well as engaged in fishing. Their major source of farm credit was personal savings and they used mainly crude farm tools.

Respondents' also engaged in non-farm income generating activities such as trading, public service, craftwork etc while 40% did not engaged in any non-farm income activities. About 11% of respondents were members of cooperatives or farmer group. None of the respondents took policy with any agricultural insurance scheme.

Using the one-dollar per day poverty line, about 78% of the respondents were poor. The depth of poverty in the area was 42.5% and this gives approximately N19,800 below the poverty line (N46,519.2) per annum. Poverty levels were found to be related to the socioeconomic characteristics of respondents such as sex, household size, age, education, landholding etc.

4.3 Risk Situations and Poverty Levels of Respondents

Various risk situations faced by farmers in the area include changes in crop yield/livestock production; changes in crop/livestock prices; changes in technology; changes in credit availability; changes in land rents; changes in cost of inputs; sickness/health problems; labour availability/scarcity; changes in weather; pest/disease incidence and flood. Table 4.18 shows the distribution.

Table 4.18:   Distribution of Respondents by Type of Risk and Poverty Level

Type of Risk	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent
Crop yield/livestock	2	5	7	6	20	16.67
Crop/livestock	1	2	3	4	10	8.33
prices	1	1	1	2	5	4.17
Technology	3	4	4	3	14	11.67
Credit availability	1	4	3	2	10	8.33
Land rents	2	5	3	1	11	9.17
Cost of inputs	0	2	1	0	3	2.5
Sickness/health problems	2	6	2	1	11	9.17
Labour availability/scarcity	2	7	5	4	18	15.0
Weather	1	4	3	2	10	8.33
Pest/disease incidence	2	3	2	1	8	6.67
Flood						
Total	**17**	**43**	**34**	**26**	**120**	**100.0**

Source: *Field Survey Data, 2004*

The result shows that a greater number of the respondents (16.67%) indicated that changes in crop yield/livestock production is the major type of risk they faced. This was followed by changes in weather (15%) while the least type of risk faced was sickness/health problems (2.5%). This further confirms

the result on respondents own perception of their body health. The study tried to find out if risk situation faced by farmers were dependent on their poverty levels. The x^2 calculated, 13.445 was found to be less than the x^2 critical value, 43.8 at 0.05 probability level. This led to the acceptance of the null hypothesis that risk situation faced by farmers are independent of their poverty levels. Thus the situation/degree of poverty does not predispose respondents to particular risks.

4.4 Risk Management Strategies and Poverty Levels of Respondents

Farmers usually employ combinations of risk management strategies when faced with risk situations. The risk aversion strategies employed by farmers in the area are presented in table 4.19 according to their poverty levels. The strategies include: combination of different crops/livestock; combination of crop and livestock enterprises; replanting of crops; use of improved varieties/breeds; use of pesticides/herbicides; borrowing of money from friends, credit groups, banks etc; construction of gutter to drain flood; spreading sales/harvest over different periods; contracting for prices of inputs and outputs before time; engaging in non-farm income sources. Others include saving money, hiring labour, use of exchange labour, involvement of all family members in farm work and going to hospital when sick.

Table 4.19: Distribution of Respondents by Risk Management Strategy & Poverty Levels

Risk Management Strategy	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent
Combination of different crops/livestock	1	6	6	4	17	14.17
Combination of the crop/livestock enterprise	0	3	5	2	10	8.33
Replanting of crops	1	5	3	0	9	7.5
Use of improved varieties/breeds	2	4	2	5	13	10.83
Use of pesticides/herbicides	1	4	4	2	11	9.17
Borrowing money	4	2	2	3	11	9.17
Construction of gutters against flood	2	3	1	2	8	6.67
	0	4	2	2	8	6.67
Spreading sales/harvest	0	3	4	1	8	6.67
Contracting for prices of inputs/outputs	3	5	2	3	13	10.83
Engaging in non farm income sources	3	4	3	2	12	10.0
Others						
Total	**17**	**43**	**34**	**26**	**120**	**100.0**

Source: *Field Survey Data, 2004*

Analysis shows that combination of different crops/livestock was employed by a greater percentage (14.17%) of the respondents more than other strategies. This was followed by use of improved varieties/breeds and engagement in non-farm income sources (10.8%). Chi-square result showed that the relationship between risk management strategy and poverty level was not statistically significant i.e. x^2 calculated (24.376) $<x^2$ tabulated value (43.8) at 5% level. Thus risk management strategy is independent of the poverty level and therefore the null hypothesis was accepted. This may be explained by the simple reason that combination of risk management strategies employed by a farmer depends on his circumstance; type of risk faced and risk attitudes (USDA, 2003).

4.5 Risk Attitudes of Respondents

The study employed two measures for estimating farmers attitudes

towards risk. Likert scale was used to determine farmers attitudes towards price risk while the safety first model was used to estimate farmers attitude towards production/yield risk (or variability).
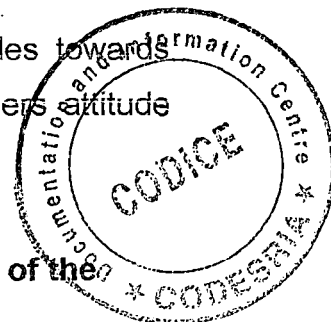
4.5.1 Classification of Respondents Based on the Sum Scores of the Risk Attitude Scale

Seven items (statements), which were divided into scale 1 and 2, were presented to the farmers and they were asked to indicate on a Likert scale from − 4 ("I strongly disagree") to 4("I strongly agree") the extent to which they agree with the items. The items were: When selling my rice, I prefer financial certainty to financial uncertainty; I am willing to take higher financial risks in order to realize higher average returns; I like taking financial risks; When selling my rice, I am willing to take higher financial risks in order to realize higher average returns; I like "playing it safe"; With respect to the conduct of business, I am risk averse; With respect to the conduct of business, I prefer certainty to uncertainty. Based on the average sum of the score on the items of the two scales, farmers were classified as risk averse if the sum score is positive, risk neutral if the sum score is zero and risk seeking if the sum score is negative. The results of the two scales are presented on table 4.20 and 4.21.

Table 4.20: Scale I Classification of Respondents into Risk Aversion Classes

Poverty levels	Risk averse	Risk neutral	Risk seeking	Total	Mean
Very poor	17(100%)	0(%)	0(0%)	17	6.35
Moderately poor	41(95.3%)	0(0%)	2(4.7%)	43	5.07
Poor	31(91.2%)	1(2.9%)	2(5.9%)	34	5.29
Non-poor	15(57.7%)	1(3.8%)	10(38.5%)	26	5.96
Total	104(86.7%)	2(1.67%)	14(11.67%)	120	5.08

Source: *Field Survey Data, 2004*

About 87% of the respondents were risk averse based on scale I classification; 1.67% were risk neutral while 11.67% were risk seeking. All the very poor were risk averse, 95.3% of the moderately poor were risk averse, none was risk neutral while 4.7% were risk seeking. For the poor class, 91.2% were risk averse, 2.9% was risk neutral while 5.9% were risk seeking. About

58% of the non-poor were risk averse, 3.8% were risk neutral while 38.5% were risk seeking (table 4.20). The mean risk attitude score of respondents was 5.08. The positive sign of the mean score implies that the respondents were risk averse on the average based on scale I classification. This is consistent with the findings of Pennings and Garcia (2001) that 62% of the respondents in their study were risk averse, 6% were risk neutral and 32% were risk seeking.

Based on scale 2 classification as shown in table 4.21, all the farmers were risk averse. This is inconsistent with Pennings and Gorcia (2001) whose findings showed that 43% of respondents were risk averse, 52% were risk seeking and 5% were risk neutral.

Table 4.21: Scale 2 Classification of Respondents into Risk Aversion Classes

Poverty levels	Risk averse	Risk neutral	Risk seeking	Total	Mean
Very poor	17(100%)	0(0%)	0(0%)	17	5.65
Moderately poor	43(100%)	0(0%)	0(0%)	43	6.56
Poor	34(100%)	0(0%)	0(0%)	34	5.59
Non-poor	26(100%)	0(0%)	0(0%)	26	5.81
Total	**120(100%)**	**0(0%)**	**0(0%)**	**120**	**5.99**

Source: *Field Survey Data, 2001*

4.5.2 Estimation of Farmers Risk Attitude towards Yield Variability

The estimation of the risk attitude coefficients, K, required estimation of production function for the study area. The parameters of the generalized production function were estimated using the double log function. The regression results are presented on table 4.22. The adjusted R^2 was 0.316.

Table 4.22: Estimates of the Production Function

Variables in Log	Coefficients	Standard Error	t-value
X_1 = Fertilizer use	0.170	0.129	1.310
X_2 = Planting Materials	-1.900	0.643*	-2.953
X_3 = Farm Size	-0.757	0.534	-1.418
X_4 = Labour	2.272	0.522*	4.349
X_5 = Cost of Herbicides	0.358	0.081*	4.398
X_6 = Cost of Equipments	0.769	0.309*	2.484
Intercept	-1.384	1.688	-0.820
R^2	0.351		
F	10.172		

Note * = Significant at 5% level.

Source: Calculations from field survey data, 2004.

The data used in the estimation of the production function is presented in appendix II. The derived marginal productivity of fertilizer (x_i), together with the coefficient of variation of output θ, (used as a proxy for yield) and the product (P) and factor (P_i) prices for 2003 provided a value of k for each farmer using the safety first model given as:

$$K = \frac{1}{\theta} \left(1 - \frac{P_i x_i}{p f_i \mu y} \right)$$

θ was derived from the time series data on rice production in the study area presented in appendix I. Average factor (fertilizer) and product (rice) prices and mean yield (μy) were computed from field survey data and presented in appendix IV. The computed risk parameters, k, are presented in appendix III.

The respondents were classified into four risk aversion groups based on the value of the risk parameter K as follows:

$K < 0$	=	Risk preferring
$0 < K < 0.4$	=	Low risk aversion
$0.4 \leq K \leq 1.2$	=	Intermediate risk aversion
$1.2 < K < 2.0$	=	High risk aversion

The result of the distribution of respondents by risk aversion class and poverty levels is presented in table 4.23. The result shows a distribution of risk

aversion highly skewed towards the risk averters and centered on 1.44. About 99% of the respondents were risk averse. This result is close to that of Moscardi and de Janvry (1977) following the indirect method as well as that of Scandizzo and Dillon (1978) for subsistence peasants in North East Brazil but following the direct approach of Von Neumann and Morgenstern (1947).

Table 4.23 shows there were varying degrees of risk aversion. While majority (71.67%) showed high risk aversion, only 0.83% showed risk preference and no respondent showed risk neutrality (k=0).

Table 4.23: Distribution of Respondents by Risk Aversion Groups and Poverty Levels

	Very Poor	Moderately Poor	Poor	Non-Poor	Total	Percent	Mean risk coeffi cient
Risk Neutrality	0	0	0	0	0	0	0
Risk Preferring	0	1	0	0	1	0.83	-0.11
Low risk aversion	0	2	0	2	2	1.67	0.14
Intermediate risk aversion	4	3	12	12	31	25.83	0.94
High risk aversion	13	37	22	14	86	71.67	1.67
Total	17	43	34	26	120	100.0	
Mean risk coefficient	1.50	1.51	1.40	1.32	1.44		
Standard deviation	0.30	0.44	0.40	0.38			

Source: Field Survey Data, 2004

Although the distribution shows that risk aversion increases as poverty level increases, the result of the F-test shows that there is no significant difference between the mean risk aversion coefficients of farmers with differing poverty levels. The F-calculated value, 0.185 was less than F critical value, 2.69 at 0.05 probability level thus leading to the acceptance of the null hypothesis. This implies that the differences in the mean risk aversion coefficient observed for farmers with differing poverty levels could therefore be attributed to chance or sampling error.

4.5.3 Determinants of Risk Attitudes

In order to determine the effect of poverty and other socioeconomic variables on farmers attitude towards risk in the area, a regression analysis was run. Of the three functional forms tried, the semi log model was chosen on the basis of the value of R^2, F-value and conformity of the parameter estimates with a prior expectations.

Results of the analysis showed that R square was 0.386. This implied that 39% of the variation in Y (risk attitude) was explained by the independent variables. Adjusted R square was 0.297 (30%) and standard error of estimate was 0.15139. F-test was significant at 0.05 probability level thus the null hypothesis that poverty and socioeconomic variables have no effect on risk attitudes was rejected. The result of the regression analysis is presented in table 4.24.

Table 4.24: Determinants of Risk Attitudes using one Stage Regression Analysis

Independent variables	Regression coefficients	Standard Error	T-value
Z_1 = Age	-2.89E-03*	.002	-1.905
Z_2 = Household size	-1.88E-02**	.005	-3.818
Z_3 = Educational level	-7.71E-03**	.004	-2.004
Z_4 = Off farm income	3.876E-07	.000	1.120
Z_5 = Extension contact	-1.89E-02**	.010	-1.917
Z_6 = Land under control	4.511E-03	.005	.878
Z_7 = Membership of solidarity group	.164*	.099	1.647
Z_8 = Housing condition	-9.68E-03	.019	-0.507
Z_9 = Durable Asset	9.66E-02	.127	-7.61
Z_{10} = Bodily Health	-5.05E-02	.038	-1.331
Z_{11} = Degree of accessibility to Basic amenities	-3.76e-02	.032	-1.157
Z_{12} = Sex	-2.19E-02	.070	-.313
Z_{13} = Poverty level 1	.148**	.059	2.501
Z_{14} = Poverty level 2	.107**	.047	2.288
Z_{15}= Poverty level 3	4.161E-02	.041	1.009
Intercept	.550**	.149	3.698
R^2	.386		
Adjusted R^2	.279		
F	4.320**		

Note:
** = Significant at 5%
* = Significant at 10%
Source: *Calculations from field survey Data; 2004.*

From table 4.24, household size, educational level, extension contact, poverty levels 1 and 2 were significant at 5% level; age and membership of a solidarity group were significant at 10% level. As a result the null hypothesis that poverty and socioeconomic characteristics of farmers have no significant effect on their risk attitudes was rejected. With respect to age of the respondents, there are usually no a priori signs for the coefficients due to the competing hypothesis regarding its effect on risk attitudes, i.e. it could be positive or negative (Shahabuddin et al, 1986). In this study, age was found to be inversely related to risk attitude and statistically significant at 10% level of probability. This implies that the higher the age of the farmer, the less risk averse he will be. This agrees with the findings of Shahabuddin et al (1986) who observed that the age variable was negatively related to risk attitudes in 7 out of 8 equations and as such concluded that the variable may have also reflected the age of the family members, and hence the quality of effective labour supply. It also supports the findings of Binswanger (1980) who found out that older people having dealt much more in risky economic games at high stakes might be more willing to take risks at high levels than young people. Age may also be indexing for the wealth status of the household and accumulation of social capital. Older farmers are more likely to have accumulated more wealth than younger farmers. Moreover older farmers are more likely to have greater social capital and networks, which serve as some form of traditional insurance or fall-back strategies in the process of decision making. The mean age of farmers in the study area was found to be 43.7 years.

Household size was a significant determinant of risk attitude. There are two opposing interpretations as to the nature of the relationship between household size and risk attitude. The larger the household size, the greater will be the total consumption needs of the farm family and thus, the less willingness to bear risk. However, to the extent that larger household size also augments the total labour supply of the farm household and thereby enhances its income generating potentials, the effect of a larger household size on risk attitude may be neutralised. This study shows a negative relationship between household size and risk attitude coefficient. This implies that majority of the households

contribute to household income by supplementing its labour supply especially during peak periods of labour requirement such as harvest and weeding period. This result is consistent with the findings of Moscardi and de Janvry (1977). The average household size in the area was 7.6 members.·

Extension contact was also identified as a significant determinant of risk attitude. Extension contact is inversely related to risk attitudes. The implication of this result is that the more extension agents have useful contacts with farmers, the less risk averse the farmers will be. This is because extension education enhances farmers access to technological learning and improved production inputs that will lead to increased productivity. Thus farmers deprived of access to extension services are prone to being more risk averse.

Membership of a solidarity group was equally found to be a significant determinant of risk attitudes. This variable is expected to have positive impact on the risk bearing ability of farmers because it enhances farmers access to credit, other production inputs such as fertilizer, chemicals and improved seeds as well as reduces production cost. This expected relationship is however, dependent on the motive with which the farmers joined the group. If farmers join the group with the motive of following the technological package introduced by extension agents then there will be a relationship. The result here shows that membership of a solidarity group had a positive relationship with risk attitudes coefficient implying that members exhibit more risk averse behaviour than non-members. This unexpected sign may be attributed to the weakness of the cooperative systems and farmer groups in absorbing members risk in agricultural production. In Nigeria, the cooperative societies and farmer groups are not well organised such that farmers can transfer their individual risks to them. Farmer groups are not organised, and lack recognition from the government. Also, co-operative societies are weak; often lack patronage from the members thereby leading to its instability and mortality. Under these conditions the farmers risk-bearing ability in these groups is further threatened.

Average number of years of schooling in the area was 5.5 years. Table 4.24 shows that education had an inverse relationship with risk attitude coefficient and was statistically significant. The result conforms to the a priori expectation that the more educated respondents will be more willing to bear

risk than the less educated ones. This is consistent with the findings of Binswanger (1980) who observed that at low game levels education variable had little influence on risk aversion, but at higher game levels, it generally reduced the level of risk aversion and was often statistically significant. The result also agrees with that of Moscardi and de Janvry (1977) whose findings show that schooling had a positive impact on risk taking though this impact was of no great importance due to the low average level of education (2.4 years) in the area.

Two of the variables indicating the degrees of poverty, namely poverty levels 1 and 2 were found to be statistically significant and positively related to risk aversion. This implies that holding all other factors constant, the risk aversion coefficient is expected to be higher by 13% and 10% for farmers in poverty levels 1 and 2 respectively than for those in poverty level 4, that are less poor (table 4.24). Thus the lower a household's per capita income or poverty level, the more risk averse they will be. In other words households whose income fall below the poverty line are less willing to take risk than the non poor households. This supports the observations of Lamb (2003) and Mosley and Verschoor (2003) that poorer farmers are more risk averse than wealthy ones and as such avoid prospects in which the probability of failure looms large.

From the foregoing, it is obvious that most farmers are risk averse and they seek for ways of keeping risk at the barest minimum. Further, the study shows that poverty variables have significant effect on the risk attitudes of farmers.

CHAPTER FIVE

5.0 SUMMARY, RECOMMENDATIONS AND CONCLUSIONS

This section is concerned with the summary of the study with respect to its objectives, the research problems, methodology and the findings as well as the recommendations based on findings and the conclusions.

5.1 Summary

The study was on Effect of Poverty on Risk Attitudes of Farmers in Benue State, Nigeria.

The specific objectives pursued were to: describe the relevant socio-economic characteristics of the farmers in Benue state; determine the extent of poverty among farmers in the area; identify the various risk situations faced by farmers with differing poverty levels; assess the risk attitudes of farmers; identify the risk aversion strategies employed by farmers with differing poverty levels and determine the effects of poverty variables on risk attitudes of the farmers.

Multistage random sampling technique was used for selecting the respondents. One hundred and twenty (120) farm households were used for the study. Data were collected during the 2003/2004 farming season.

Results of the study showed that the households on average contained about 7.6 persons, with annual per capita income of ₦32, 491 and had a total land holding of 4.8 hectares. The household head was about 44years and had spent about 5.5 years in school. The respondents diversified their portfolio of farm income by cultivating different types of crops and rearing different types of livestock. Their major source of farm capital was personal savings and they used crude farm tools. Apart from farming about 60% engaged in non-farm income-generating activities. The study showed that 78.3% of the farm households in the area were poor, that is, they earned below the international income poverty line of US$1 per day. The extent of poverty was 42.5% implying that the households were earning approximately ₦19,800 per annum below the poverty line. It was found that poverty levels were related to socio-economic characteristics of respondents. Most of the respondents lived in thatched mud

houses (51.7%), fetched drinking water from unsafe sources such as rivers and wells (96.7%), had no toilet (49.2%) and had no access to electricity (85%).

The major types of risk faced by respondents were as follows: changes in crop yield and livestock production (16.7%), changes in crop livestock prices (8.3%); changes in technology (4.2%), changes in credit availability (11.7%), changes in land rents (8.3%), changes in cost of inputs (9.2%); sickness/health problems (2.5%), labour availability/scarcity (9.2%), weather (15%), pest/disease incidence (8.3%) and flood (6.7%). Analysis showed that risk situations faced by farmers were independent of their poverty levels. The following risk management strategies were used by the respondents: combination of different crops/animals (14.2%), combination of crops and livestock enterprises (8.3%); replanting of crops (7.5%), use of improved varieties/breeds (10.8%), use of pesticides/herbicides (9.2%), borrowing of money (9.2%), spreading sales/harvest over different periods (6.7%), construction of gutters (6.7%), contracting for prices of inputs and outputs (6.7%), and engagement in non farm income sources (10.8%). Further analysis showed that risk management strategy employed was independent of respondents' poverty levels.

Result of assessment of farmers attitudes toward price risk showed that 86.7% of the farmers were risk averse, 11.7% were risk seeking and 1.7% were risk neutral based on scale 1 classification while scale 2 classified all the farmers as risk averse. Using the safety first model to assess respondents attitudes towards yield variability, analysis indicated that 71.7% of the farmers were high risk averse, 25.8% were intermediate risk averse, 1.7% were low risk averse and only 0.83% was risk preferring. The mean risk coefficients of farmers in the different poverty levels, that is 1.5 for the very poor, 1.51 for the moderately poor, 1.4 for the poor and 1.3 for the non-poor were not statistically different. This finding is rather surprising and was therefore subjected to further testing through regression.

Regression analysis showed that age, household size, educational level, number of contacts with extension agents, membership in a solidarity group and degrees of poverty were significant determinants of risk attitudes.

5.2   Recommendations

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

Due to the significant effect of age on risk attitudes and their inverse relationship technological packages should be directed to older farmers who not only are the main rural farm dwellers but also are more experienced in dealing with risk economic situations over the years and as such are less risk averse than the younger ones.

Household size was found to be inversely related to risk attitudes. Based on this finding, policies to improve the labour quality of household members are recommended since these members form major part of the labour supply in farm communities and as such are considered a form of asset. This will enhance increased agricultural productivity.

Further policies to improve the literacy level of the people will be of much benefit as education is expected to transform people's values, broaden their understanding of life situations and consequently enhance their ability to invest in risky but high return income generating opportunities. Government should seek for ways of encouraging greater awareness and education among rural indigent dwellers. This could be achieved through proper funding of the education system, scholarships and adult literacy campaigns.

Moreso, there is need for formation of viable agricultural cooperatives and strengthening of the extension system in the area in particular and the country at large having realized the significant impact of this on farmers risk attitudes.

Based on the identified risk situations faced by the farmers in the area, policies that will encourage subsidizing of cost of inputs, provisions of cheap credit facilities to farmers and stability of agricultural product prices as well as encourage the use of improved technologies are necessary.

Finally, due to the significant impact of degree of poverty on farmers risk attitudes, the various public-sector interventions and stakeholders should seek for relevant and effective means of reducing the poverty levels of farm households. A right policy option could be to increase households' access to physical and human capital assets to create opportunities for them to alleviate

their poverty level. Also, the use of social protection practices such as income insurance, price-support schemes, credit insurance, etc may be helpful strategies in mitigating the effect of poverty on risk attitudes of farmers.

5.3 Conclusion

Farming everywhere is a risky business and this is more pronounced among small scale farmers in poor communities.

In the study, estimation of an expression capturing peasant behaviour towards risk derived from a safety first model of farmer behaviour was done. The risk coefficients were estimated using field survey data in the two local government areas of zone B in Benue State. The risk coefficients are shown to be significantly related to a set of important socio-economic and poverty variables that characterise peasant households in Benue State. These variables accounted for about 39% of the variation in risk coefficients. This underscores the need to consider the socio-economic and poverty characteristics of the farm household, and its associated attitudes and behaviour towards risk-taking, when designing new farm technologies and other agricultural policies in Benue State and in Nigeria at large. Such technological and institutional packages if optimally tailored to peasants economic behaviour will greatly enhance the chances of success of rural development interventions and programmes.

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APPENDIX I

Output of Rice in Benue State: 1992-1999

Year	Output(000 metric tonnes)
1992	279.8
1993	378.9
1994	5396.0
1995	4067.8
1996	2940.0
1997	3492.0
1998	3568.0
1999	3477.0

Source: *Ministry of Finance and Economic Planning, Statistics Division.*

APPENDIX II
Data For Estimation of Production Function

S/N	Rice Yield	Fertilizer	Seeds	Farm Size	Labour	Herbicides	Equipment
1	833.330	62.500	66.670	1.200	185.000	0.001	550.000
2	1000.000	100.000	50.000	1.000	51.000	4800.000	640.000
3	650.000	0.001	50.000	2.000	196.000	0.001	482.500
4	900.000	75.000	55.000	2.000	101.000	5000.000	299.500
5	1333.330	83.330	50.000	1.200	53.000	5833.330	908.330
6	200.000	0.001	40.000	1.500	36.000	0.001	410.000
7	700.000	0.001	50.000	1.000	197.000	0.001	244.000
8	600.000	0.001	40.000	2.500	181.000	0.001	292.800
9	933.330	66.670	40.000	1.500	51.000	5333.330	200.000
10	600.000	0.001	40.000	1.000	198.000	0.001	816.000
11	750.000	0.001	62.500	0.800	194.000	0.001	737.500
12	714.290	0.001	64.290	0.700	57.000	7142.860	128.570
13	625.000	0.001	37.500	0.800	153.000	0.001	170.000
14	900.000	0.001	60.000	1.000	205.000	0.001	149.000
15	750.000	0.001	112.500	0.800	205.000	0.001	190.000
16	1000.000	0.001	54.550	1.100	189.000	0.001	480.910
17	583.330	41.670	58.330	1.200	187.000	0.001	516.670
18	1400.000	75.000	60.000	1.000	47.000	6000.000	740.000
19	714.290	71.430	42.860	0.700	217.000	0.001	867.140
20	1300.000	100.000	50.000	1.000	170.000	7000.000	1070.000
21	900.000	100.000	50.000	1.000	39.000	5000.000	590.000
22	1166.660	83.330	83.330	1.200	46.000	8333.330	1167.500
23	777.780	0.001	55.560	0.900	219.000	0.001	810.000
24	800.000	0.001	60.000	1.000	195.000	0.001	686.000
25	625.000	0.001	62.500	0.800	210.000	0.001	630.000
26	800.000	0.001	70.000	1.000	190.000	0.001	250.000
27	900.000	0.001	45.000	1.000	190.000	0.001	697.000

28	1333.330	0.001	50.000	3.000	105.000	1166.670	303.330
29	571.430	0.001	57.140	0.700	217.000	0.001	767.140
30	750.000	0.001	80.000	1.000	186.000	0.001	730.000
31	1200.000	0.001	50.000	1.000	192.000	0.001	580.000
32	1100.000	0.001	100.000	1.000	190.000	0.001	150.000
33	700.000	150.000	100.000	1.000	198.000	0.001	2005.000
34	1700.000	0.001	75.000	1.000	189.000	6000.000	180.000
35	800.000	0.001	40.000	1.000	190.000	0.001	568.000
36	1200.000	0.001	70.000	1.000	160.000	0.001	864.000
37	1083.330	0.001	37.500	1.200	170.000	0.001	75.000
38	1200.000	0.001	50.000	1.000	186.000	0.001	960.000
39	1083.330	66.670	46.670	1.500	185.000	0.001	113.000
40	1300.000	175.000	60.000	1.000	62.000	5000.000	805.000
41	400.000	0.001	40.000	1.000	209.000	0.001	591.000
42	533.330	0.001	40.000	1.500	141.000	0.001	496.670
43	300.000	0.001	40.000	1.000	184.000	0.001	290.000
44	1200.000	150.000	60.000	1.000	89.000	6000.000	395.000
45	100.000	0.001	80.000	1.000	197.000	0.001	654.000
46	933.330	66.670	60.000	1.500	40.000	5333.330	773.330
47	300.000	0.001	40.000	1.000	215.000	0.001	630.000
48	66.670	0.001	40.000	3.000	30.000	0.001	63.330
49	200.000	0.001	50.000	1.000	199.000	0.001	978.000
50	1000.000	100.000	40.000	1.000	57.000	4800.000	597.000
51	30.000	50.000	50.000	1.000	48.000	0.001	280.000
52	50.000	0.001	65.000	2.000	69.000	2500.000	102.000
53	100.000	0.001	100.000	1.000	192.000	0.001	510.000
54	0.001	0.001	50.000	2.000	171.000	0.001	132.500
55	0.001	0.001	43.330	3.000	43.000	0.001	217.670
56	600.000	50.000	50.000	1.000	174.000	0.001	240.000
57	80.000	60.000	48.000	2.500	60.000	6000.000	84.000
58	0.001	0.001	100.000	1.000	94.000	0.001	170.000
59	0.001	0.001	55.000	2.000	45.000	0.001	85.500
60	600.000	0.001	64.000	1.000	210.000	0.001	545.000

61	640.000	0.001	38.400	2.500	122.000	0.001	382.000
62	1300.000	0.001	66.000	2.000	142.000	550.000	680.000
63	2150.000	75.000	42.000	2.000	55.000	1600.000	885.000
64	777.780	0.001	35.560	0.900	48.000	1777.770	244.440
65	750.000	0.001	37.500	0.800	196.000	0.001	1293.750
66	833.000	0.001	40.000	0.600	187.000	0.001	650.000
67	875.000	0.001	32.500	0.800	83.000	1500.000	625.000
68	900.000	0.001	32.000	1.000	163.000	0.001	570.000
69	785.710	0.001	40.000	1.400	184.000	0.001	550.000
70	777.780	0.001	27.780	0.900	171.000	0.001	1488.890
71	1200.000	0.001	32.000	2.000	47.000	700.000	422.500
72	777.780	0.001	36.670	0.900	83.000	3111.110	644.440
73	1200.000	50.000	32.000	1.000	64.000	2400.000	710.000
74	750.000	0.001	32.000	2.000	180.000	0.001	410.000
75	750.000	0.001	32.500	0.800	199.000	0.001	417.500
76	900.000	0.001	30.000	1.000	144.000	0.001	350.000
77	923.080	0.001	34.620	1.300	187.000	0.001	407.690
78	571.420	0.001	42.860	1.400	144.000	0.001	600.000
79	777.780	0.001	28.890	0.900	159.000	0.001	850.000
80	833.330	0.001	30.000	0.600	155.000	0.001	400.000
81	875.000	0.001	40.000	0.600	179.000	0.001	650.000
82	1000.000	0.001	40.000	0.800	193.000	0.001	785.000
83	1041.670	0.001	35.000	2.400	175.000	0.001	529.170
84	777.780	0.001	33.330	0.900	176.000	0.001	688.890
85	857.140	0.001	40.000	0.700	179.000	0.001	607.140
86	700.000	0.001	32.000	2.000	204.000	0.001	630.000
87	875.000	0.001	37.500	0.800	203.000	0.001	662.500
88	800.000	0.001	90.000	1.000	161.000	0.001	635.000
89	1083.330	0.001	30.000	1.200	194.000	0.001	1118.330
90	1000.000	0.001	40.000	0.600	111.000	0.001	783.330
91	1000.000	50.000	48.000	2.000	40.000	2700.000	480.000
92	800.000	50.000	45.000	1.000	84.000	2550.000	770.000
93	888.880	55.550	44.440	0.900	86.000	1777.770	1143.330

94	1142.850	71.430	39.290	1.400	57.000	1714.290	592.860
95	1066.670	66.670	42.670	1.500	49.000	1133.330	193.330
96	900.000	75.000	48.000	2.000	48.000	1800.000	330.000
97	1066.670	66.670	42.660	3.000	74.000	2666.670	503.330
98	1000.000	50.000	42.660	3.000	40.000	1066.670	103.330
99	1100.000	50.000	45.000	2.000	67.000	1600.000	342.500
100	1000.000	50.000	32.000	2.000	58.000	1250.000	130.000
101	1166.670	116.670	32.000	3.000	76.000	8333.330	240.000
102	857.140	0.001	45.710	0.700	159.000	0.001	485.710
103	650.000	0.001	32.000	2.000	155.000	0.001	297.500
104	750.000	0.001	37.500	0.800	171.000	0.001	1137.500
105	875.000	0.001	50.000	0.800	194.000	0.001	408.750
106	750.000	0.001	46.670	1.200	148.000	0.001	572.500
107	1000.000	0.001	32.000	1.000	174.000	1600.000	325.000
108	888.890	0.001	27.780	0.900	207.000	0.001	333.330
109	900.000	0.001	32.000	1.000	217.000	0.001	264.000
110	700.000	0.001	32.000	2.000	158.000	0.001	335.000
111	900.000	0.001	50.000	2.000	47.000	6000.000	727.500
112	1000.000	0.001	49.230	1.300	56.000	1615.380	1346.150
113	916.670	0.001	40.830	1.200	180.000	0.001	800.000
114	1100.000	0.001	32.000	1.000	169.000	0.001	520.000
115	1800.000	0.001	48.000	0.500	72.000	5000.000	876.000
116	800.000	75.000	32.000	2.000	74.000	1700.000	682.500
117	1500.000	0.001	55.000	0.400	218.000	0.001	887.500
118	1250.000	0.001	41.670	1.200	69.000	2541.660	404.170
119	1000.000	0.001	48.000	1.000	141.000	0.001	995.000
120	1166.670	0.001	43.330	0.600	143.000	0.001	333.330

Source: Field Survey Data, 2004

APPENDIX III

Data on Risk Attitudes Determinants

S/N	Risk Att.	Age (Yrs.)	HHS	Ed. L(Yrs)	OFI N/A	Ext. Agent	Land Hold	SG	Housing
1	1.03	42	3	7	19000	0	3	0	4
2	0.65	38	5	14	100000	0	2	0	4
3	1.67	70	10	7	300000	0	3	0	4
4	0.91	52	20	13	100000	0	5	0	4
5	0.82	50	11	14	120000	0	3	0	4
6	1.67	54	13	7	60000	0	14	0	3
7	1.67	52	10	14	50000	0	1	0	2
8	1.67	46	10	6	70000	0	4.5	0	3
9	0.99	46	8	7	80000	0	2	0	4
10	1.67	60	10	0	30000	0	2	0	4
11	1.67	27	4	10	60000	0	1.5	0	4
12	1.67	26	2	15	20000	0	1	0	4
13	1.67	46	4	0	30000	0	1.8	0	4
14	1.67	42	5	8	120000	0	2	0	3
15	1.67	45	2	12	40000	0	3	0	5
16	1.67	40	8	0	26000	0	3.5	0	5
17	1.24	42	9	13	60000	0	2.5	0	3
18	0.91	48	11	14	150000	0	2	0	3
19	0.94	48	5	12	100000	0	1	0	3
20	0.65	40	8	12	90000	0	2.5	0	2
21	0.65	41	8	12	120000	0	2	0	3
22	0.82	50	7	10	80000	0	3	0	4
23	1.67	40	9	7	30000	0	2	0	1
24	1.67	35	6	7	50000	0	2.5	0	4
25	1.67	38	5	0	50000	0	2	0	4
26	1.67	32	8	6	40000	0	2	0	4
27	1.67	55	16	6	30000	0	2	0	3
28	1.67	43	7	6	100000	0	20	0	4
29	1.67	20	4	6	65000	0	2	0	4
30	1.67	31	6	0	20000	0	3	0	4
31	1.67	21	5	12	0	0	2	0	5
32	1.67	40	4	10	60000	0	1	0	2
33	0.14	65	25	8	74400	0	3	0	4
34	1.67	33	10	9	65000	0	2	0	4
35	1.67	34	8	13	60000	0	2	0	3
36	1.67	21	4	9	35000	0	2	0	4

37	1.67	39	2	10	120000	0	1.2	0	4
38	1.67	39	14	12	0	0	2	1	3
39	0.99	42	4	10	100000	0	1.5	0	4
40	-0.11	28	11	9	60000	0	4	0	3
41	1.67	50	7	2	80000	0	2	0	5
42	1.67	44	6	7	80000	0	2.5	0	4
43	1.67	36	8	7	40000	0	2	0	4
44	0.14	58	14	13	100000	15	3	1	4
45	1.67	56	12	7	0	15	4	1	3
46	0.99	39	12	8	0	0	4	0	4
47	1.67	40	4	0	20000	0	1	0	4
48	1.37	38	8	7	0	0	5	0	4
49	1.67	42	10	0	35000	0	2	0	4
50	0.65	42	7	7	130000	0	1	0	4
51	1.16	45	7	5	0	0	1	0	2
52	1.67	40	16	0	50000	2	2	0	2
53	1.67	20	11	8	0	10	2	1	4
54	1.67	35	4	10	0	5	2	1	2
55	1.67	59	12	0	0	0	5	0	5
56	1.16	40	11	0	10000	10	2	1	3
57	1.06	33	10	9	37000	4	10	1	4
58	1.67	35	5	12	25000	12	3	1	4
59	1.67	42	10	0	40000	4	4	1	2
60	1.67	26	5	9	0	0	2	0	4
61	1.67	50	9	0	0	0	5	0	5
62	1.67	60	18	0	0	0	10	0	3
63	0.91	40	25	0	0	0	10	0	4
64	1.67	27	3	0	0	0	6	0	4
65	1.67	47	6	0	0	0	7	0	4
66	1.67	38	6	0	0	0	6	0	3
67	1.67	40	7	0	50000	0	4	0	4
68	1.67	56	6	0	0	0	6	0	4
69	1.67	42	6	0	50000	0	6	0	4
70	0.65	60	10	0	0	0	7	0	3
71	1.67	50	5	12	100000	6	6	1	5
72	1.16	46	7	0	0	0	6	0	4
73	1.67	32	6	6	200000	0	5	0	4
74	1.67	66	10	6	0	0	8	0	4
75	1.67	42	5	0	0	0	4	0	3

76	1.67	36	7	0	10000	0	5	0	3
77	1.67	48	9	0	0	0	8	0	4
78	1.67	61	10	0	0	0	8	0	4
79	1.67	55	7	0	0	0	7	0	4
80	1.67	60	6	0	15000	0	7	0	3
81	1.67	55	5	0	0	0	6	0	4
82	1.67	47	7	0	0	0	9	0	4
83	1.67	63	10	0	0	0	10	0	4
84	1.67	45	7	0	0	0	9	0	4
85	1.67	56	7	0	0	0	5	0	2
86	1.67	52	9	0	0	0	9	0	4
87	1.67	62	5	0	0	0	8	0	4
88	1.67	70	5	0	0	0	8	0	4
89	1.67	68	9	0	70000	0	9	0	4
90	1.67	50	6	0	0	0	7	0	4
91	1.16	35	11	4	15000	0	3	0	3
92	1.16	30	6	6	20000	0	5	0	4
93	1.1	43	6	0	30000	0	3	0	3
94	0.94	50	8	0	60000	0	6	0	3
95	0.99	30	5	12	0	0	3	0	4
96	0.91	32	7	6	15000	0	8	0	3
97	0.99	52	12	0	0	12	8	1	3
98	1.16	41	4	0	0	0	7	0	5
99	1.16	50	6	0	0	0	5	0	4
100	1.16	37	3	12	0	0	14	0	4
101	0.48	58	7	8	10000	0	5	0	4
102	1.67	28	5	0	0	0	6	0	4
103	1.67	35	7	7	0	0	7	0	4
104	1.67	48	9	0	0	0	9	0	4
105	1.67	36	5	0	30000	0	8	0	3
106	1.67	60	7	0	0	0	10	0	4
107	1.67	32	4	12	10000	0	7	0	5
108	1.67	40	7	0	20000	0	6	0	4
109	1.67	28	3	12	0	0	5	0	4
110	1.67	64	7	0	50000	0	8	0	4
111	1.67	52	9	18	252000	8	7	1	4
112	1.67	25	9	8	30000	0	1.3	0	4
113	1.67	25	4	11	0	0	1.2	0	4
114	1.67	45	9	0	0	0	1	0	1
115	1.67	50	8	0	0	0	5	0	4
116	0.91	42	11	15	150000	12	5	1	4

117	1.67	60	5	0	0	0	10	0	4
118	1.67	40	9	15	30000	0	5	0	4
119	1.67	37	8	0	20000	0	6	0	4
120	1.67	22	2	12	0	0	4	0	5

S/NO	Dur. Asset	BH	Degree of Access	Sex	P1	P2	P3
1	0.1	0	1.83	1	0	0	0
2	0.7	1	3.83	1	0	0	0
3	0.1	1	1.83	1	0	0	1
4	0.6	1	4	1	1	0	0
5	0.7	1	3.5	1	0	0	1
6	0.7	1	3.5	1	0	1	0
7	0.3	1	2.67	1	0	1	0
8	0.2	1	2.17	1	0	1	0
9	0.4	0	3.83	1	0	0	0
10	0.2	1	2.33	1	0	0	1
11	0.1	0	1.83	1	0	0	0
12	0.3	1	3.17	1	0	0	0
13	0.1	1	2.5	0	0	0	0
14	0.3	1	2	1	0	0	0
15	0	1	2	1	0	0	0
16	0.1	0	2	1	0	0	1
17	0.3	1	2.33	1	0	0	1
18	0.2	1	3	1	0	0	1
19	0.2	1	1.83	1	0	0	0
20	0.3	1	2	1	0	0	1
21	0.2	1	2.67	1	0	0	1
22	0.2	1	2	1	0	0	0
23	0.4	0	3	1	0	1	0
24	0.1	1	1.83	1	1	0	0
25	0.1	1	1.83	0	0	0	0
26	0.2	1	1.83	1	0	0	1
27	0.4	1	2.5	1	1	0	0
28	0.1	0	2.5	1	0	0	0
29	0.3	1	2	1	0	1	0
30	0.2	1	2	1	0	1	0
31	0.4	0	2.67	1	0	1	0

32	0.2	1	2.33	1	0	0	0
33	0.4	1	2.5	1	0	1	0
34	0.4	0	2.67	1	0	1	0
35	0.3	0	2.67	1	0	1	0
36	0.3	0	2.5	1	0	0	1
37	0.1	1	2.67	1	0	0	0
38	0.3	0	2.67	1	0	1	0
39	0.5	1	2.67	1	0	0	0
40	0.2	0	2.17	1	0	1	0
41	0.2	0	2.5	1	1	0	0
42	0.6	1	2.67	1	0	0	1
43	0.1	1	2.5	1	0	1	0
44	0.5	1	4	1	0	1	0
45	0.1	0	3.33	1	0	1	0
46	0.2	1	2.83	1	1	0	0
47	0	1	2.83	0	0	0	0
48	0.1	0	2.5	1	0	0	1
49	0.3	1	2.5	1	1	0	0
50	0.5	1	3.17	1	0	0	1
51	0.1	0	2.5	1	0	0	1
52	0	1	2.5	1	0	1	0
53	0.2	1	2.83	1	0	1	0
54	0.1	1	2.83	1	0	0	1
55	0.1	1	3	1	0	1	0
56	0.1	1	2.83	0	0	1	0
57	0.1	0	3.17	1	1	0	0
58	0.2	1	3	1	0	0	1
59	0.1	1	3	0	0	1	0
60	0.1	0	2.83	1	0	1	0
61	0.1	1	2.83	0	0	1	0
62	0.2	1	2.33	1	1	0	0
63	0.3	1	2.5	1	1	0	0
64	0.2	1	2.5	1	0	0	0
65	0.1	1	2	1	1	0	0
66	0.1	1	2	1	0	1	0
67	0.3	1	3	1	0	0	1

68	0	1	2.17	1	0	1	0
69	0.2	1	1.83	1	0	0	0
70	0.1	1	2.17	1	0	1	0
71	0.4	0	2.33	1	0	0	0
72	0.2	1	2	1	0	0	1
73	0.2	1	2	1	0	0	0
74	0.2	1	1.83	1	0	1	0
75	0.1	1	1.83	1	0	0	1
76	0.1	1	1.67	1	0	0	1
77	0.2	1	1.67	1	1	0	0
78	0.1	1	1.83	1	1	0	0
79	0.1	1	2	1	0	0	1
80	0	0	1.5	1	0	1	0
81	0.1	0	2	1	0	0	1
82	0.1	1	1.5	1	0	1	0
83	0.3	1	2.17	1	0	1	0
84	0.2	1	1.67	1	0	1	0
85	0.1	1	1.67	1	0	1	0
86	0.2	1	2	1	0	1	0
87	0.1	1	2	1	0	1	0
88	0.1	1	2	1	0	1	0
89	0.2	1	2.17	1	1	0	0
90	0.1	1	2	1	0	1	0
91	0.1	1	3.33	1	0	0	0
92	0.2	0	2.33	1	0	0	0
93	0.1	1	3.17	1	0	0	1
94	0.2	1	3	1	0	0	0
95	0.1	1	3	1	0	0	0
96	0.1	1	3.17	1	0	1	0
97	0.2	1	3	1	0	1	0
98	0.2	1	3	1	0	0	0
99	0.2	1	3	0	0	0	1
100	0.1	1	2.67	1	0	0	1
101	0.1	1	1.67	1	0	0	1
102	0.1	1	1.5	1	1	0	0
103	0.2	1	1.67	1	0	1	0

104	0.2	1	2	1	0	1	0
105	0.1	1	2	1	0	0	1
106	0.1	1	1.67	1	0	1	0
107	0.1	1	1.83	1	0	0	1
108	0.1	1	2	1	1	0	0
109	0.2	1	1.5	1	0	0	0
110	0.1	1	1.67	1	0	0	1
111	0.2	1	3.33	1	0	0	1
112	0.3	0	3.33	1	0	0	1
113	0.1	1	2.17	1	0	0	1
114	0.1	1	2	1	1	0	0
115	0.1	1	2.17	1	1	0	0
116	0.4	1	2.5	1	0	0	1
117	0.1	1	2	1	0	1	0
118	0.1	1	2.33	1	0	1	0
119	0.1	1	1.67	1	0	1	0
120	0.1	0	2.67	1	0	0	1

Source: Field Survey Data, 2004

Appendix IV: Average Product and Factor Prices and Mean Yield of Rice in Benue State.

Item	Value
Average product price (₦/kg of rice)	44.15
Average factor (fertilizer) price (₦/kg of NPK)	37.16
Mean yield of rice (kg/ha)	812.65

Source: *Field Survey Data, 2004*

APPENDIX V

UNIVERSITY OF NIGERIA, NSUKKA

DEPARTMENT OF AGRIC ECONOMICS

Questionnaire: Effect of Poverty on Risk Attitudes of Farmers in Benue State

Dear Respondent,

The researcher is carrying out a study on the on the above topic. This exercise is purely for an academic purpose. Please kindly supply the accurate information. All information will be treated confidentially.

Yours faithfully,

Nzenwa, G. C.

SECTION ONE:

SOCIOECONOMIC CHARACTERISTICS

Name:..

1.a Local Government Area ....(b) Community / District...............

(c) Sex .... (d) Age...........................

2. How many children do you have? ....

3. How many wives do you have ? ....

4.a Do you have any formal education? Yes ☐ No ☐

(b) If yes, how many years of schooling did you complete ? ....years.

5. How much do you earn per annum?................................

SECTION TWO:

FARM / NON FARM ACTIVITIES

6. How many hectares of Land do you have under the following presently:

(a) Fallow land ....hectares

(b) Cultivated land ....hectares

7. How did you obtain the land you use in farming?

(a) Completely owned (b) Completely rented

(b) Partly owned and partly rented (d) others specify.............

8. Which of the following farm activities do you engage in?

Crops:

(a) Maize

(b) Yam

(c) Rice

(d) Sorghum

(e) Soyabean

(f) Cassava

(g) Others (Specify)...................

Livestock / Fisheries:

(a) Goat

(b) Pig

(c) Sheep

(d) Poultry

(e) Fishery

(f) Others (specify)...............

10. What is your main source of farm capital (a) Personal savings (b) Banks (c) Money lenders (d) Cooperatives (e) Friends / relations (f) Others (specify)...................

11a. How many hectares of rice farm did you cultivate last year? ....

11b. What type of farmland did you cultivate? (a) Upland (b) low land

12. What quantity of rice seed did you plant last year? ....kg

13.a Did you apply NPK fertilizer on your rice farm (s) last year? Yes ☐ No ☐

b. If yes, what quantity of fertilizer did you apply?.............bags

c. If no, what was your reason for not applying fertilizer?

(i) Not available

(ii) high cost (iii) farm land is fertile enough (iv) do not know how to apply it (v) it causes damage to crops (vi) others (specify)...................

d. How much did you buy a bag of fertilizer last year? ....

14 a. Did you spray rice farm with herbicides / pesticides last year?

Yes ☐ No ☐

(c) If yes, how much did spend on herbicides / Pesticides?

15 What is your major source of farm labour ? (a) Family (6) exchange (c) Hired (d) Others (specify)...

16, For the following operations listed below, indicate where applicable the number of your family members that were involved and the number of days they worked on your rice farm last year:

	Operation	No of family members	No of days worked
1	Land clearing		
2	Tillage		
3	Planting		
4	Fertilizer application		
5	Weeding		
6	Spraying of herbicides/pesticides		
7	Harvesting		
	Total mandays		

17.a   Apart from your family members, did you hire labour in your rice cultivation last year? Yes ☐ No ☐

b. If yes, please specify where applicable the number of hired labour and number of days they worked on your rice farm last year?

	Operation	No. of hired labour	No of days worked
1	Land clearing		
2	Tillage		
3	Planting		
4	Fertilizer application		
5	Weeding		
6	Spraying of herbicides / insecticides		
7	Harvesting		
	Total mandays		

18 a. How many bags of rice did you harvest last year? ………………………

b. How much did you sell a bag of rice in the market last year?..............

19. Please fill the table below for any of the farm tools/equipments you Own

	Tools/equipment	Quantity	Unit price	Total amount
1	Matchet			
2	Cutlass			
3	Hoe			
4	Spade/shovel			
5	Head pan			
6	Rake			
7	Sprayer			
8	Tractor			
9	Sickle			
10	Wheel barrow			
11	Others (specify)			

20. Which of the following risk situation do you often encounter in your farm operation ? Tick accordingly (   )

(i) Changes in crop yield / livestock   (   )

(ii) Changes in crop/livestock prices   (   )

(iii) Changes in technology   (   )

(iv) Changes in credit availability (   )

(vi) Changes in interest rates   (   )

(vii) Changes in land rents   (   )

(viii) Changes in cost of inputs (   )

(ix) Changes in government laws and regulations (   )

(x) Sickness/health problems   (   )

(xi)   Labour availability/scarcity (   )

(xii)   Changes in weather (   )

(xiii)   Changes in pests/ disease incidence (   )

(xiv)   Flood (   )

(xv)   Theft (   )

(xvi) Others (specify) ....

21 Which of the following strategies do you often use in handling the risk situation selected in question 20? Tick accordingly ( )

(i) Combination of different crops / animals ( )

(ii) Combination of crop and livestock enterprise ( )

(iii) Fencing the farm ( )

(iv) Replanting of crop ( )

(v) Use of improved varieties/breeds ( )

(vi) Use of pesticides / herbicides ( )

(vii) Borrowing money from friends, banks, credit groups etc ( )

(viii) Providing gutters for drainage ( )

(ix) Participating in Nigerian Agricultural insurance scheme ( )

(x) Spreading sales / harvest over different periods ( )

(xi) Contracting for prices of inputs and outputs before time ( )

(xii) Engaging in non-farm income sources ( )

(xiii) Obtaining remittances from children in the cities ( )

(xiv) Others (specify)...

22. Using the following responses indicate the extent to which you agree with the statements displayed underneath:

SD = Strongly disagree   D = Disagree

FD = Fairly Disagree   SLD = Slightly Disagree

U = Undecided   SLA = Slightly agree

FA = Fairly agree   A = Agree

SA = Strongly agree

Statements:

	-4	-3	-2	-1	0	1	2	3	4
	SD	D	FD	SLD	U	SLA	FA	A	SA

1. When selling my rice, I prefer financial certainty to financial uncertainty
2. I am willing to take higher financial risks in order to realize higher average returns
3. I like taking financial risks
4. When selling my rice, I am willing to take higher financial risks in order to realize higher average returns
5. I like "playing it safe"
6. With respect to the conduct of business, I am risk averse
7. With respect to the conduct of business, I prefer certainty to uncertainty

23.a Apart from farming, do you engage in other income generating activities.

    Yes ☐ No ☐

    b. If yes, which other economic activity is your major source of supplementary income? (a) public service (b) Trading (c) Transportation

    (d) Artisan/craft work (e) Traditional healing (f) others (specify)

24. How much does your household earn from non-farm activities per annum? ....

25. How much is your annual household farm income? ....

26. What is your total annual household income? ....

27. Do you belong to any cooperative or farmer group? Yes ☐ No ☐

28. a. Did you receive any extension service last year? Yes ☐ No ☐

    b. If yes, how many times did you have contact with (or visit from) extension agents last year? .... times

29. Have you ever been involved in gambling (ie lottery, pool, betting etc)?

Yes ☐ No ☐

30.a Are you aware of Nigerian Agricultural Insurance scheme?

Yes ☐ No ☐

b. If yes, do you participate in the insurance scheme? Yes   No

SECTION 3

31. How many people are feeding and living with you now in the house?......

32. How many living (bed) rooms does your house contain? ....

33. Do you have any of the following items in you house?

i. Colour Television   Yes ☐ No ☐
ii. Electric Iron   Yes ☐ No ☐
iii. Telephone   Yes ☐ No ☐
iv. Video recorder   Yes ☐ No ☐
v. Radio   Yes ☐ No ☐
vi. Refrigerator   Yes ☐ No ☐
vii Car or van   Yes ☐ No ☐
viii Motor bike   Yes ☐ No ☐
ix Gas or electric cooker   Yes ☐ No ☐
x Wall clock   Yes ☐ No ☐

34. Are you suffering from any of the following health problems?

i. Ulcer   Yes ☐ No ☐
ii. Tuberculosis   Yes ☐ No ☐
iii. Malaria   Yes ☐ No ☐
iv. Typhoid   Yes ☐ No ☐
v. Hypertension   Yes ☐ No ☐
vi Migraine   Yes ☐ No ☐
vii. Cancer   Yes ☐ No ☐
viii. Mental disorder   Yes ☐ No ☐
ix Physical disability   Yes ☐ No ☐

35. How is your health in general? (1) very bad (2) bad (3) fair (4) good (5) very good

36. Indicate your type of dwelling place: (a) thatched mud house

(b)   mud house with zinc (c) concrete/cement house

37.   What is your major source of drinking water? (a) pipe borne water
      (b) River (c) Well/borehole (d) others (specify)...........................

38.   What toilet facilities do you have in your house? (a) flush (b) pit
      (c) none   (d) others (specify) ....

39.   What is the major source of light in your house? (a) electricity
      (b) lantern (c) others (specify) ....

40.   When sick where do you normally go for treatment? (a) hospital
      (b) chemists/pharmacists (c) traditional medicine person
      (d) none (e) others (specify) ....

41.   Please indicate your degree of accessibility to the following basic
      amenities using the responses provided below:
      Very Accessible = VA, Accessible = A, Moderately Accessible = MA,
      Less Accessible = LA, Not accessible = NA

		5	4	3	2	1
	Item/Amenity	VA	A	MA	LA	NA
1	Portable/safe water					
2	Good health services					
3	Electricity					
4	Education					
5	Good sanitary facilities					
6	Good road					