ECONOMIC EVALUATION OF THE NATIONAL PROGRAM ON FOOD SECURITY IN THREE SELECTED STATES OF NORTH-WEST, NIGERIA

BY

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A THESIS SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES AHMADU BELLO UNIVERSITY, ZARIA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS

**DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY,
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February, 2016

DECLARATION

I hereby declare that this thesis titled the "**ECONOMIC EVALUATION OF THE NATIONAL PROGRAM ON FOOD SECURITY IN THREE SELECTED STATES OF NORTH WEST, NIGERIA**" is a record of my own research work under the supervision of Prof. Omolehin, R. A., Dr. Damisa, M.A. and Prof. Omokore, D.F. It was never presented anywhere, either wholly or in part, for the purpose of the award of a degree. All literatures consulted and cited were fully acknowledged within the text and by means of references.

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CERTIFICATION

This thesis entitled "**ECONOMIC EVALUATION OF THE NATIONAL PROGRAM ON FOOD SECURITY IN THREE SELECTED STATES OF NORTH WEST, NIGERIA**" by Fatima Kabiru Aliyu meets the regulation governing the award of the Doctor of Philosophy (Ph.D.) degree of the Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to the resource poor farmers of Nigeria who despite their challenges are able to produce food for the nation.

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ABSTRACT

The broad objective of this study was to evaluate the impact of the National Program of Food Security (NPFS) on the income, technical efficiency, food security and poverty status of smallholder farmers in Kano, Kaduna and Katsina states. A multi-stage sampling technique was used for the study. Three sites were purposively selected in each state while the sampled farmers were randomly selected. A total of 221 NPFS beneficiaries and 221 non- beneficiaries totaling 442 respondents were sampled in the study. The primary data used for the study were collected using structured questionnaire and was based on 2013 cropping season while the year for before was 2008 and after was 2013. Descriptive statistics, stochastic frontier production model, Foster, Greer and Thorbecke food insecurity and weighted poverty index, double difference estimator, logit regression analysis, probit regression analysis, paired t-test and Z- statistic were the tools of analyses employed to analyze the primary data. The result of the study revealed that most of the respondents were married, with age mean of 48 years and 47 years for the beneficiaries and non-beneficiaries respectively. Majority of the farmers (58%) of the beneficiaries had no formal education. The mean household size of the respondents was 9 persons. Their mean farm size was 2 and 1.75 hactares for the beneficiaries and non-beneficiaries respectively with mean farming experiences of 23years and 22years for beneficiaries and non-beneficiaries of NPFS, respectively. Crop farming was the major activity of the farmers. The study also revealed that the difference in the changes in the average incomes of the beneficiaries and non-beneficiaries before and after the NPFS was statistically significant at 1% probability level. This implies that the program was successful in increasing the beneficiaries' income. The result of the of the efficiency model showed that the NPFS variable was significant at 1% level and negatively related to the technical inefficiency of the farmers. This indicates that NPFS has enhanced the technical efficiency of the beneficiaries. However the farmers' technical efficiency was 68% suggesting that technical efficiency could be improved through efficient utilization of their resources. Based on the result of the food insecurity indices of the respondents, the NPFS had a positive impact on the food security status of the beneficiaries. Only 37. 6% of the beneficiaries were food insecure while 57.9% of the non-beneficiaries were food insecure. The programme also had a positive impact on reducing the level of poverty among the beneficiaries as their poverty head count was 42% while that of the non-beneficiaries was 59%. The constraints to the effective implementation of the programme include untimely supply of inputs, insufficient availability of credit and untimely trainings. Inadequate funding was also a major constraint as was discovered in Katsina state where the expanded NPFS phase did not make as much impact as in the other two states. Based on the findings, it was concluded that the NPFS was successful in increasing the farmers' income and enhancing their technical efficiency as well as their food security status. It has also alleviated the poverty status of the beneficiaries. Hence the recommendation that the NPFS should be scaled up to all the Local Government Areas in the country and it should be adequately funded in order to realize the full benefits and potentials of the programme.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Nigeria has a highly diversified agro ecological condition, which makes possible the production of a wide range of agricultural products. Hence, agriculture constitutes one of the most important sectors of the economy. This is because it contributes more than 30% of the total annual gross domestic product (GDP), employs about 70% of the labour force, accounts for over 70% of the non-oil exports and, perhaps most important, provided over 80% of the food needs of the country, (Adegboye, 2004;IFPRI,2013).

Agriculture provided adequate food for the Nigerian populace both in quantity and quality during the era before independence in 1960. Helleiner (1996) indicated that between 1950 and 1960, Nigeria was self-sufficient in terms of food production and consumption, though the production then was at subsistence level. The economy was experiencing rapid growth of 4.5% between 1958 and 1963, the driving force being a booming trade in agricultural commodities export, growing annually at 5.5%. The second decade of Nigerian independence (1970-1980) opened the way to food shortages as a result of declining agricultural production due to discovery of oil and increasing population growth rate. The rate of growth of Nigeria's food production has been very slow. Annual food growth rate has been put at 2.65% and population growth rate at 3.2 %, leaving a food deficit of 0.55% (Central Bank of Nigeria, 2007). This obvious disparity between the rate of food production and demand for food in Nigeria has led to a food demand-supply gap, an increasing resort to food importation and high rate of increases in food prices. These have resulted to widespread food insecurity, hunger and malnutrition, making the idea of self-sufficiency in the country to become more and more difficult to achieve (Helleiner, 1996; Ojo, 2003). This worsening food security situation has also resulted in increase in poverty especially among rural dwellers.

According to the National Bureau of Statistics (NBS, 2010), relative poverty in the country rose from 54% in 2004 to 69% in 2010.The breakdown shows that the northwest geo-political zone has the highest rate at 77.7% in 2010 (NBS, 2010).

The food self-sufficiency ratio has fallen from 98% in the early 1960s to less than 54% in 1986. In 1990, 18% of the population was estimated to be critically food insecure and this increased to 36% in 1992, and further increased to 40% in 1996 (Idachaba, 2004). To be able to provide the needed food for the rising Nigerian population, the government resorted to importation of food. The food import bill grew substantially as more food was imported into the country. The quantity of foodstuff imported rose from 0.69 million metric tons (MT) in 1994 to 6.91MT in 2001 (Okolo, 2004). This is despite the various interventions made by the Federal Government (FGN) to increase agricultural productivity and reduce poverty.

Agricultural revolution is a fundamental pre-condition necessary for the attainment of food security, poverty reduction and general economic growth, especially in developing countries. In line with this, over the years, several government policies and programs have been designed to stimulate domestic food production with the goal of addressing the worsening food insecurity and making Nigeria a more food secure nation. Some of these policies and programmes include the National Accelerated Food Production Programme (NAFPP) in 1972, National Agricultural Cooperative Bank (NACB) in 1972, Agricultural Development Projects (ADPs) in 1976, Operation Feed the Nation (OFN) in 1976, River Basin Development Authorities (RBDAs) in 1974, National Seed Service (NSS) in 1977, Agricultural Credit Guarantee Scheme (ACGS) in 1977, Rural Banking Scheme (RBS) in 1977, Green Revolution (GR) in 1980, Directorate of Foods Roads and Rural Infrastructure (DFRRI) in 1986, National Agricultural Land Development Project (NALDA) in 1986, National Fadama Development Project (NFDP) in 1991, Poverty Alleviation Programme (PAP) in 1999,

National Agricultural Development Fund (NADF) in 2000 and Commodity Marketing and Development Companies (CMDCs) in 2000. Moreover, the Presidential Initiative on some crops was established in 1999 and the National Economic Empowerment Strategy (NEEDS) in 2003. As observed by Ihomodu (2004) empirical records of many of these programmes and projects are not impressive enough to bring about the expected food security in the country. Ukeje (2004) and Egbutah, (2009) both noted that these governments' interventions were neither able to achieve national food security nor reduce poverty in the country. Similarly, Mohammed (2008) noted that despite all these efforts, not less than 65% of Nigerians are food insecure. It is in order to address household food security challenges and alleviate poverty that the Federal Government of Nigeria (FGN) initiated the National Special Program for Food Security (NSPFS) in 2001.

1.2 Problem Statement

Africa was the only region where the number of hungry people grew over the past two decades from 175 million to 239 million, with nearly 20 million added in the past four years. The prevalence of hunger, although reduced over the entire period, has risen slightly over the past three years, from 22.6% to 22.9% - with nearly one in four hungry. In sub- Saharan Africa, the modest progress achieved in recent years up to 2007 was reversed, with hunger rising at 2% per year since then (FAO, 2012).

In Nigeria, estimates put the number of hungry people at over 53 million, which is about 30% of the country's total population of around 160 million; and 52% live under the poverty line (Oriola, 2009). International Fund for Agricultural Development IFAD (2009) also put the number of Nigeria's poor at 70% of the population with 35% living in absolute poverty. The situation seems to be worsening as the percentage of Nigerians living in absolute poverty rose from 54.7% in 2004 to 60.9% in 2010. The North West region has the highest rate at 70% of the population. It also has the highest

number of food poor people with 51.8% (NBS, 2010). These are matters of grave concern largely because Nigeria was self-sufficient in food production and was indeed a net exporter of food to other regions of the continent in the 1950s and 1960s.

In the past 20 years, Nigeria has witnessed a decline in growth in the agriculture sector with its share of the GDP declining from over 60% in the pre-oil period to about 30% in 2005. Growth in the sector is slow. According to IFPRI (2013), annual food growth rate is estimated at 3.7% while annual food demand rate is estimated at 6.5%. This has resulted in rising food imports and falling levels of national food self-sufficiency leading to increased household food insecurity and rural poverty (Ukeje, 2004; Amaza, 2006).

It is believed that agricultural growth is particularly effective in reducing hunger and malnutrition and attainment of food security in poor countries since most of the poor depend on agriculture and related activities for at least part of their livelihoods. This is because hunger and poverty are interrelated as they reinforce each other. Therefore, agricultural growth involving smallholders will be most effective in reducing extreme hunger and poverty when it generates employment and adequate food for the poor (AU, 2005).

This is the underlying principle of NPFS which is geared towards improving an integrated and sustainable agricultural and rural development in order to enhance household food security, increase incomes, reduce poverty and improve socio-economic conditions of beneficiaries. This study therefore, intends to evaluate and analyze the impact of NPFS on food security, incomes, efficiency and poverty status of the beneficiaries across selected project sites in 3 selected states in North West Nigeria. It will also compare the impacts on the basis of sites location to reveal if location of sites has impacted on the project outcome. It also seeks to find out if the objective of the programme which is increasing household food security and poverty reduction within

the rural populace has been achieved. The study will seek to analyze and assess how the NPFS has impacted on the income of both male and female beneficiaries in the study area. As the life span of the expanded phase of the programme in question is over, the most important question left unanswered is to what extent have NPFS impacted on the overall food security and poverty status of beneficiaries in the study areas? It is against this background that this study intended to address the following research questions.

i. what are the socioeconomic characteristics of farmers in the study area?
ii. what is the impact of NPFS on the incomes of the farmers ?
iii. what is the impact of NPFS on their technical efficiency?
iv. what is the impact of NPFS on the farmers food security status ?
v. what is the impact of NPFS on the poverty status of the farmers ?
vi. what are the factors militating against the effective implementation of the programme?

1.3 Objectives of the study

The broad objective of this study was to evaluate the impact of NPFS on the income, technical efficiency, food security status and poverty status of small holder farmers in the study area. On this basis, the specific objectives of this study were to:

i. describe the socioeconomic characteristics of farmers in the study area;
ii. determine the impact of NPFS on the income of the farmers;
iii. evaluate the impact of NPFS on the technical efficiency of the beneficiaries ;
iv. determine the impact of NPFS on the food security status of the farmers;
v. evaluate the impact of NPFS on their poverty status: and
vi. identify the factors militating against the effective implementation of the program .

1.4 Justification for the study

Adequate information is an indispensable component in analyzing and making well informed decisions. Sustainable food production for increased food availability, affordability and rural income can be achieved through proper implementation of programmes like NPFS, which are targeted towards improving the livelihood of smallholder farmers. Consequently, there is the need to evaluate the impact of such programme on the targeted beneficiaries to ascertain the achievements of the programme. This will generate the required information needed for proper and informed decisions by policy makers and international donor agencies.

It will also provide post evaluation assessment information that may be needed in planning similar programmes. This is needed to improve the plans and measures to redirect efforts and resources towards enhancing the quality of livelihood of rural farmers who produce over 90% of food consumed in the country. It is expected that the findings of the study will enable the stakeholders to see the quality and quantity of impacts of the second expanded phase of NPFS on the targeted programme outcomes.

Identifying the main factors causing technical inefficiency is a sure way of determining improvements in future programmes that are concerned with improving the technical efficiency and income level of smallholder farmers. Also, assessing the connection between the NPFS and poverty reduction will go a long way in shaping future plans of related programmes. It is believed that the findings of the study could be useful to those involved in decision-making process at the farm level, state, national level and donor agencies by identifying the factors contributing to efficiency, household food security and poverty reduction in the country. Also, it could provide basic information about better project management practices to enhance the effectiveness of project implementation in the study area.

Furthermore, the study will be of great importance to the donor agencies in rating the recipients' worthiness and readiness to partake in such programme in the future. It is expected that the findings will assist donor officers in designing flexible, effective and efficient packages that would serve the interest of the Government and the farmers.

Similarly, the findings of the study will assist planners and policy makers in taking the appropriate measures and making policies that could better the livelihood of the smallholder farmers in the country, which could lead to achieving household food security and reducing poverty in the nation. Finally, it is expected that the study would assist researchers who will identify other areas for further studies on food security, smallholder productivity and poverty alleviation in the nation.

1.5 Scope of the study

This study was restricted to the assessment of the impact of the second expanded phase of NPFS (2007—2013) on the smallholders' income, technical efficiency, food security status and poverty reduction on the targeted beneficiaries in the three states. Emphatically, only the new expanded sites served as the study working population. With adequate baseline data of the selected programme sites at hand, both experimental and non-experimental approaches to impact assessment was adopted in the study. Data at both farm and household levels were employed in the study. In the conducted reconnaissance survey, beneficiaries in all the selected sites that were involved in rain fed food crop production component served as the sampling frame, from where the sample size was formed.

1.6 Hypotheses for the Study

The hypotheses that were tested in this study are: -

1. NPFS has no impact on the income of farmers in the study areas.

2. NPFS has no impact on the household food security of small holder farmers in the study area.
3. NPFS has no impact on the poverty status of farmers in the study area.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The Concepts of Food Security and Food Insecurity

The concepts and definitions of food security and insecurity have been discussed for a long period of time. There is much literature on the concepts and definitions of food security. Since its evolvement it is defined in different ways by international organizations and researchers. According to Hoddinot (1999) there are close to 200 definitions and 450 indicators of food security. Maxwell and Frankenberger (1992) also mentioned the many definitions and indicators of food security.

In the early periods the question was on whether a nation or a region could get enough food to meet the cumulative requirements of its population. This implies that special attention was given to fluctuations in aggregate food supply. Food security interventions were also primarily concerned with providing effective shock absorber mechanisms against such fluctuations. Such conceptions could be clear from the definition of the World Food Conference of 1974 (Barrett 2002).According to the World Food Conference of 1974, food security was defined as: ***'****availability at all times of adequate world food supplies of basic foodstuffs…to sustain a steady expansion of food consumption…and to offset fluctuations in production and prices'***.

However it was soon realized that this definition gave a very limited view of the food security problem. It is so because a large number of a population could be living in hunger even if the country had sufficient food in the aggregate during normal times. It is also a paradox that global food security exists alongside individual food insecurity. It is known that the world produces enough food to feed every one. However, there are countries in the world, regions within countries, villages within regions, households within villages and individuals within households that are not able to meet their basic food requirements. This means that adequacy at the national level does not necessarily

ensure adequacy at the household or individual level. As a result, food security had advanced from emphasizing the supply side through the individual and household level (demand side) for improved access to food in the 1980s (FAO, 1983). In the 1990s, improved access was redefined by taking into account livelihood and subjective considerations. It emphasizes a broader framework of individual behavior in the face of uncertainty, irreversibility, and binding constraints on choice (Osmani, 2001). The most widely used definition of food security is the one forwarded by the World Food Summit in 1996 and broadly set as '*Food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life'* (FAO, 1996). This definition integrates stability, access to food, availability of nutritionally adequate food and the biological utilization of food.

At the World Summit of Food Security in 2009, this definition was reconfirmed, and the concept was extended and specified by adding that the "four pillars of food security are availability, access, utilization, and stability" and stated that "the nutritional dimension is integral to the concept" (FAO, 2009). The strength of this definition is its comprehensiveness and imperative for "concerted actions at all levels" (these are "individual, household, national, regional, and global levels") and "coordinated efforts and shared responsibilities" across institutions, societies, and economies to tackle food insecurity effectively (FAO, 1996). Furthermore, poverty is regarded as the major obstacle to achieving food security at the household level. Therefore, poverty eradication is essential to improve access to food (FAO 1996). As Sen (1981) pointed out, adequate food supply is only one of many preconditions of having enough food to eat, while the causes of hunger and starvation may be of other nature.

Food security concepts and definitions have developed over the past thirty years to reflect its complexities and dimensions. Hence, the current concept emphasizes the

role of multiple factors that affect the household's or individual's ability to acquire enough food all the times (Maxwell, 1996). Consistence with these definitions, food security can be defined with the main emphasis on food availability, access, stability, acceptability and utilization.

The other concept that is worth mentioning is the issue of food insecurity. It is believed that people who frequently do not have enough to eat according to accepted cultural norms created a crisis. For this reason, the phrase '*Food Insecurity'* was used to describe the instability of national or regional food supplies over time. It was then expanded to include lack of secure provisions at the household and individual level. Food insecurity concern may be due to either inadequate physical availability of food supplies, poor access among the population, or inadequate utilization of food (Habicht *et. al*., 2004).

Food insecurity is classified as chronic or transitory. Some other literature also include a third kind of food insecurity; i.e., cyclical type of food insecurity. Chronic food insecurity occurs when a household is persistently unable to meet the food requirements of its members over a long period of time. It, therefore, afflicts households that persistently lack the ability to either buy food or produce their own. Structural factors contributing to chronic food insecurity include poverty (as both cause and consequence), the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2002). On the other hand, transitory food insecurity refers to a temporary decline in a household's access to enough food. It results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness or unemployment, instability in food prices, production, household income or combination

of these factors. Finally, the cyclical type of food insecurity is caused by seasonality (FAO, 2006).

In general, a household can be said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a household should be able to cope with short-term variations without sacrificing the nutritional needs of any of its members. Finally, the concept and definition of food security were developed and clearly explained based on the growing hunger, food insecurity and malnutrition situations in developing countries. From the above definitions of food security, slight variations were observed. However, the overall basic principles and definitions of food security, that is, "availability, access, stability, acceptability and utilization" were stressed in the definitions cited above. Therefore, for the purpose of this study, the definition put forward by the World Food Summit (FAO, 1996) was taken as a working definition of food security and the household level is considered as the key unit of food security analysis.

The concept of food insecurity includes not only the lack of availability, access, and utilization or use of food (for example, food preparation and intra-household food distribution), but also perceptions (for example, that food is insufficient, inadequate, unacceptable, uncertain, or unsustainable) (Wolfe and Frongillo, 2000). Food insecurity has been defined as the inability to acquire or consume an adequate quality of sufficient quantity of food in socially acceptable ways, or the uncertainty that one will be able to do so (Radimer *et al*., 1990). Food insecurity as experienced in other locations is likely to be somewhat different but will include similar components that go beyond availability and access. Food security affects dietary intake and ultimately, nutritional status and physical well-being. Although measures of dietary intake of individuals can assess some aspects of food insecurity, such as caloric insufficiency and nutrient

inadequacy, they do not assess the cognitive and affective components of uncertainty (expressed as anxiety), unacceptability, or un-sustainability.

Food security, on the other hand, refers to the condition in which all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 1996). Food availability, stability of supplies and food accessibility over time are related determinants of food security.

2.2 Food insecurity: Causes and Solutions

Despite considerable efforts of national governments and the international community to reduce hunger and malnutrition in the context of the Millennium Development Goals (MDGs) and other initiatives, the proportion of undernourished people in developing countries has been largely constant since the mid-1990s (FAO, 2010). While some progress in hunger reduction had been made until 2007, the 2008 global food price crisis and subsequent food price increases in local markets have pushed millions of people into food insecurity (FAO, 2009).

The main causes of this rise in global and national food insecurity include trade restrictions imposed by major food exporters, biofuels policies, and increased food commodity speculation combined with poor national and local governance to cope with such shocks. Besides, longer-term dynamics such as climate change and mounting food demand through changing dietary patterns and growing populations have strained international food markets and are expected to lead to further rising food prices and increasing price volatility (FAO, 2011). This will in turn lead to more food insecurity among vulnerable groups especially in developing countries like Nigeria.

A broad range of policies has been proposed to reduce the vulnerability of the world's poor to global food price increases, including amendments in global trade rules that restrict the possibility of food exporters to impose export bans, stricter rules on

biofuel production and food commodity speculation, the institutionalization of grain reserves to stabilize prices in times of crises, and the creation and expansion of national social safety mechanisms, in addition to a boost in investments to raise agricultural productivity and adapt to changing climate sustainably (World Bank, 2012). However, few of the proposed policies have been implemented so far, and the return to lower food prices after the 2008 global food price crisis was short-lived. In 2011, international food prices increased for the second time within three years, sparking concerns about a repeat of the 2008 crisis and related consequences for the poor (World Bank, 2012).

Both the causes of recent food crises and the proposed responses show the complexity of the global food system and highlight the growing importance of factors that go beyond agriculture and the household level. Yet, interventions to address food insecurity have often focused on agriculture-based approaches and have been geared towards improving households' access to food. Nonetheless, Millennium Development Goals (MDG) progress assessments confirm that the developing world is particularly off-track in achieving the goals closely linked to food and nutrition security (World Bank, 2012). While substantial progress in reducing extreme poverty has been made over the past two decades mainly as a result of robust economic growth in major developing countries, hunger and child malnutrition has been much more persistent. Accordingly, while the target of reducing extreme poverty (MDG 1a) may have already been reached at the global level, meeting the hunger-reduction target (MDG 1b) by 2015 will be difficult and meeting the target related to child nutrition (MDG 1c) is unlikely in sub Saharan countries like Nigeria (UN, 2011; World Bank, 2012). Achieving these goals require sustained political commitment at the highest levels because it needs an integrated approach which is often lacking in most of these countries (FAO, 2014).

The grave impacts of the recent food price increases and the disconnection between poverty reduction and nutrition improvement have ignited a broad debate about the usefulness of the conventional approaches to address hunger and malnutrition and the kind of changes that are needed. For example, the International Food Policy Research Institute (IFPRI)'s 2020 Vision Initiative draws attention to the nexus between agriculture, nutrition, and health and aims at finding solutions to better leverage agriculture for improving nutrition and health (IFPRI, 2012). Along the same line, the World Bank acknowledges that "in the longer term, the focus should be broadened to strengthening the link between smallholder agriculture and nutrition, addressing seasonal food deprivation, and promoting girls' education and women's income" (World Bank, 2012).

The concept of food security problem is complex and goes beyond the simplistic idea of a country's inability to feed its population. Though, the issue of serious food and nutrition problem is associated with less developed countries, the main dimensions of the problems in individual countries are different. This has encouraged misleading generalizations about the causes, effects and remedies for the problem (Ojo, 1991). The fight against hunger therefore demands an integrated set of actions which simultaneously addresses the causes of food insecurity (Committee on World Food Security CFS, 2005).

The root problem of inadequate access to food is poverty. This is in the sense of the failure of the economic system to generate sufficient income and distribute it broadly enough to meet households' basic needs. The problem can be addressed by either giving food directly to the poor (non-market distribution of aid); increasing their incomes so that they have greater entitlement to food through the market (given existing marketing costs); and/or reducing the costs of food delivered through markets by fostering technical and institutional innovations in farm-level production and the

marketing system (Jayne *et al*., 1994). Therefore, governments at all levels should provide the enabling environment for increasing food production which enhance food security (Egbutah, 2009).

The 1996 World Food Summit reaffirmed that a peaceful, stable and enabling political, social and economic environment is the essential foundation which will enable states to give adequate priority to food security and poverty eradication. Good governance, promotion and protection of all human rights and fundamental freedoms, including the right to development and the full and equal participation of men and women are essential for achieving sustainable food security for all (FAO, 1996). Attaining food security is therefore a primary responsibility which rests with individual governments.

Access to the components of nutrition security, over and above those required for food security, is also a challenge that must be addressed. Investments in education, sanitation, and access to health care must continue and be increased if the advances required in nutrition security are to be made (IFPRI, 2013). Ultimately, the responsibility of ensuring food security for all lies with national governments who have the duty of establishing the conditions and institutions necessary to enable their citizens have access to the basic requirements of food and nutrition security (Egbutah,2009). The basic determinants of food and nutrition security in any one African country will never be exactly the same as those of another (AU, 2005). This is because of the different historical factors, agro ecological conditions, economic comparative advantages and institutional structures at play in each of the countries. As such, a single detailed policy and action prescription will not enable national governments in different countries to effectively address malnutrition. It must however be recognized that all African countries can attain nutrition security if sufficient commitment exists. Political will must be applied and dedicated efforts made to marshal the human, institutional, and

material resources necessary for the task (Benson, 2004). For there to be improvement in food and nutrition security situation of a country, national governments must address a number of issues including the following:

i. Provision of access to sufficient quantities of food items. This may require formulation of policy for sustained, broad-based, economic growth. It is estimated that, to end hunger in Sub-Saharan Africa by 2050, a 3.5 percent annual average growth rate in per capita Gross Domestic Product (GDP) is necessary in the region (Benson, 2004).

ii. Direct nutrition interventions to provide food to those suffering from acute hunger and malnutrition, nutrition information and supplements to women of childbearing age and young children are necessary. Such interventions are a vital component of any effort to build the quality of human capital, encourage economic growth, and improve standards of living (MCC, 2011).

iii. Enhancing the means to acquire food, whether through cash incomes or access to productive resources. Considering the importance of agriculture as a source of income to rural households, there is a need for improvement in their agricultural production. The effectiveness of on-farm production determines the level of access to food enjoyed by both farmers and the broader population to whom they are linked through the market. Increased food supplies simultaneously increase the income of farming households and reduce the prices people pay for food in the market place, both of which enhance food security and reduce poverty. Moreover, increases in the production of both food and non – food crops contribute to the broader economy, both in rural areas and in urban manufacturing centers (Nchuchuwe and Adejuwon, 2012).

iv. The issue of gender equity must be addressed, as a close link exists between improved child nutrition and the extent to which women participate in making

economic decisions within their households. Greater social equity enhances women's access to resources thereby increasing the diversity and quantity of food they can provide and improving the level and quality of the care they can give to their dependents (Ukeje, 2004; MCC, 2011).

v. Locally conceived and implemented action has been shown to be the most effective way to improve food and nutrition security. National governments should give broad direction to local efforts and facilitate the success of such efforts through resource allocation, institutional support, and the provision of necessary expertise.

vi. Central governments should ensure that budgetary allocations reflect the central importance that food and nutrition security have for the welfare of all people, as well as the immense economic benefits they provide for relatively little cost. In this regard, donor funding should be viewed as a secondary resource, and used to complement the resources allocated by governments (Ukeje, 2004; FAO, 2014).

vii. Dedicated advocacy should be used to inform policymakers at all levels of the critical role that improved nutrition plays in development and poverty alleviation (UNICEF, 2013). Without this, it is unlikely the malnourished will receive any attention in any planning and resource allocation decisions made in the democratic, decentralized, bottom-up political systems emerging across Africa. The need to improve food and nutrition security must be communicated effectively and understood widely; its significance for the welfare of all members of society must be recognized. Ultimately, advocacy must build the political will needed to ensure that resources are provided to help individuals and households attain food and nutrition security.

2.3 Problems of Food Security in Nigeria

At the national level, per capital growth of production of major food in Nigeria has not been sufficient to satisfy the demand of an increasing population (Kormawa, 1999). A significant breakthrough in productivity to efficiently guarantee domestic self-sufficiency is still constrained by a number of problems. Some problems include: inadequate supply of farm outputs, access to capital, environmental hazards, low level of education, poor extension services, and communal / religious crisis etc. (Ukeje, 2004; Egbutau, 2009).

2.3.1 Inadequate supply of farm outputs

The unavailability of major farm inputs (fertilizers, seeds, agrochemicals and machineries) critical for agricultural production at the appropriate time and at the right price has remained a source of worry. Despite government effort in procurement and stabilization of such farm inputs, there still remain problem of unavailability, accessibility and affordability of farm inputs (Ukeje, 2004; Egbutah, 2009).

2.3.2 Access to capital

Small scale farmers have limited access to capital, this is more pronounced for female farmers who in most cases do not have much needed collateral in form of land and are handicapped due to limited resources and access to this capital (Ukeje, 2004; Egbutah, 2009).

2.3.3 Environmental hazards

The problems of drought/desertification as well as soil erosion have remained very serious for Nigeria agriculture. This problem often manifest in the form of soil degradation and deforestation. Climate change has also adversely affected food security as manifested by shorter rainy season and flooding across the country (Ukeje, 2004;

Nwajiuba, 2012). While some of these forces are caused by natural forces, they could also be caused by direct result of overgrazing, over cultivation, bush burning and deforestation associated with increased population and poor cultivation practices.

2.3.4 Low level of education

The low level of education among small scale farmers has remained a major constraint to the adoption of major farming techniques and the ability to access other inputs necessary for increased productivity in the sector (Kaliisa, 1999). Most small scale farmers are illiterates with no formal education like other rural dwellers (Egbutah, 2009).

2.3.5 Inadequate capital expenditure

Agricultural share of the total capital expenditure over the years has been low. There is need to increase the fund allocated to the agricultural sector if the much talked about food security is to be achieved (Jones and Wolf, 1999). Inadequate funding of the sector reflects its low priority in the country's political agenda or the lack of understanding of its challenges (Ukeje, 2004; Egbutah, 2009).

2.3.6 Communal / religious crisis

This constitutes a major threat to food security in Nigeria. In most communal/religious crisis, food reserves are usually burnt completely and food crops on the farm are usually destroyed too (Brown, 2000). The whole agricultural production system from the farms to the consumers is disrupted leading to food shortages (Ukeje, 2004; Egbutah, 2009).

2.3.7 Poor extension services

Agricultural extension services are established for the purpose of changing the knowledge, practices, skills, attitudes of rural people (Watts, 2001). Agricultural extension assist farm people through educational procedures in improving farming methods and techniques, increasing production efficiency and income, changing their

level of living and lifting the social and education al standard of rural life (FAO, 1997). Extension services and training has not been very effective in achieving the purpose for which it has been established (Egbutah, 2009). As such, there is need to train and empower extension staff to ensure that they deliver quality services.

2.3.8 Post-harvest losses

Due to inefficiency in our harvesting, processing and storage facilities, lots of agricultural produce are being lost or destroyed during the stage of post-harvest. This situation has a discouraging effect on the farmers as they struggle to sell most of their crops immediately after harvest resulting in cut throat competition and low prices. It is estimated that about 15-20% of the crops produced are lost before they can be consumed (Ukeje, 2004).

2.4 Changes in Nigerian Governments' Polices at Achieving Food Security

Since independence, every administration has made efforts to achieve food security in the country. In the 1960s, Nigeria depended on agriculture to provide infrastructure and run services until the discovery of oil in the country (Nchuchuwe and Adejuwon, 2012). In the 1970s, the Government introduced the National Accelerated Food Production Programme and the Nigerian Agriculture and Cooperative Bank were established to increase food production and fund agriculture. These were followed by Operation Feed the Nation and the Green Revolution in 1976 and 1980 respectively. The programmes were designed to revolutionize the agricultural sector of the Nigerian economy, which was performing poorly. For instance, between 1965 and 1970 the percentage share of agriculture in total GDP was 54.8%. This dropped to 38.6% between 1971 and 1975 and reduced further to 21.1% from 1976 to 1980. To make the programmes more effective, farmers most especially in the rural areas were taught farming practices and agriculture was made compulsory in all secondary schools. In addition, eleven numbers River Basin Development Authorities (R.B.D.A) were

established to facilitate irrigation agriculture as an attempt to expand production. Also, farm settlements were established for cash and food crops to reduce food importation and encourage exportation (Oriola, 2009).

DFRRI and NALDA were established to open up rural areas by building roads, provision of basic amenities and clearing of land for agricultural purposes in order to boost agricultural production, diversify the rural economy and reduce poverty. These and other previous government's efforts between 1981 and 1985 yielded some good result as the contribution of agriculture to GDP rose from 34.7% in 1981 to 40.3% in 1985 (Oriola, 2009) but thereafter declined until 2002 when it began to rise (see table 2.1). These increases were as a result of various government interventions in the agricultural sector between 1999 and 2002. Although they succeeded in increasing agriculture's contribution to the GDP, they were not able to achieve national food security as the quantity of food imported into the country kept increasing (Ukeje, 2004; Oriola, 2009). Despite all these efforts, not less than 65% of Nigerians are food insecure (Mohammed, 2008). According to the NBS (2012), 51.8% of the population in northwest Nigeria is food poor in 2010. Nigeria still depends on food importation to feed its citizens and in recent years, the contribution of agriculture to the Gross Domestic Product (GDP) is on the decline as shown in Table 2.1.

Table 2.1: Contribution of Agriculture to the Total GDP (2000 – 2012)

Year	Total GDP (₦ billion)	Agric share of GDP	% Share of Agric. in Total GDP
2001	431.78	182.66	42.30
2002	451.71	190.37	42.14
2003	495.01	203.01	41.01
2004	527.58	216.21	40.98
2005	561.83	231.46	41.19
2006	595.82	248.60	41.72
2007	632.86	267.06	42.20
2008	672.20	283.18	42.13
2009	718.98	299.82	41.70
2010	776.33	317.28	40.87
2011	834.00	335.18	40.19
2012	888.89	348.49	39.21

Source: CBN (2012)

2.5 Overview of the National Program for Food Security (NPFS)

As a follow-up to the 1996 World Food Summit, Nigeria as one of the 82 Low-income food deficit countries (LIFDCS) requested for assistance from the Food and Agriculture Organization (FAO) to establish its National Special Programme for Food Security (NSPFS). This is aimed at achieving food security and reduction in poverty as a step to realize the first Millennium Development Goal (MDG 1) which is reducing by half hunger and extreme poverty by 2015. The Federal Government of Nigeria (FGN) with assistance from FAO implemented the Special Programme for Food Security (SPFS) as a pilot programme in Kano State, with the objective of identifying, adapting, testing and promoting intervention packages that promote growth in the agriculture sector. The SPFS was further up-scaled into a five-year nationwide National Special

Programme for Food Security (NSPFS) between 2001 and 2006, covering the whole country (3 sites per state which gave a total of 109 sites).The programme was funded mostly by the FGN, states and local governments in the country while the FAO provided technical implementation assistance. International donor agencies including African Development Bank (AfDB) and Islamic Development Bank (IDB) also provided some funds for the programme. The FGN administered the funds. The states must pay their counterpart funds to the FGN in order to access the required funds.. The programme covered about 30,000 farm families. The nationwide NSPFS programme first phase was completed in June 2007.

The second expanded phase of the NSPFS called the National Programme of Food Security NPFS (2007-2013) started after the completion of the NSPFS in 2007. While NSPFS was operated in 109 sites, one site per senatorial district, the NPFS involved expansion to three sites in each senatorial district. Therefore, 218 new sites were added to the existing 109 sites. Thus, the expansion phase covered 327 Local government areas (LGA), slightly less than half of the total number of LGAs in the country with one site per LGA. It is expected that about seventy thousand (70,000) farm households (HH) would benefit directly from the programme while another 785,000 households would benefit through the outreach component. As with the NSPFS, the general objective of the NPFS is to increase national and household food security through the development of smallholder agriculture, increase incomes and reduce poverty in an economical and environmentally sustainable basis (NPFS, 2007). It emphasized the use of tested technologies, grassroots participation and South-South cooperation (Oriola, 2009). The specific objectives of the program include the following:-

i. improve household food security and incomes through increases in agricultural productivity, diversification and sustainable use of natural resources.

ii. enhance food security of consumers through improved availability of and access to a variety of foods;

iii. increase the incomes of producers through the adoption of value addition to primary products and more efficient marketing.

iv. enhance farmers and consumers access to support services such as extension, credit, nutrition and health education ; and

v. foster the participation of poorer section of the rural population such as women, youths and other vulnerable groups into the development of the community.

These objectives are to be achieved through four components.

Component 1: Site Development and Outreach

The objective of this component is to improve agricultural productivity, enhance processing, on farm storage and promote diversification of agricultural enterprises. It has the following sub components.

- Crop intensification
- Water use and control
- Soil fertility management
- Agro forestry
- Animal production and health
- Aquaculture and Artisanal Fisheries Development
- Agro processing and On-farm storage
- Research Extension Farmer-Input linkage
- Nutrition and Health

Component 2: Community Driven Development

The objective of this component is to create awareness and facilitate the participation of rural communities in the programme through group formation and strengthening of existing ones. It has the following sub components.

- Group and Community Development
- Marketing of Agricultural Inputs and Commodities
- Rural Finance

Component 3: Rural Infrastructure Component

This component is to provide and develop such infrastructure as feeder roads, culverts, drainages, markets and small earth dams where needed by the participating communities.

Component 4: Project Management Support Component

The component is to provide for both institutional and operational support for the implementation of the program. The Federal Ministry of Agriculture and Rural Development (FMARD) are responsible for national implementation through its Projects Coordinating Unit which coordinates implementation activities between Federal and States Governments. The FAO provides technical and advisory support for program implementation. The sub components are;

- Federal Government Level Coordination
- State Government Level Coordination
- Local Government Area Level Coordination
- Planning, Monitoring and Evaluation

2.6 Measurement of food security

As defined previously, food security refers to sustainable access by all people at all times to sufficient food for an active and healthy life, whereas food insecurity refers to the lack of access to enough food for an active healthy life. Thus, according to many researchers, the determinants of food insecurity are also classified within the framework of the general definition of food security, that is, food availability, access, stability and utilization (Maxwell and Frankenberger 1992; Hoddinott 1995; Ahmad, 2010) while some other researchers gave more attention only on access and utilization of food and

the determinant of food security can be seen as a combination of two distinct problems (Sen, 1981; Osmani, 2001). Within the history of food security direct measurement, four instruments have been influential: the Food Sufficiency Status Question (Bickel *et al*., 2000); the Community Childhood Hunger Identification Project instrument (Wehler *et al*., 1995), the Radimer/Cornell instrument (Radimer *et al*., 1990), and the U.S. Department of Agricultures' Food Security Survey Module1 (FSSM) (Bickel *et al*., 2000).

All consist of a question or a series of questions asked, generally as part of a telephone survey, to the person in the household most responsible for food preparation and provision. The Food Security Survey Module (FSSM) was developed on the basis of the preceding three instruments and now represents the most widely used and most tested food security direct measure. Methods for assessing whether families in developing countries are meeting their food needs have evolved over time, but measuring food security has always been difficult due to a lack of sufficient nationally representative data collected at the household or individual level (Smith *et al*., 2006). Measurement is typically indirect and based on food balance sheets and national income distribution and consumer expenditure data. To measure household food security, a food security index was constructed. This involved two steps: identification and aggregation. Identification is the process of defining a minimum level of nutrition necessary to maintain healthy living — the "food security line" for the population under study, below which households are classified as food-insecure. Aggregation on the other hand derived food security statistics for the households (Omotesho *et al*., 2006).

Food security was traditionally measured through aggregate sustainable food supplies, food availability, accessibility, and adequacy (Busch and Lacy, 1984). In many developing countries, particularly in Sub-Saharan Africa, food security is commonly measured through consumption and anthropometric measures. Maxwell and

Frankenberger (1992) listed 25 broad indicators and a host of other indicators related to the different aspects of food security. Following FAO (2003), five general types of methods/indicators are identified. These are undernourishment measure, food intake measures, anthropometric measures, food accessibility measure and Household Food Security Scale (HFSS) module. Among the methods of measuring households' food insecurity highlighted above, Food-Energy intake approach as used by Foster, Greer and Thorbecke (1984) was adopted for the study because of its effectiveness, simplicity and ease of computation.

This method involves defining a food insecurity line for the study area using a regression of the Cost-of-calorie of food consumed by each household on the calorie equivalent. Therefore, the food insecurity line is given as

$$\ln E = a + bC \quad \ldots\ldots\ldots\

Where P_α is degree of food insecurity for α taking values of 1, 2 and 3 for headcount, short-fall and severity of food insecurity, n is the number of food insecure households, G_i is the *per capita* calorie intake deficiency of the i^{th} household.

2.7 Determinants of Food Security

The socioeconomic characteristics and resources of individual households have been identified as the basic factors influencing the food security status of households in southwest Nigeria (Sanusi *et al.,* 2006). Kidane *et al.* (2005) in a study conducted in Ethiopia identified household size, education and farmland size and land quality as determinants of food security status of a household. Educational attainment by the household head could lead to awareness of the possible advantages of modernizing agriculture by means of technological inputs; engage them in diversification of household incomes which, in turn, would enhance households' food supply. Amaza *et al*. (2006) in a study on the determinants and measurements of food security in Nigeria noted that the major determinants of food insecurity are: household size, gender, educational level, farm size and types of household farm enterprise. They concluded that policy measures towards the provision of better family planning should be given adequate attention and priority by the government in addition to improving access to education, credit facilities and agricultural extension services for rural households.

According to Nimoh *et al.* (2012) in a study on seasonal food shortages and coping strategies adopted by rural households in northern Ghana, reported that education, farm size, income from off-farm activities, income from rearing and sale of livestock/poultry and receipt of remittances were the significant variables that determined household food availability. Household size has a negative and significant relationship with the probability of household food availability. Calculated at average family size of sampled households, food security decreases with an increase in family

size. Similarly, Haile *et al.* (2005) found that household size negatively affected food availability in a study on food security in sub Saharan Africa.

Education was found to have a significant and positive relationship with household food security. Haile *et al.* (2005) in a similar study found that education had significant and positive relationship with household food security. This indicates that households with relatively better educated household heads are more likely to be food secure than those headed by uneducated household heads. An improvement in education level defined by the shift in educational level from illiterate to literate will therefore increase the probability of a household being food secure. Keeping the other variables in the model constant, farm size is positively and significantly related to household food security. As noted by Najafi (2003) in a study in Iran, food production can be increased extensively through expansion of area under cultivation. Paddy (2003) in a study conducted in Uganda and Haile *et al.* (2005) reported that household food availability is negatively related to household size while farm size has a positive relationship. Use of improved crop production technologies particularly fertilizer and seed, in the study area is another factor which was expected to have a significant impact on household food security. A positive, but insignificant relationship was found between improved technologies usage and household food security. This means users of improved technologies are likely to be food secure. Per capita aggregate production has a significant and positive influence on food security. A unit change in per capita aggregate production, calculated at sample means, results in an increase in the probability of food security.

Involvement in other employment and/or rearing of livestock/poultry has a positive and significant effect on household food security. Therefore there is a positive and significant relationship between engagement in extra income activities and household food security as discovered by Agboola *et al*. (2008) in a study conducted in

Nigeria. As noticed, any level of involvement in these extra income generating activities will result in increases in household food security.

According to Amaza *et al*. (2006) the determinants and measurement of food insecurity in Nigeria is related to household size, gender, educational level, farm size and type of household farm enterprise as major determinants of food insecurity. The study which was conducted in Borno state further revealed that the coefficient of the household size variable was negative and significant at 1% level. This shows that household with large sizes had higher possibility of being food insecure than those with smaller size and vice versa in the project area. The larger the number of less active adults (e.g. old or unemployed) and children, the higher the burden on the active members in meeting the cost of minimum household nutrition, hence the higher the level of food insecurity, and vice versa. This agrees with Kidane *et al* (2005) study in Ethiopia.

Omotesho *et al*. (2006) in their study on the determinants of household food security in Kwara state also found that farm size, gross farm income and household size are significant determinants of food security in the study area. The gender of household heads also affects the food security status of the households(Amaza *et al*,2006).The study revealed that households headed by women have higher probability of being food insecure in the project area. This according to Babatunde *et al* (2007) is because women generally have less access to productive resources as well as education. For this study, the probit regression model was adopted in order to determine the impact of the NPFS on the food security status of the respondents and also to identify the determinants of food security in the study area. The probit regression model is specified as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots + \beta_{13} X_{13} + u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.4)$$

Y = Food security status (1 = food secured and 0 = food insecure); X_1 = NPFS (1 = Beneficiary and 0 otherwise); X_2 = Age of household head (years); X_3 = Educational level of household head (number of years of formal schooling); X_4 = Farming experience (years); X_5 = Extension contact (number of contacts with extension agents and or farmers); X_6 = Membership of association (years); X_7 = Household size (number of members of the household); X_8 = Amount of credit obtained (₦); X_9 = Farm size (Ha); X_{10} = Market distance (km); X_{11} = Assets owned (₦); X_{12} = Total annual income(₦); X_{13} = Non-food expenditure (₦); $\beta_1 - \beta_{13}$ = coefficients of independent variables; β_0 = constant term; u = white noise

2.8 Concept of Poverty

Poverty is a complex human phenomenon associated with unacceptably low standard of living. It has multiple dimensions, manifestations and causes (World Bank, 2001). Poverty can be described as the level of deprivation that encompasses shortfalls or inadequacies in basic human needs, which prevent people from achieving internationally acceptable levels of well-being (Sengul and Tuncer, 2005). By and large, the poor have been described as those who cannot satisfy their basic needs of food, clothing and shelter, unable to meet social and economic obligations, lack gainful employment, are deprived of access to basic facilities and human wellbeing and unable to attain minimum standard of living (World Bank, 2001).

Poverty is a household's inability to provide sufficient income to satisfy its need for food, shelter, education, clothing and transportation (Ogwumike, 1998). Minimum standards for food are based on nutritional requirements in terms of calories and protein consumption as well as the traditional food of the people is also allowed for in the selection of the food items to give the required national stock.

Shelter and education, the number of person per room and the number of children attending school (and the level of schooling) respectively, are adopted as minimum standard. However, the problem of defining minimum standard for clothing and transportation has persisted. Poverty has been defined as the inability to attain a minimum standard of living (World Bank, 1990). The report constructed two indices based on a minimum level of consumption in order to show the practical aspect of the concept. While the first index was a country specific poverty line, the second was global, allowing cross-country comparisons (Walton, 1990). The United Nations has introduced the use of such other indices as life expectancy, infant mortality rate, primary school enrolment ratio and number of persons per physician. Poverty is seen as lack of command over basic consumption needs, which mean, in other words, that there is an inadequate level of consumption giving rise to insufficient food, clothing and/or shelter, and moreover the lack of certain capacities, such as being able to participate with dignity in society (Aluko, 1975).

Poverty has also been conceptualized in both the "relative" and "absolute" sense. This is generally based on whether relative or absolute standards are adopted in the determination of the minimum income required to meet basic life's necessities. The relative conceptualization of poverty is largely income-based or ultimately so. Accordingly, poverty depicts a situation in which a given material means of sustenance within a given society is hardly enough for subsistence in that society (Townsend, 1962). Absolute poverty refers to lack of the physical requirements of a person or a household for existence, and at its extreme, those affected are no longer able to live a life worthy of human dignity (Schubert, 1994 and Hemmer, 1994). Relative poverty exists where households within a given country have per capita income of less than one-third of the average per capita of such country (World Bank, 1990). Relative poverty

would occur where certain sections of a society do not have adequate income to enable them have access to some basic needs being enjoyed by other sections of society.

It can also be said that poverty as a way of live is characterized by low calorie intake, inaccessibility to adequate health facilities, low quality education system, low income, unemployment, and under employment and inaccessibility to various housing and societal facilities (Onibokun and Kumuyi, 1996). Poverty has the consequences of breeding social disillusion with respect to what the societal objectives are and members' responsibilities towards attainment of these objectives (Olorunsanya *et al*., 2011). A society where the majority spends 90% of their income on consumption with little or nothing for saving and eventual plough back into the economy would be impeded by slow growth. This means that the affected group would not be able to participate effectively in national development. Poverty in this sense would result in a vicious cycle reproducing itself in perpetuity.

2.9 Measurement of Poverty

Given that poverty has been correctly conceptualized, traditional approaches to measurement usually start with the specification of poverty line and the value of basic needs considered adequate for meeting minimum levels of decent living in the affected society. Poverty can be measured using the head count ratio which is based on the ratio or percentage of the number of individual or household whose income are not equal to the poverty line to the total number of individuals or households (Ahluwalia, 1978). Another method of measuring intensity of poverty is the "income gap" ratio. Here the deviation of the poor's incomes from the poverty line is average and divided by the poverty line or expressed as its percentage (World Bank, 1980).

On measurement of poverty, Foster *et al*. (1984), Grootaert and Braithwaite (1998) and Ravallion (1996) observe that the most frequently used measurements are:

i. the head count poverty index given by the percentage of the population that live in the household with a consumption per capita less than the poverty line;

ii. poverty gap index which reflects the depth of poverty by taking into account how far the average poor person's income is from the poverty line; and

iii. the distributional sensitive measure of squared poverty gap defined as the mean of the squared proportionate poverty gap which reflects the severity of poverty.

This traditional poverty analytical approach which involves the setting of a poverty line, z, for classifying households into poor and non-poor, respectively, was adopted in this study with the poverty line defined as the 2/3 of mean per capita household expenditure. The three poverty indices are commonly referred to as Foster-Greer-Thorbecke (FGT) poverty index (Foster *et al*., 1984). These are incidence of poverty, depth of poverty and poverty severity.

The measure relates to different dimensions of the incidence of poverty P_0, P_1 and P_2 were used for head count (incidence), depth and severity of poverty respectively. The three measures were based on a single formula but each index puts different weights on the degree to which a household or individual falls below the poverty line. The model is stated thus:

$$P_a = \frac{1}{N}\left(\sum_{i=1}^{n}\frac{y_i - z}{z}\right)^a \quad \ldots\ldots\ldots\

α = Foster-Greer-Thorbecke (FGT) index and takes on the values of 0, 1 and 2 for incidence, depth and severity of poverty measures respectively.

The quantity in bracket is the proportionate shortfall of expenditure/income below the poverty line.

If $\alpha = 0$, then FGT measures the incidence of poverty

If $\alpha = 1$, then FGT measures the depth of poverty

If $\alpha = 2$, then FGT measures the severity of poverty

According to Omonona (2010), the measurement and analysis of poverty are necessary to:

i. know what the situation is,
ii. understand the factors determining this situation,
iii. help design interventions best adapted to the situation, and
iv. assess the effectiveness of current policies and to determine whether the situation is changing.

The incidence of poverty (headcount index) is the share of the population whose income or consumption is below the poverty line; that is, the share of the population that cannot afford to buy a basic basket of goods. The depth of poverty (poverty gap) provides information regarding how far households are from the poverty line. This measure captures the mean aggregate income or consumption shortfall relative to the poverty line across the whole population. The poverty severity (squared poverty gap) takes into account not only the distance separating the poor from the poverty line (the poverty gap), but also the inequality among the poor; that is, a higher weight is placed on those households further away from the poverty line.

2.10 Poverty Incidence in Nigeria

Poverty is often defined based on income or money. The poor are often considered as those earning below a particular income recognized as minimum amount needed to provide the basic necessity for a living.

This is put at US$275 and US$370 per annum (Levy, 1991) for the extreme poor and for the moderate poor respectively. However, poverty is more than income; it entails lack of access to a range of basic services and infrastructures which include, education, health and farm inputs. Majority of Nigerians do not have access to the quantity and quality of food needed for a healthy living and are therefore living below the poverty line i.e. less than $1 a day. For example, by the year 2000 about 70% of Nigerians had income of less than $1 a day. The NBS in its 2010 national poverty report revealed that the rate of relative and absolute poverty had risen from 54.4% and 54.7% respectively in 2004 to 69.0% and 60.9% in 2010 respectively. Furthermore, the percentage of the population living on $1 a day rose from 51.6% in 2004 to 61.2% in 2010. In addition, 63.3 per cent of the rural population is in relative poverty and 79.2 per cent are in subjective poverty. More than four-fifths (86.5 per cent) of the households participated in agriculture in the rural areas compared with only 14.0 per cent in the urban areas. The poor participated more in agriculture than non-agriculture. Twenty-five per cent of the core poor households were in agriculture.

Poverty is increasingly being recognized as both a policy and economic problem in Nigeria (Fields, 2000); this is stressed by the Interim Poverty Reduction Strategy Paper in Nigeria as well as the Poverty and Vulnerability Assessment of the country. These documents provide trends and profile of poverty which is critical for policy analysis and design of effective poverty reduction strategies. One important consensus in the literature on poverty is that, poverty is a rural phenomenon (World Bank, 1990;

Fields, 2000). By this it is acknowledged that rural communities are worst hit by poverty. The poverty situation in Nigeria is disturbing, both the quantitative and qualitative measurement attests to the growing incidence and depth of poverty in the country.

Poverty reduction improves the quality of life of the people and provides them with the means to acquire and maintain their basic needs but the country remains vulnerable to hunger and poverty. For example, more than 60 percent of Nigerians are living on less than US$1 per day (World Bank, 2003). According to Oguntola (2008), the country ranked 20 on the 2006 Global Hunger Index (GHI). Similarly, the nation's rank in the 2013 Human Development Index (HDI) remains low, being the 132nd out of 187 countries (UNDP, 2014). The low HDI score reflects the situation of poor access to basic social services in the country (UNDP, 2004). World Bank (1995) report on poverty status in Nigeria showed that poverty incidence was more in rural areas and was characterized by poor basic facilities, food insecurity, obsolete farming practices, poor nutritional values, little access to savings facilities, inability to educate children due to high cost, inadequate diet, poor latrines, bathrooms, kitchens, limited access to good drinking water, poor electric power supply and lack of clothing materials. These were based on direct access to basic needs of households. Furthermore, poverty gap in Nigeria is widening and a greater proportion of the nation's wealth is being concentrated in the hands of the wealthiest 20% of the nation (Ali-Akpajiak and Pyke, 2003). This widening gap of inequality further marginalizes the poor and has been one of the reasons for civil strife and political instability. These issues of inequality and poverty in the rural and urban areas have necessitated governments and international agencies whose programmes have traditionally concentrated on rural areas to move (systematically) to develop strategies to improve urban livelihoods.

2.11 Review of Empirical Studies on Food Security and Poverty in Nigeria

Daudu and Ajayi (2009) assessed the performance of the NSFSP in Benue State. The study concludes that the performance of the programme was high in the following components; farm intensification, water management, diversification, fisheries, and group management based on the performance indices. While the following components: Input distribution, credit and cost recovery, agro-processing recorded low performance. They also indicated that the major problems faced by the programme were language barrier, untimely release of funds, lack of means of transportation and untimely supply of inputs.

Ayoade *et al*. (2011) investigated the impact of NSPFS on poverty alleviation among women in the three project sites of Oyo state. The women's participation has significantly improved their mobility status and water consumption. Loans provided for the project participants assisted the recipients in boosting their farm production as a result of increase in farm size cultivated. A significant relationship was found between output, level of participation, marital status and poverty alleviation level.

Oriola (2009) developed from his study titled 'a Framework for Food Security and Poverty Reduction in Nigeria' a framework for understanding the relationship between irrigation system, food production and poverty. He recognizes the natural endowment; soil and water resource of the nation for productive agriculture and irrigation technology as remedy to vagaries of weather as militating factor against adequate food production. He concludes that with the full commitment of all the three tiers of government to agriculture, through the proposed framework for irrigation projects, the projects will bring out the best from both the small and large-scale schemes all over the country. The schemes will be more functional, efficient, generate employment, enhance farmers' income and reduce poverty and at the end make food security sustainable.

Mercy (2010) carried out a study on the determinants of food security in Nigeria. She examined the determinants of food security in Nigeria with food security index (FSI) proxied by per calorie availability between 1976 and 2006 and also the structural factors influencing the food deficit profile of the country. Total Domestic Output of Food (TDOF), Food Imports (FIMP), Real Per Capita Income (RPCI), Domestic Food Price Index (DFPIX) and Share of Government Expenditure in Agric (SAGE) were identified as factors determining food security. The study brought into focus the need to increase total domestic output of food, reduce the level of food imports, and increase agricultural funding and policies that will improve income in order to achieve food security. Fluctuation in income and domestic food prices suggest transitory food insecurity as a potential problem in Nigeria.

Oluyole *et al*. (2009) opined that household monthly income and household size, respectively, increases and decreases household food security. Also revealed in the study were about 43% of the sampled households in the study area were food secure while over 57% of the households were food insecure. Hence, more cocoa farming households in the study area are food insecure than those that are food secure.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

Nutrition survey conducted by the Government of Nigeria and the United Nations Children's Fund (UNICEF) in 1993 revealed that the northern savannah zone, in which Kano, Kaduna and Katsina states are located, had the highest prevalence in the country (51%) of worsening food insecurity. Food insecurity situation in Nigeria is worsening with the passage of time due to the wide gap between the national supply and demand for food. For example the percentage of food insecure households rose from 18% in 1986 to over 40% in 2005 (Sanusi *et al*. 2006). These states are also located in the northwest geo- political zone. It also has the highest number of food poor people (51.8%) and incidence of absolute poverty (70%) in the country (NBS 2010). The zone had the highest prevalence in the country of stunting or chronic under-nutrition and alarming statistics for micronutrient deficiencies of iron, vitamin A and iodine in adults and children (UNICEF, 2013). This had led to a high incidence of malnutrition-related diseases, including kwashiorkor and goiter, which were not only undermining health but hindering agricultural production in states traditionally considered the bread basket of Nigeria. Therefore, these three states were randomly selected from the zone to serve as the study area.

Kano state is located between latitudes 11^0 30'N and longitude 8^0 30' E. The state has a land mass of about 20,760 square km (NAERLS, 2011).It has about 1,254,000ha of arable land with 443,000ha of fadama land (KNARDA).The state has the largest irrigable land area at 3milion ha (Olofin *et al*., 2008) in the country. Based on the National Population Census (NPC) figures of 2006, the state has a projected population of 10,885,071.12 in 2011 with an annual growth rate of 3%. The state is considered to be agrarian as more than 65% of the working adults are engaged in

farming and related activities as a means of livelihood. The average annual rainfall is 700mm with the mean daily maximum and minimum temperatures of 35^0 C and 19^0 C, respectively. The major crops grown in the State include sorghum, rice, maize, millet, cowpea, groundnut, sesame, soya beans, onions, tomato and other vegetables (NAERLS, 2011).

Katsina state is located between latitude 12^0 15'N and longitude 7^0 30'E in the savanna ecological zone. It has a land mass of 24,971 square kilometers. It has a total available farm land area of 1.64 million hectares; total identified Fadama area is 36,139 ha with irrigable fadama area of 25,000 ha. Rainfall in Katsina state ranges from 400 to 800mm in the northern and southern parts. Based on the census figure of 2006 (NPC), the state has a population of about 5,792,579 million with an annual growth rate of 3%. Katsina state feature prominently in the cultivation of millet, sorghum, maize, rice, sugarcane, irrigated wheat, cowpea, groundnut, cotton and vegetables. The most prominent cropping pattern under rain fed is mixed cropping, where two to four crops are grown on the same farm. Each of the crops is also grown as a sole-crop. The major livestock produced in the state include cattle, sheep, goat, poultry, horses, donkey and camel (NAERLS, 2011).

Kaduna state is located between latitude 09^0 02' N and 11^0 32'N and also longitude 6^0 15' and 08^0 60'E in the Northern Guinea Savannah. According to the 2006 census report, Kaduna state has a population of 6,113,503 million with an annual growth rate of 3%. It has a land area of about 48,473.2 square kilometers. It has 2.2 million hectares of arable land of which about 80,000 ha is fadama area. Majority (61%) of the population comprise of small-scale subsistence agricultural producers. The mean annual rainfall is 1,524mm which spreads within 7-9 months, depending on the year. The annual temperature range is between 14.6^0C and 36^0C. The soil and the climate favors the production of a wide variety of crops, which includes legumes (groundnuts,

soyabean, lima bean, bambara nut and pigeon pea); cereals (maize, millet, sorghum and rice) solanecious crops (peppers, tomato, garden egg, potato, tobacco and other vegetables); tree crops (guava, cashew, mango, oranges, paw paw and oil palm); and root and tuber crops (yam, sweet potatoes, coco-yam ginger and cassava) National Agriculture Extension Research Liaison Service (NAERLS, 2011). The state is also a major livestock producer.

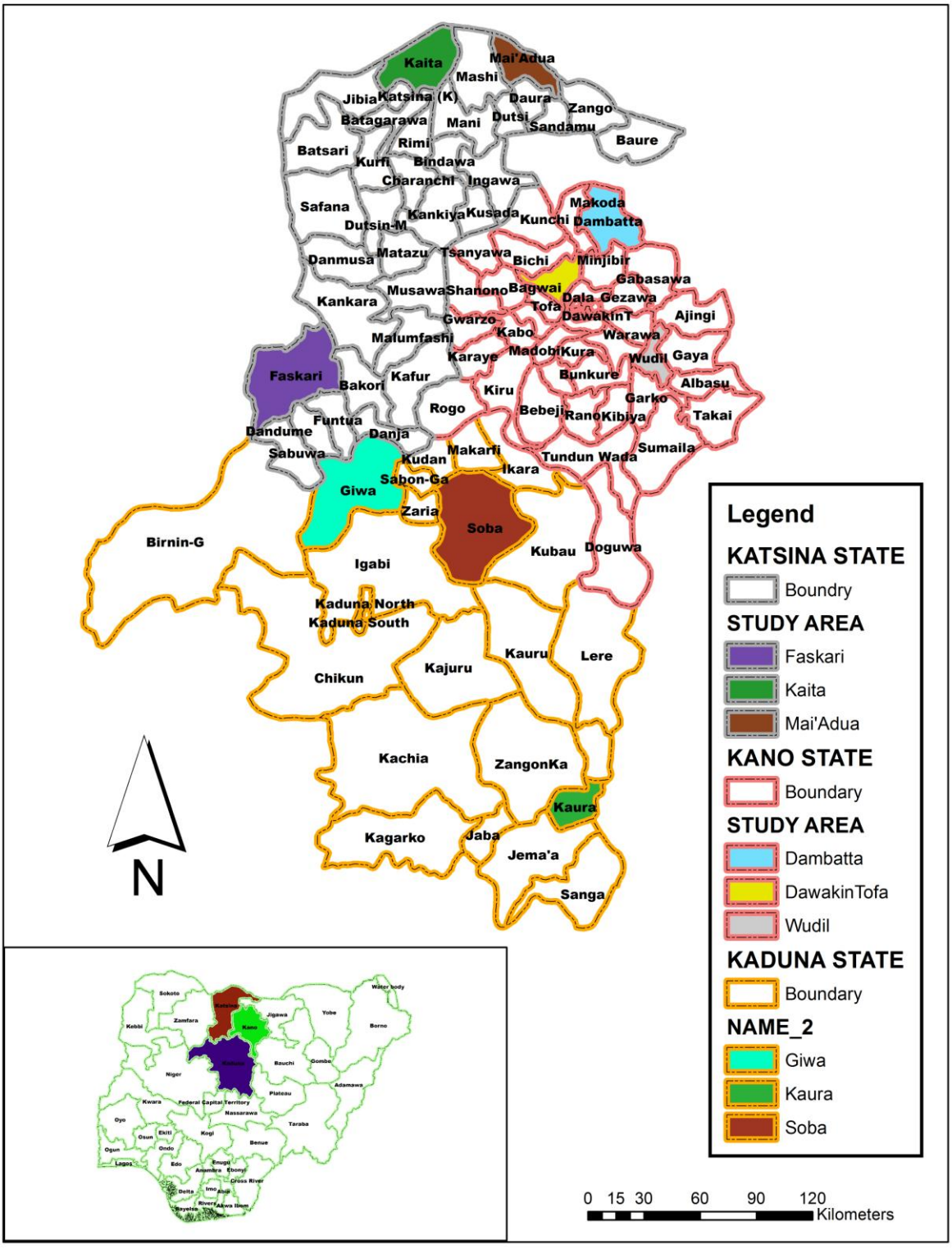


Figure 3.1: Map of Nigeria showing the study states

3.2. Sampling Technique and Sample Size

A multi-stage sampling technique was employed to select the beneficiaries and non-beneficiaries for the study. New sites established in the year 2007 under the expanded phase (2007-2013) were used in the study. In the first stage, one new site from the expanded NPFS phase was randomly selected in each senatorial district of each study state. Therefore, a total of nine sites i.e. three sites per state were used in the study. A site is a cluster of wards in a village. The new sites were selected based on the fact that the study is on the expanded phase of the programme. In the second stage, 5% of the total beneficiaries from each site were randomly selected from the list of male and female participants by balloting techniques. The list of the beneficiaries was provided by the KNARDA, KADP and KTARDA for Kano, Kaduna and Katsina states respectively. The beneficiary sample size was 221. Similarly, equal number (221) of non-beneficiary farmers was randomly selected using the ballot box technique from the same areas for comparison with the beneficiaries (treatment group) to achieve the stated study objectives. They were purposively selected due to their non-participation in any NPFS activity. Therefore, a total number of 442 respondents were used in the study (Table 3.1).

Table 3.1: Distribution of Respondents based on sex and the study sample size

State	LGA	Site chosen	Beneficiaries					Non-beneficiaries				
			Male	5% selected	Female	5% selected	Sample size	Male	5% selected	Female	5% selected	Sample size
Kano	Danbatta	Sajin Dawa	430	22	90	5	27	430	22	90	5	27
	Dawakin Tofa	Lanjan	941	47	154	8	55	941	47	154	8	55
	Wudil	Makera	720	36	130	7	43	720	36	130	7	43
		Total	2091	105	374	20	125	2091	105	374	20	125
Kaduna	Soba	Turawa	145	7	22	1	8	145	7	22	1	8
	Giwa	Ugw. Kanawa	717	36	42	2	38	717	36	42	2	38
	Kaura	Fadan Attakar	424	21	40	2	23	424	21	40	2	23
		Total	1286	64	104	5	69	1286	64	104	5	69
Katsina	Kaita	Kaita	201	10	22	2	12	201	10	22	2	12
	Maiadua	Tsabu	119	6	16	1	7	119	6	16	1	7
	Faskari	Faskari	135	7	10	1	8	135	7	10	1	8
		Sub-total	**455**	**23**	**48**	**4**	**27**	**455**	**23**	**48**	**4**	**27**
		Total		**192**		**29**	**221**		**192**		**29**	**221**

Sources: KNARDA, KADP and KTARDA (2007)

3.3 Data Collection

The primary data were collected through the use of pretested and validated questionnaire administered to both beneficiaries and non-beneficiaries of NPFS. Information collected was based on 2013 cropping season, the year for before was 2008 and after was 2013. The questionnaire was pre-tested among the beneficiaries and non-beneficiaries of NPFS in two sites namely Faskari and Turawa in Katsina and Kaduna states respectively. The structured questionnaires were administered to the respondents in all the study sites between November and December 2013. This was done with the help of properly trained enumerators from the planning and monitoring (PME) units of the ADPs in the three states. The respondents were visited in their homes and farms for interview sessions conducted through the use of structured questionnaires administered by the researcher and research assistants. The information collected included: socioeconomic characteristics such as age of farmers, household size, years of schooling, years of farming experience and years of membership of agricultural cooperative organizations. Others were outputs and inputs used in productions, total farm size in hectares, annual incomes in naira, food and non-food consumption patterns of the respondents and their expenditure. Information was also collected on the constraints of implementation of NPFS in the study area.

3.4 Analytical Techniques

The tools of analysis that were employed to achieve the objectives of the study

i. Descriptive statistics

ii. Double difference estimator

iii. Stochastic frontier production function,

iv. Foster, Greer and Thorbecke (FGT) food security index

v. Foster, Greer and Thorbecke weighted poverty index

vi. Probit regression analysis

vii. Logit regression analysis

viii. Paired t-test

ix. Z-test

3.4.1 Descriptive statistics

The descriptive statistics such as the mean, standard deviations, frequency distribution and percentages was used to describe the socioeconomics of the sampled farmers (objective i) and the constraints militating against effective implementation of NPFS in the study area (objective vi).

3.4.2 The difference in difference estimator

The difference in difference (or "double difference") estimator is defined as the difference in average outcome of the beneficiary group before and after treatment minus the difference in average outcome in the non-beneficiary group before and after treatment: it is literally a "difference of differences." Double difference method is a standard programme evaluation tool used to measure potential impacts (Verner and Verner, 2005). Its advantage is that it nets out the effects of additive factors whether observable or unobservable that have fixed(time invariant) impacts on the income indicator such as the farmer's ability or the inherent quality of natural resources, or that reflect common trends affecting project participants and non- participants equally such as changes in prices and weather (Ravallion, 2005). This model was used to achieve objective (ii) which is to evaluate the impact of the NPFS on the incomes of both beneficiaries and non-beneficiaries in the study area. To use this model, information on both projects beneficiary and non- beneficiary is often required for before and after programme intervention. In the study, the year for before project was 2008 and after was 2013. The annual income from the following farming activities (maize, sorghum, millet, soyabean, cowpea, groundnut

and rice) and non-farming activities (teaching, trading, transportation, handcraft and civil service) of the beneficiaries and non-beneficiaries of NPFS in the three states was used for this study.

The Verners model adapted for this study is specified in equation (3.1) as follows:

$$DD = \left[\left(\frac{1}{P}\sum_{i}^{P}(\bar{Y}_{tia} - \bar{Y}_{tib})\right) - \left(\frac{1}{C}\sum_{j}^{C}(\bar{Y}_{oja} - \bar{Y}_{ojb})\right)\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where:

$\bar{Y}_{tia}$ = Income variable of beneficiary after NPFS

$\bar{Y}_{tib}$ = Income variable of beneficiary before NPFS

$\bar{Y}_{0ja}$ = Income variable of non-beneficiary after NPFS

$\bar{Y}_{0jb}$ = Income variable of non-beneficiary before NPFS

P = number of beneficiaries

C = number of non-beneficiaries

DD = the difference between the average changes in the income for the beneficiaries and non-beneficiaries. The difference in the changes will indicate how the programme has impacted on the incomes of the respondents. A positive and significant income difference value implies a positive project intervention on the beneficiaries.

3.4.3 Paired t-test

Paired t-test was used to achieve part of objective ii which is to evaluate the impact of the NPFS on the total annual incomes of both beneficiaries and non-beneficiaries and to test hypothesis i of this study which is National Programme on Food Security has no impact on the income of farmers. A paired t-test was used to compare two population means where you have two samples in which observations in one sample can be paired with observations in the other sample. The annual incomes from the following farming

activities (maize, sorghum, millet, soyabean, groundnut and rice) and non-farming activities (teaching, trading, transportation, handcraft and civil service) that were predominant among the beneficiaries and non-beneficiaries of NPFS in the three states was used for this study. It is used for before-and-after observations on the same subjects.

The model is specified as follows:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n} + \frac{S_2^2}{n}}} \quad \ldots\ldots\ldots\

Where

Yi represent the output level of the *i*th sample farm; *f* (X_iß) is a suitable function such as Cobb-Douglas or translog production functions of vector, X_i, of inputs for the *i*th farm and a vector, *ß*, of unknown parameters. ε_i is an error term made up of two components: V_i is a random error having zero mean, N (0; σ^2_v) which is associated with random factors such as measurement errors in production and weather which the farmer does not have control over and it is assumed to be symmetric independently distributed as N (0; σ^2_v) random variables and independent of U_i.

On the other hand, U_i is a *non-negative* truncated half normal, N (0, σ^2_u) random variable associated with farm-specific factors, which leads to the ith firm not attaining maximum efficiency of production; U_i is associated with technical inefficiency of the farm and ranges between zero and one. However, U_i can also have other distributions such as gamma and exponential. N represents the number of firms involved in the cross-sectional survey of the farms.

Technical efficiency (TE) of an individual firm is defined in terms of the ratio of the observed output to the corresponding frontier output, conditioned on the level of inputs used by the firm. Technical inefficiency is therefore defined as the amount by which the level of production for the firm is less than the frontier output. This is shown in equation (3.3)

$$TE_i = \frac{Y_i^*(observed\ output)}{Y_i(frontier\ output)} = \frac{f(X_i\beta)exp(V_i - U_i)}{f(X_i\beta)exp(V_i)} = exp(-U_i) \ldots\ldots\ldots\ldots\ldots (3.4)$$

$$Technical\ Inefficiency = 1 - \widehat{TE} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

In their article Bravo-Ureta, *et al*., (1993) suggested that the stochastic frontier production function could be established in two ways. First, if no explicit distribution for the efficiency component is made, and then the production frontier could be

estimated using a stochastic version of corrected ordinary least squares (COLS). However, if an explicit distribution is assumed, such as exponential, half-normal or gamma distribution, then the frontier is estimated by maximum likelihood estimates (MLE). According to Greene (1980), MLE makes use of the specific distribution of the disturbance term and this is more efficient than COLS.

Previously, TE was estimated using a two-stage process. First, was to measure the level of efficiency/inefficiency using a normal production function. Second, was to determine socio-economic characteristics that determine levels of technical efficiency. This was done by using a probit model, with TE as the dependent variable and the socioeconomic characteristics as the independent variables. However, since 2000, the stochastic frontier and inefficiency models are jointly estimated using Limdep (Green, 2002) or Frontier computing packages, which apply MLE.

3.4.4.1 Empirical study model specification

A number of previous studies were specified as Cobb-Douglas production function to represent the frontier function. This was used to achieve objective (iii) of the study. The empirical stochastic frontier production model for the study is expressed as:

$$lnY_i = \alpha_0 + lnb_1x_1 + lnb_2x_2 + lnb_3x_3 + lnb_4x_4 + v_i - u_i \dots\dots\dots\dots\dots\dots\dots (3.6)$$

Where:

Y_i = Output (grain equivalent) of ith farmer on hectare basis

X_1 = Quantity of seed (grain equivalent per hectare) used by the ith farmer;

X_2 = Quantity of agrochemicals (litres/ha)

X_3 = Quantity of fertilizer (kg/ha)

X_4 = Labour (man-days/ha)

V_i = are random variables which are assumed to iid $N(0, \sigma_u^2)$ and independent of the U_i

U_i = which are non-negative random variables which are assumed to account for technical inefficiency in production and are often assumed to be iid $N(0, \sigma_u^2)$

α_s= vector of unknown parameters to be estimated

The technical inefficiency effect U_i in equations (3.1) is assumed to be influenced by some farm's and farmer's characteristics and is defined as:

$$U_i = \delta_0 \sum_{i=1}^{8} \delta_n Z_i \dots\dots\dots\

3.4.5 Foster, Greer and Thorbecke food insecurity index

This tool was used to determine the food security status of both the beneficiaries and non-beneficiaries of NPFS. A separate food insecurity line was defined for the study area. To achieve this, a regression of the Cost-of-calorie of food consumed by each household on the calorie equivalent as proposed by Foster, Greer and Thorbecke (1986) was used. This method has been applied to several studies, whose main focus was on food insecurity. Besides, the method satisfies the monotonicity axiom, focus axiom, symmetry axiom, transitivity axiom, and additive, and decomposability by population sub–group. Therefore, following their approach, the food insecurity line is given as

$$\ln E = a + bC \quad \ldots\ldots\ldots\

$$P_a = \frac{1}{n}\left(\sum_{i=1}^{n} G_i\right) = \frac{1}{n}\left(\sum_{i=1}^{n} \frac{Y_i - Z}{Z}\right)^{a} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.10)$$

Where P_a is degree of food insecurity for α taking values of 1, 2 and 3 for headcount, short-fall and severity of food insecurity, n is the number of food insecure households, G_i is the *per capita* calorie intake deficiency of the ith household, Yi is the household food expenditure and Z is the food insecurity line.

3.4.6 Probit regression model

This was used to achieve objective iv. However, it was employed after the food security status of the beneficiaries and non-beneficiaries were determined using the Foster, Greer and Thorbecke Food insecurity index. The Probit model is a normal cumulative distribution function and because the model is estimated using Maximum Likelihood Estimates (MLE) approach, it overcomes the difficulties arising from the non-normality and heteroskedastic variance of the error terms if Ordinary Least Square regression were to be carried out. Such models are referred to as qualitative or binary choice models (Capps and Krammer, 1985). Total farm size devoted to the following farming activities (maize, sorghum, millet, melon, soya bean, bambara nut, groundnut and rice, sweet potatoes, cassava and coco-yam) that were predominant among the beneficiaries and non-beneficiaries of NPFS in the three states was used as total farm size for this study. The model is implicitly defined as:

$$P_i = P(Y = 1|X) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.11)$$

$$P_i = P(I_i^* \leq I_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.12)$$

$$P_i = P(Z_i \leq \beta_1 + \beta_1 X_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.13)$$

$$P_i = F(\beta_1 + \beta_1 X_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.14)$$

The model is explicitly given as follows:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots + \beta_{13} X_{13} + u \ldots\ldots\ldots\ldots\ldots\ldots (3.15)$$

Y = Food security status (1 = food secured and 0 = food insecure)

X_1 = NPFS (1 = Beneficiary and 0 otherwise)

X_2 = Age of household head (years)

X_3 = Educational level of household head (number of years of formal schooling)

X_4 = Farming experience (years)

X_5 = Extension contact (number of contacts with extension agents and or farmers in 2013 cropping season)

X_6 = Membership of association (years)

X_7 = Household size (number of members of the household)

X_8 = Amount of credit obtained (₦)

X_9 = Total farm size (Ha)

X_{10} = Market distance (km)

X_{11} = Assets owned (₦)

X_{12} = Total annual income (₦)

X_{13} = Non-food expenditure (₦)

$\beta_1 - \beta_{13}$ = coefficients of independent variables

β_0 = constant term

u = white noise

3.4.7 Foster-Greer-Thorbecke's (FGT) weighted poverty index

The Foster, Greer and Thorbecke (FGT) measures of poverty are widely used because they are consistent and additively decomposable (Foster *et al.*, 1984).

This was used to determine the poverty status of the farmers. Poverty head count index, poverty gap index and squared poverty gap index was computed to measure the incidence, depth and severity of poverty of the farming households. The General Foster, Greer and Thorbecke (FGT) poverty index ($P_{\alpha i}$) can be expressed as:

$$P_{ai} = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^{a} \ldots\ldots\ldots\

To obtain the value of Z_i, the likelihood of observing the sample was formed by introducing a dichotomous response variable. The explicit logit model is expressed as:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots + \beta_{11} X_{11} + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.19)$$

Where:

Y = Poverty status (1 = non-poor and 0 = poor)

X_1 = Age of farmer (years)

X_2 = Educational level of household head (number of years of formal schooling)

X_3 = Farming experience (years)

X_4 = Household size (number of members of the household)

X_5 = NPFS (1 = Beneficiary and 0 otherwise)

X_6 = Extension contact (number of contacts with extension agents and or farmers in 2013 cropping season)

X_7 = Membership of association (years)

X_8 = Amount of credit obtained (₦)

X_9 = Total farm size (Ha)

X_{10} = Assets owned (₦)

X_{11} = Total annual income (₦)

$\beta_1 - \beta_{11}$ = coefficients of independent variables

β_0 = constant term

u = white noise

3.4.9 Comparison of two sample means

The Z- statistic was used to test the hypotheses ii and iii of the study. It is based on the comparison of the means of two groups especially when the sample size is larger than 30. The Z-statistic is expressed as follows:

$$Z = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S^2_1}{n_1} + \frac{S^2_2}{n_2}}} \quad \ldots\ldots\ldots\

3.5.2.1. Gender (X_1)

Culturally, provision of household needs and general welfare are responsibilities accorded men. Male household heads are not limited to job opportunities in their immediate environment whereas, child bearing and home keeping may limit food security among female household heads. Consequently, households headed by females may likely have high probability of being food insecure in the study area (Amaza *et al*., 2006). The negative relationship between food security status and gender is expected. Female household heads are usually saddled with the responsibility of home keeping and raising children which usually limits their engagements in some income generating activities compared to their male counterparts. This was measured as either male or female; male is scored 1 and 0 for female.

3.5.2.2 Marital status (X_2)

This was measured as 1 for married and 0 for single.

3.5.2.3 Age (X_3)

The farmer's age is measured in years. It is concerned with how old the farmer had been from birth to the time of interview. The age of the farmer, was measured as the number of years the farmer has lived on earth as at the time of the research. It was expected that respondents' age would have positive influence on the food security status of the beneficiaries of the National Programme on Food Security up to a certain level. This suggests that as household heads advance in age, their food security status increases, however it starts decreasing as they pass their active productive age (Amaza *et al*., 2009). Therefore, age could have both positive and negative relationship with food security depending on the age group of the farmers.

3.5.2.4 Educational level (X_4)

Level of education is the number of years an individual farmer actually spent in formal school. Education was measured by the number of years a respondent spent in formal schooling. The respondents were asked to give the number of years spent in primary, secondary and tertiary schools. The a priori knowledge is that when the learners spend more years in formal school, they become more proficient in reading and writing. It is expected that education would be positively associated with food security status of the beneficiaries of the National Programme on Food Security. The more years respondents spent in formal education, it's likely they have higher income. Quaye (2008) opined that educational qualification/level is explained in terms of contribution of education on working efficiency, competency and diversification of income. Household heads become more visionary in creating conducive environment to educate dependants with long term target to ensure better living condition, hence are food secure compared to their uneducated counterparts. This implies that food security increases with years spent in school.

3.5.2.5 Farming experience (X_5)

Experience is the act of gaining knowledge through constant practice of a skill, which brings about specialization. Farming experience was measured by the actual number of years the farmer had engaged in farming activities. It is expected that farming experience will have a positive influence on the food security status of the beneficiaries of the National Programme on Food Security. The more experienced farmers have greater ability to use modern practices. According to Oluyole *et al.* (2009) who reported that an experienced farmer is likely to have higher productivity and hence be able to provide more food for his household members.

3.5.2.6 Household size (X_6)

Household size is the total number of individuals (wife/wives, children or grandchildren, and extended family members) that live with and feed from the household. This variable was measured by adding up the number of wives, children, relatives, and dependents actually living with the respondent in his household at the time of the research. This variable is expected to have positive or negative relationship with the food security status of the beneficiaries of the National Programme on Food Security depending on the magnitude, age structure and available farm labour among members. According to the world report study conducted in Tanzania (World Bank, 2000; Setotaw, 2006), farm households with large family size and women-head had significantly lower levels of food security.

3.5.2.7 Extension contact (X_7)

Extension contact was measured as the number of times per year an extension worker visited a respondent especially to educate him on National Programme on Food Security and also the frequency of visits of the respondent to extension worker on crop production. A positive relationship is hypothesized between extension contact and the food security status of the beneficiaries of the National Programme on Food Security. Frequent extension contacts expose the farmer to new and improved farming practice, enhances the level of adoption and general farm output. This implies that the higher the number of extension contacts per cropping season, the higher the probability of increased productivity, hence food security (Amaza *et al*., 2006).

3.5.2.8 Membership of association (X_8)

This was measured by the number of years the respondents belonged to a social group or association as at the time the study was conducted. The expected sign of the coefficient for cooperative membership is positive. Active participation in cooperative

activities tend to attract benefits in terms of helping members in mobilizing resources within society for agricultural operations and marketing, access to inputs (essential manufactured goods) at cheaper rates, enables members take advantage of economies of scale in production, processing and marketing of agricultural produce. Also, it assists in the training and education of members in modern agricultural practices and use of agricultural inputs. It is expected that as the level of participation increases, the probability of being food secure increases (Amaza *et al*., 2006).

3.5.2.9 Amount of credit (X_9)

This is the amount of money borrowed by the respondent for the purpose of crop production in 2013. Crop production involves purchase of improved inputs and payment of extra labour required for additional farm operations. Credit is therefore required to finance these incidental expenses therefore, it is expected to be positively related to food security (Amaza *et al*., 2006). This was measured in naira amount of credit obtained. The amount of credit received would positively influence the food security status of the beneficiaries of the National Programme on Food Security. Suggesting that households with access to credit facilities would be economically empowered to divert incomes and access food in adequate quantity and quality.

3.5.2.10 Total farm size (X_{10})

Farm size was measured as the number of maize hectares the farmer cultivated. Total farm size devoted to the following farming activities (maize, sorghum, millet, soyabean, groundnut and rice) that were promoted by the NPFS for 2013 cropping season in the three states was used as total farm size for this study. The expected sign of the coefficient on farm size is positive. This indicates that households with larger farm sizes are likely to produce more food and possibility of increased production translates

to more income and improves food security than those with smaller farm sizes and vice versa (Amaza *et al*., 2006).

3.5.2.11 Assets owned (X_{11})

Household assets holding in the study area was considered as one of the measures of household resilience, which cushioned the effects of adverse circumstances such as crop failure, drought, etc. on household food security. Assets are seen as readily available convertible resources to meet household needs in lean periods. It was computed in a monetary value. It is expected to be positive sign. This implies that food security status increases as assets level increases. According to Hassan and Babu (1991) and Amaza *et al.* (2009) reported that the level of assets ownership is an indication of its endowment and provides a good measure of household resilience in terms of food crisis, resulting from famine, crop failures, or natural disasters. Ownership of assets therefore lays a good foundation for food security and general household livelihood sustenance. The farmers with value of assets equivalent to the average (and above) of the total will be scored 1 (high), while those with the total value of assets less than the average will be scored 0, (low).

3.5.2.12 Total annual income (X12)

This refers to as the proceeds, returns, or earnings generated from farming activities and non-farming activities in the year 2013 by the farmers within the season of the study from both the beneficiaries and non-beneficiaries of the NPFS. Farmers participate in agricultural programme to obtain higher return relative to their alternative. This was measured in Naira (₦). The annual incomes from the following farming activities (maize, sorghum, millet, soyabean, groundnut and rice) and non-farming activities (teaching, trading, transportation, handcraft and civil service) that were predominant among the beneficiaries and non-beneficiaries of NPFS in the three states

was used for the study. This implies that as the level of income of household heads increases especially through income diversification, the food security status of their respective households increases (Amaza *et al*., 2006). Income is an important factor to food access especially in the metropolis where food production is limited and food items are purchased at prevailing market prices.

3.5.2.13 Market distance (X_{13})

In this study, market distance measures how long it takes to move farm produce from the farm gate to the nearest market. It was measured as Km. It is expected to be positive or negative sign, negative sign meaning a decrease in distance from the farmers' village to the nearest market would increase chances of market participation hence increase in income. Conversely, positive sign meaning a unit decrease in distance, households closer to market outlets would be likely to participate in marketing activities than households living further away.

3.5.3 Expected outcome

3.5.3.1 Output

This is the total quantity of crop harvested per unit area cultivated by the respondents in 2013 cropping season. It was measured in Kg.

3.5.3.2 Food security

Food security exists when all the people in a respondent's household at all time, have enough food preference to eat for an active and healthy life at the time of this study. This was measured as 1 for food security otherwise 0.

3.5.3.3 Poverty status

Poverty is the condition that is said to exist when people lack the means to satisfy their basic needs. This was measured as 1 for non-poor otherwise 0.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the results and discussion of findings based on the objectives of the study. Socioeconomic characteristics of the farmers in the study area is in section 4.1, the impact of NPFS on the income of the farmers in the study area is in section 4.2, the impact of NPFS on the technical efficiency of farmers in the study area is in section 4.3, the impact of NPFS on the food security status of the farmers in the study area is in section 4.4, the impact of NPFS on the poverty status of the farmers in the study area is in section 4.5 and the factors militating against the effective implementation of the programme is in section 4.6.

4.1 Socioeconomic Characteristics of Farmers in the Study Area

4.1.1 Distribution of farmers based on gender

The findings of the pooled states revealed that there were more male than female farmers (Table 4.1). It showed that 86.9% of the beneficiaries and non-beneficiaries of NPFS were male while 13.1% of the beneficiaries and non-beneficiaries were female. This is in line with the distribution of the sample size of the beneficiaries (treatment group) and non-beneficiaries of NPFS established based on the sample frame of beneficiaries of NPFS from the sites chosen. The result implies that farming is largely a male dominated occupation in the study area and a plausible explanation for this could be due to gender roles and responsibilities that limits the activities of women to mostly agro-processing. This finding is in consonance with Idiaye and Omonona (2014) who found that male household heads were dominant (73.1% of beneficiaries; 73.9% of non-beneficiaries) in a similar study on National Special Programme for Food Security (NSPFS) and Poverty among Farming Households in Oyo state, Nigeria. Also as noted by Awotide *et al*. (2010) women rarely own land, may have lower education due to

discriminatory access as their access to productive resources as well as decision making tend to occur through the mediation of men.

4.1.2 Distribution of farmers based on marital status

The findings also showed that most of the respondents were married (Table 4.1). The result of the pooled sample based on their marital status shows that majority of the beneficiaries (95.9%) and non-beneficiaries (93.21%) of NPFS were married. This is in line with Chukelu (2009) who reported that most of the respondents were married (88.89%) in a similar study on" Effect of the National Programme on Food Security on Food Production: A Case Study of Anambra State, Nigeria". However, the proportion of the married beneficiaries of NPFS was higher than the proportion of the married non-beneficiaries by 2.72%. This implies that NPFS activities in the study area were largely targeted at married farmers and this could be due to the immense responsibilities of married farmers towards meeting the food and non-food needs of their household members. This is in line with the goals of NPFS of ensuring food security and poverty reduction among farming households.

4.1.3 Distribution of farmers based on age

Age is an important socioeconomic characteristic of farmers as it influences the active involvement or otherwise of farmers in the day to day farming activities especially in traditional agriculture where most of the farm operations are performed manually using hand tools (Egbutah, 2009). The result of the pooled sample in Table 4.1 shows that majority (35.8%) of the beneficiaries of NPFS were within the age bracket of 40 – 49 years with a mean age of 48 years while 26.7% of the non-beneficiaries were within the age bracket of 40 – 49 years with a mean age of 47 years. This result implies that the farmers were in their economically productive age group (15-60years) and were therefore, actively involved in the management of the farming

operations of their respective farms. This agrees with Ogunniyi *et al.* (2011) who reported similar finding that most of the farmers in their study were in their productive age and therefore they could participate actively in various agricultural productions. Also, across the sampled states of the study (Kano, Kaduna and Katsina), the beneficiaries and non-beneficiaries of NPFS were in their active age bracket as their mean age ranged from 46 – 50 years.

4.1.4 Distribution of farmers based on educational qualification

The educational status of farmers is an important socioeconomic variable that influences their production. From the result of the pooled sample presented in Table 4.1, majority (52% and 60%) for the NPFS beneficiaries and non-beneficiaries respectively) in the study area had no formal education. This is at variance with the result of Idiaye and Omonona (2014) who reported that majority of the beneficiaries (40.4%) and non-beneficiaries (50%) of NSPFS in Oyo state had secondary school educational attainment. The non-formal educational status of majority of the farmers in this study implies that the understanding of farmers to improved farm management practices maybe impaired and this corroborates Bello *et al.* (2012) who noted that low level of education as attained by farmers infer that farmers were less likely to understand the scientific basis of agriculture. Also, across the sampled states of the study (Kano, Kaduna and Katsina), the beneficiaries of NPFS in Kaduna state had the highest mean years(1.42) followed by Katsina state (1.30) and Kano state(0.40) of formal education while for the non-beneficiaries, Katsina state has the highest mean (1.13) followed by Kaduna state(0.96) and Kano(0.40). From the pooled sample, the beneficiaries of NPFS had higher mean years of formal education than the non-beneficiaries.

4.1.5 Distribution of farmers based on household size

Household size is an important socioeconomic variable that influences the food security and poverty status of the farmers. The result of the pooled sample presented in Table 4.1 shows that majority (34.4% and 35.8%) for the NPFS beneficiaries and non-beneficiaries respectively) in the study area had household size of 6 – 10 persons and very few of both categories of farmers had household size of 21 – 30 persons. This suggests that the distribution of the household size for both categories of farmers is similar. This result differed from Ayoade *et al.* (2011) who reported that most of the participants of NSPFS in Oyo state (71.08%) had between 1 and 5 people in each of their households. Across the sampled states of the study (Kano, Kaduna and Katsina), the non-beneficiaries of NPFS in Kano had a higher mean household size (11 persons) than the beneficiaries (10 persons). However in Kaduna and Katsina states, the farmers had equal household mean size of 7 persons and for the pooled sample, both categories of farmers had equal household mean size of 9 persons. This implies that both categories of farmers have a relatively high household size which could serve as a vital source of family labour thereby reducing the quantity of hired labour required by the farmers and invariably reducing the cost of labour incurred for the farm production activities of the farmers. Also, as noted by Idrisa *et al*. (2012), household size has the effect of encouraging farmers to improve their earning capacity because some family members would tolerate certain levels of unfavorable conditions created by channeling family resources into investment on improved technologies.

Table 4.1: Socioeconomic characteristics of all the sampled and the pooled sampled farmers in the three states

Variable	Kano		Kaduna		Katsina		Pooled	
	*Group 1 Freq (%)	*Group 2 Freq (%)	*Group 1 Freq (%)	*Group 2 Freq (%)	*Group 1 Freq (%)	*Group 2 Freq (%)	*Group 1 Freq (%)	*Group 2 Freq (%)
Gender								
Male	105(84)	105(84)	64(92.75)	65(92.75)	23(85.19)	23(85.19)	192(86.88)	192(86.88)
Female	20(16)	20(16)	5(7.25)	5(7.25)	4(14.81)	4(14.81)	29(13.12)	29(13.12)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Marital status								
Married	121(96.8)	113(90.4)	65(94.20)	67(97.10)	26(96.30)	26(96.30)	212(95.93)	206(93.21)
Single	4(3.2)	12(9.6)	4(5.80)	2(2.90)	1(3.70)	1(3.70)	9(4.07)	15(6.79)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Age								
20-29	0(0)	8(6.4)	2(2.90)	2(2.90)	1(3.70)	1(3.70)	3(1.36)	11(4.98)
30-39	14(11.2)	24(19.2)	21(30.43)	27(39.13)	6(22.22)	8(29.63)	41(18.55)	59(26.70)
40-49	54(43.2)	33(26.4)	18(26.09)	16(23.19)	7(25.93)	9(33.33)	79(35.75)	58(26.24)
50-59	37(29.6)	35(28)	17(24.64)	16(23.19)	6(22.22)	8(29.63)	60(27.15)	59(26.24)
60-69	18(14.4)	19(15.2)	9(13.04)	6(8.70)	7(25.93)	1(3.70)	34(15.38)	26(11.76)
70-79	2(1.6)	6(4.8)	2(2.90)	2(2.90)	0(0)	0(0)	4(1.81)	8(3.62)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Mean	49.42	48.35	46.57	44.42	49.07	43.89	48.49	46.58
S.E	0.807	1.131	1.406	1.414	2.339	1.963	0.697	0.822
Educational qualification								
No formal	91(72.8)	93(74.4)	16(23.19)	30(43.48)	8(29.63)	9(33.33)	115(52.04)	132 (59.73)
Primary	20(16)	11(8.8)	19(27.54)	18(26.09)	7(25.93)	8(29.63)	46(20.81)	37(16.74)
Secondary	12(9.6)	18(14.4)	23(33.33)	15(21.74)	8(29.63)	6(22.22)	43(19.46)	39(17.65)
Tertiary	2(1.6)	3(2.4)	11(15.94)	6(8.70)	4(14.81)	4(14.81)	17(7.69)	13(5.88)
Total	125(100)	125(100)	69(1000	69(100)	27(100)	27(100)	221(100)	221(100)
Mean	0.40	0.45	1.42	0.96	1.30	1.19	0.83	0.70
S.E	0.065	0.074	0.123	0.121	0.205	0.207	0.067	0.065
Household size								
1-5	24(19.2)	27(21.6)	37(53.62)	28(40.58)	13(48.15)	12(44.44)	74(33.48)	67(30.32)
6-10	48(38.4)	32(25.6)	21(30.43)	35(50.72)	7(25.93)	12(44.44)	76(34.39)	79(35.75)
11-15	43(34.4)	40(32)	5(7.25)	6(8.70)	4(14.81)	3(11.11)	52(23.53)	49(22.17)
16-20	8(6.4)	18(14.4)	3(4.35)	0(0)	1(3.70)	0(0)	12(5.43)	18(8.14)
21-25	2(1.6)	8(6.4)	0(0)	0(0)	0(0)	0(0)	2(0.90)	8(3.62)
26-30	0(0)	0(0)	3(4.35)	0(0)	2(7.41)	0(0)	5(2.26)	0(0)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Mean	9.89	10.76	7.23	6.97	7.33	7.00	8.87	8.68
S.E	0.389	0.539	0.739	0.413	1.365	0.762	0.367	0.378

*Group1=Beneficiaries and *Group 2 = non-beneficiaries

4.1.6 Distribution of farmers based on method of land acquisition

Land is a critical factor of production in agricultural production as it is a major input. Based on the study result presented in Table 4.2, the major mode of land acquisition by both categories of farmers is inheritance as indicated by 85.5% and 84.4% of the beneficiaries and non-beneficiaries of NPFS respectively and least mode of land acquisition is gift as indicated by 1.4% and 4.9% of the beneficiaries and non-beneficiaries respectively. This shows that although there were several means of land acquisition by both categories of farmers in the study area, land for farm production activities in the three states was largely through inheritance. The implication of this is that over time, the proportion of land to be inherited will be reducing as land is shared among the children of the deceased leading to land fragmentation (Amaza *et al*., 2009)

Table 4.2: Distribution of farmers based on method of land acquisition

Land acquisition	**Beneficiaries**		**Non-beneficiaries**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Inheritance	189	85.5	182	84.4
Purchase	23	10.4	20	9.0
Rent	12	5.4	9	4.9
Borrowed	33	14.9	14	6.3
Gift	3	1.4	9	4.9
Total	260*		234*	

NB: Total frequency exceeded sample size because multiple response was allowed

4.1.7 Distribution of farmers based on farm size

Farm land is a very important input in agriculture and therefore, its size matters a lot in production. This is buttressed by Ajibefun (2006) who posited that land size is one of the indicators of the level of economic resources available to farmers and also, farmers' total land holding may serve as a good proxy for wealth, status and income levels (Bonabana-Wabi, 2002). The distribution of the farm size of both categories of

farmers for pooled states is presented in Table 4.3. Most of the farmers (87.3% and 88.2%) of the beneficiaries and non-beneficiaries of NPFS respectively) had small farm holding of 0.1 – 3 ha and only about 1% of the beneficiaries and non-beneficiaries had farm size of more than 9ha. Across the sampled states, beneficiaries in Kano, Kaduna and Katsina states respectively had higher mean farm size than the non-beneficiaries. Also, the pooled sample of the beneficiaries with mean farm size of 2.0 ha had a higher farm size than the non-beneficiaries who had mean farm size of 1.75 ha. Despite the slight disparity in the farm holdings of both categories of farmers, majority are small holder farmers. This corroborates the finding of Chukelu (2009) who reported that the NPFS farmers in Anambra state have farms of 1- 2 hectares as indicated by 66.67% of the farmers.

4.1.8 Distribution of farmers based on years of farming experience

The study revealed that majority of the beneficiaries had farming experience of 1-10 years as indicated by 65.6% while about 38.9% of the non-beneficiaries of NPFS had farming experience of 11-20 years (Table 4.3). This finding compares favourably with that of Idiaye and Omonona (2014) who equally established that both the beneficiaries and non-beneficiaries of NSPFS in Oyo state had farming experience of 10 – 20 years as indicated by 55.8% of the beneficiaries and 36% of the non-beneficiaries respectively. Very few of the farmers had farming experience of 21-30 years as indicated by about 9 % of the beneficiaries of NPFS in the study area. The result implied that both categories of farmers had high years of farming experience and therefore, the two categories of farmers are comparable groups. Across the sampled states, beneficiaries in Kano, Kaduna and Katsina states had more mean years of farming experience than the non-beneficiaries. From the pooled sample of farmers in the study area, both categories of farmers had equal mean years of farming experience

of 22 years. This implies that both categories of farmers have farming experience and have acquired practical knowledge of managing their farms over time and this may enhance their production. This agrees with Idrisa *et al.* (2012), that says more experienced farmers may have better skills and access to new information about improved technologies. It could also imply that knowledge gained over time from working in uncertain production environment may help in evaluating information thereby influencing their adoption decision.

4.1.9 Distribution of farmers based on years to membership of farmers' cooperative

The study revealed that 54% of the beneficiaries have been members of farmers' cooperative for over a period of 6 – 10 years while very few (about 1%) of the beneficiaries have never been members of any farmers cooperative (Table 4.3). Majority (50.9%) of the non-beneficiaries of NPFS have never been members of any farmers cooperative while very few (about 9%) have been members of farmers' cooperative for over 10 years. The result further shows that a large proportion (99%) of the beneficiaries of NPFS were members of farmers cooperatives whereas a large proportion (51%) of the non-beneficiaries of NPFS were not members of any farmers cooperative. This implies that the beneficiaries of NFPS might have profited more from their farmers cooperative in terms of access to credit facilities, farm inputs, market outlets and vital farming information via training. Amaza *et al*. (2006) also posited the benefits of membership to associations by farmers in their study in Borno state. Beneficiaries in Kaduna state had the highest mean of 8.9 years followed by Katsina (7)) and Kano state (6) while Kaduna state has the highest mean for the non-beneficiaries followed by Katsina and Kano states. Across the states and also for the pooled sample of the farmers, the beneficiaries had higher mean years (7) of cooperative membership than the non-beneficiaries (3.66) in the study area.

4.1.10 Distribution of farmers based on frequency of extension contact

The study also investigated the frequency of extension visits to farmers. Majority (90%) of the beneficiaries of NPFS had access to extension contact and in the case of the non-beneficiaries of NPFS, 52% had no access to extension contact as shown in Table 4.3. This suggests that beneficiaries of NPFS had more access to extension service as provision of extension is one of the modules of the NPFS. Therefore, the beneficiaries of NPFS benefitted from it. Across the sampled states, beneficiaries in Kano and Kaduna with average monthly extension contacts of 7 and 8 times respectively had higher extension contacts than the non-beneficiaries. In Katsina state, the beneficiaries with average monthly extension contacts of 4 times had higher extension contacts than the non-beneficiaries. From the pooled sample of the farmers, the beneficiaries with average monthly extension contact of 12 times had more extension numbers than the non-beneficiaries who had an average monthly extension of 4 times. This result implies that the benefits of extension service delivery to farmers were largely achieved by the beneficiaries of NPFS than the non-beneficiaries in the study area. Increased farmers' interaction with extension personnel in the form of multiple visits by extension agents, and technical support to farmers greatly increases farmers' knowledge of available technologies and their potential benefits (Idrissa *et al*., 2012)

Table 4.3 cont'd: Socioeconomic characteristics of all the sampled and the pooled sampled farmers in the three states

Variable	Kano		Kaduna		Katsina		Pooled	
	Group 1 Freq (%)	**Group 2 Freq (%)**	**Group 1 Freq (%)**	**Group 2 Freq (%)**	**Group 1 Freq (%)**	**Group 2 Freq (%)**	**Group 1 Freq (%)**	**Group 2 Freq (%)**
Farm size								
0.1-3	122(97.6)	123(98.4)	53(76.81)	52(75.36)	18(66.67)	20(74.07)	193(87.33)	195(88.24)
3.1-6	3(2.4)	2(1.6)	16(23.19)	15(21.74)	7(25.93)	7(25.93)	26(11.76)	24(10.86)
6.1-9	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
>9	0(0)	0(0)	0(0)	2(2.90)	2(7.41)	0(0)	2(0.90)	2(0.90)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221
Mean	1.61	1.03	2.71	2.59	3.23	2.63	2.11	1.75
S.E	0.055	0.058	0.187	0.251	0.527	0.347	0.100	0.109
Farming experience								
1-10	22(17.6)	18(14.4)	8(11.59)	10(14.49)	4(14.81)	2(7.41)	145(65.61)	30(13.57)
11-20	36(28.8)	45(36)	31(44.93)	29(42.03)	10(37.04)	12(44.44)	56(25.34)	86(38.91)
21-30	41(32.8)	35(28)	13(18.84)	20(28.99)	4(14.81)	11(40.74)	19(8.60)	66(29.86)
>30	26(20.8)	27(21.6)	17(24.64)	10(14.49)	9(33.33)	2(7.41)	1(0.45)	39(17.65)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Mean	22.06	21.67	24.62	21.91	24.89	21.30	22.99	21.92
S.E	0.918	0.946	1.525	1.327	2.504	1.509	0.771	0.699
Cooperative membership								
Non-member	7(5.6)	109(87.2)	0(0)	2(2.90)	1(3.70)	1(3.70)	9(4.07)	112(50.68)
1-5	118(94.4)	6(4.8)	28(40.58)	31(44.93)	11(40.74)	10(37.04)	69(31.22)	47(21.27)
6-10	0(0)	9(7.2)	25(36.23)	22(31.88)	11(40.74)	11(40.74)	120(54.30)	42(19.00)
>10	0(0)	1(0.8)	16(23.19)	14(20.29)	4(14.81)	5(18.52)	23(10.41)	20(9.05)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(1000	221(100)	221(100)
Mean	6.22	0.74	8.91	7.54	7.78	7.30	7.25	3.66
S.E	0.315	0.186	0.666	0.495	0.790	0.685	0.300	0.304
Extension contact								
No contact	13(10.4)	108(86.4)	6(8.70)	5(7.25	3(11.11)	2(7.41)	22(9.95)	115(52.04)
1-5	15(12)	5(4)	13(18.84)	16(23.19)	5(18.52)	4(14.81)	33(14.93)	25(11.31)
6-10	43(34.4)	6(4.8)	30(43.48)	43(62.32)	11(40.74)	19(70.37)	84(38.01)	68(30.77)
11-15	20(16)	4(3.2)	18(26.09)	3(4.35)	8(29.63)	0(0)	46(20.81)	7(3.17)
>15	34(27.2)	2(1.6)	2(2.90)	2(2.90)	0(0)	2(7.41)	36(16.29)	6(2.71)
Total	125(100)	125(100)	69(100)	69(100)	27(100)	27(100)	221(100)	221(100)
Mean	7.10	1.35	8.57	6.97	7.67	7.41	11.59	3.85
S.E	1.119	0.410	0.777	0.435	0.903	0.750	0.712	0.342

*Group1=Beneficiaries and *Group 2 = non-beneficiaries

4.1.11 Distribution of farmers based on farm enterprises

The findings of the study presented in Table 4.4 shows that majority (76.5% and 94.6% for the NPFS beneficiaries and non-beneficiaries respectively) of farmers in the study area were into crop farming enterprises. A larger proportion (40.7%) of the beneficiaries of NPFS were into livestock farming enterprise compared to the non-beneficiaries with only 11.8% that were into livestock farming. The high involvement of the beneficiaries in livestock farming relative to the non-beneficiaries could be attributed to the improved livestock production activities benefitted by the beneficiaries of NPFS from the livestock module. Very few (about 1%) of both categories of farmers were into forestry. This finding is in line with that of Idiaye and Omonona (2014) who reported that the beneficiaries of NSPFS in Oyo state were largely into livestock production (44.4%) unlike the non-beneficiaries who were largely into crop production (50%) only.

Table 4.4: Distribution of farmers based on farm enterprises

Farm enterprise	**Beneficiaries**		**Non-beneficiaries**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Crop	169	76.5	209	94.6
Livestock	90	40.7	26	11.8
Fishery	2	0.9	10	4.5
Forestry	2	0.9	2	0.9
Total	263*		247*	

NB: Total frequency exceeded sample size because multiple response was allowed

4.1.12 Distribution of farmers based on non-farm income generating activities

The distribution of the respondents based on the type of non-farm income generating activities they are engaged in is presented in Table 4.5. It shows that majority (66.5% and 74.7% of the NPFS beneficiaries and non-beneficiaries respectively) in the three states were involved in one form or another of non-farm income generating activity. A larger percentage of the two categories of farmers (32.6% and 38% for the NPFS beneficiaries and non-beneficiaries respectively) were involved in trading and very few **(**1.8% and 1.4% of the NPFS beneficiaries and non-beneficiaries respectively) were civil servants. The participation of majority of the farmers in non-farm income generating activities implies that the farmers could not rely solely on farming for income generation to meet their household needs and had to opt for a multiple string of income from non-farm income generating activities. This agrees with the study of Amaza *et al*. (2009) which found that most of the participants of PROSAB in Borno state are engaged in non-farm income generating activities.

Table 4.5: Distribution of farmers based on non-farm income generating activities

Activity	**Beneficiaries**		**Non-beneficiaries**	
	Frequency	**Percentage**	**Frequency**	**Percentage**
None	74	33.5	56	25.3
Teaching	30	13.6	8	3.6
Trading	72	32.6	84	38.0
Transportation	5	2.3	21	9.5
Handcraft	40	18.1	58	26.2
Civil service	4	1.8	3	1.4
Total	225*		230*	

NB: Total frequency exceeded sample size because multiple response was allowed

4.1.13 Distribution of beneficiaries of NPFS based on access to agricultural inputs through NPFS

Accessibility to agricultural inputs to enhance the agricultural production of farmers is one of the integral activities of NPFS in the study area. The result presented in Table 4.6 shows most (about 70%) of the beneficiaries of NPFS had access to improved seeds via NPFS. This was closely followed by access to fertilizer as indicated by about 63% of the beneficiaries and the least was access to processing facilities as indicated by 4.5% of the respondents. Also, majority (97%) had access to agricultural inputs with a mean access of one which implies that on the average the respondents among the beneficiaries of NPFS had access to at least one input. In a similar study undertaken by Chukelu (2009), NPFS enhanced farmers' access to support services. It enhanced 97.22% of the respondents' access to extension, 70.83% access to credit, 52.78% to good nutrition, 72.22% to health education and 66.66% to HIV/ AIDS seminars.

Table 4.6: Distribution of beneficiaries of NPFS based on access to agricultural inputs through NPFS

Agricultural inputs	**Frequency**	**Percentage**
Improved seeds	153	69.2
Fertilizer	19	62.9
Agrochemicals	82	37.1
Farm machineries	36	16.3
Processing facilities	10	4.5
Credit facilities	86	38.9
Total	502*	
Access		
Yes	214	96.83
No	7	3.17
Total	221	100
Mean	0.97	
S.E	0.012	

NB: Total frequency exceeded sample size because multiple response was allowed*

4.14 Distribution of beneficiaries of NPFS based on NPFS modules

The NPFS is implemented through modules. The modules implemented in each site are usually chosen by the beneficiaries. The types of modules implemented in the study area were investigated. The result presented in Table 4.7 shows that beneficiaries of NPFS largely benefitted from the crop intensification module as indicated by 54.8% of them. This was followed by the livestock module with 41.6%. Majority of the respondents benefitted from the extension delivery module while very few (2.4%) benefitted from the nutrition and health module. This implies that the implementation of the NPFS modules was largely geared towards crop production and livestock while other components of agriculture (fishery, forestry and agro-processing) were not adequately taken into consideration. The result also showed that none of the beneficiaries of NPFS benefitted from the fishery development and off farm income generating activities and this suggests that the implementation of fishery development was not executed because the beneficiaries did not request for the module. The result of Chukelu (2009) revealed that farmers benefitted largely from training and visit by extension workers as indicated by 93% of the beneficiaries of NPFS in Anambra state, Nigeria. Also, Ayoade (2010) reported the high proportion of beneficiaries (68.67%) recorded high benefit scores which indicated that they actually benefited immensely from their participation in NSPFS Oyo state.

Table 4.7: Distribution of beneficiaries of NPFS based on NPFS modules

NPFS Modules	Frequency	Percentage
Crop intensification	121	54.8
Water use and control	69	31.2
Soil fertility management	71	32.1
Agroforestry	22	11.8
Livestock production	92	41.6
Fishery development	0	0.0
Extension	199	90.1
Credit	67	30.3
Agro-processing	36	16.3
Nutrition and health	5	2.3
Rural infrastructure development	9	4.1
Total	429*	

NB: Total frequency exceeded sample size because multiple responses was allowed

4.2 Impact of NPFS on the Income of Farmers in the Study Area

The impact of the NPFS on the income of the respondents was investigated in order to find out whether the program was successful in increasing the beneficiaries' income. The results of the findings are presented as follows. The result of the Double Difference Estimate (DDE) in the income of the farmers in Kano state as shown in Table 4.8 revealed that the difference in the average income of the beneficiaries of NPFS after and before the commencement of NPFS was (₦194, 336.00) and was statistically significant at 1% probability level and also, the difference in the average income of the non-beneficiaries of NPFS after and before the commencement of NPFS was (₦56, 296.00) and was statistically significant at 1% probability level. However, the difference in changes of average income between the beneficiaries and non-beneficiaries was ₦ 138, 040.00 and statistically significant at 1% probability level. This revealed that the increase in the income of the beneficiaries of NPFS surpasses the increase in the income of the non-beneficiaries and the changes in average income of both categories of farmers were

statistically significant. The implication of this result is that the expanded phase of NPFS impacted positively on the income of the beneficiaries in Kano state and hence, expansion of the existing sites in the state to accommodate other farmers will be very instrumental in enhancing their income and invariably helping the farmers to meet their financial obligations in terms of food as well as non-food consumption needs of their households.

Table 4.8: Double Difference Estimate (DDE) result of farmers Kano state

Double difference variables	**Beneficiaries**	**Non-beneficiaries**
Average income before (₦)	33, 824.00	40, 320.00
Average income after (₦)	228, 160.00	96, 616.00
Difference of average income after and before (₦)	194, 336.00	56, 296.00
Difference of changes in average income (₦)	138, 040.00	
Percentage change of average income after and before	574.55	139.62
Paired t statistic of average income after and before	16.09***	12.51***
Paired t statistic of changes in average income	11.18***	

NB: *** P < 0.01

The result of the Double Difference Estimate (DDE) in the income of the farmers in Kaduna state is presented in table 4.9. The difference in the average income of the beneficiaries of NPFS after and before the commencement of NPFS (N160, 633.78) was higher than that of the non-beneficiaries of NPFS (₦ 72, 744.93). Although there was an increase in the income of both categories of farmers prior to the commencement of the expanded phase of NPFS in 2007, the increase in the income of the beneficiaries of NPFS was higher than that of non-beneficiaries of NPFS. The difference in changes in average income of the beneficiaries and non-beneficiaries of NPFS (₦ 87, 888.85) was

statistically significant at 1% probability level. The result implies that NPFS had positive impact on the income of the beneficiaries in Kaduna state. In a similar study undertaken in Kaduna state by Simonyan and Omolehin (2012) to assess the impact of Fadama II project on the income of beneficiaries, the double difference method analysis indicated a positive mean income difference value between beneficiaries and non-beneficiaries after Fadama II project at 10% level of significance. This is in line with the finding of this study.

Table 4.9: Double difference estimate (DDE) result of farmers in Kaduna state

Double difference variables	**Beneficiaries**	**Non-beneficiaries**
Average income before (₦)	20, 736.23	16, 140.60
Average income after (₦)	181, 370.00	88, 885.51
Difference of average income after and before (₦)	160, 633.78	72, 744.93
Difference of changes in average income (₦)	87, 888.85	
Percentage change of average income after and before	774.65	450.70
Paired t statistic of average income after and before	8.86***	9.29***
Paired t statistic of changes in average income	4.54***	

NB: *** P < 0.01

The result of the Double Difference Estimate (DDE) in the income of the farmers in Katsina state as shown in Table 4.10 revealed that the difference in the average income of the beneficiaries of NPFS after and before the commencement of NPFS (₦216, 074.07) was statistically significant at 1% probability level and also, the difference in the average income of the non-beneficiaries of NPFS after and before the commencement of NPFS (₦131, 481.48) was statistically significant at 1% probability level. However, the difference in changes in average income between the beneficiaries and non-beneficiaries was ₦ 84, 592.59 but was not statistically significant. This result revealed that although the increase in the income of the beneficiaries of NPFS was more than the increase in the

income of the non-beneficiaries, the estimated changes in their average income was not statistically significant. This implies that the contribution of NPFS in enhancing the income of beneficiaries in Katsina state was very low because of low level of implementation of the programme due to non-release of funds by the FGN. Therefore, the difference between the incomes of the beneficiaries and non-beneficiaries was not statistically significant.

Table 4.10: Double difference estimate (DDE) result of farmers in Katsina state

Double difference variables	**Beneficiaries**	**Non-beneficiaries**
Average income before (₦)	110, 129.63	48, 703.70
Average income after (₦)	326, 203.70	180, 185.19
Difference of average income after and before (₦)	216, 074.07	131, 481.48
Difference of changes in average income (₦)	84, 592.59	
Percentage change of average income after and before	196. 20	139.62
Paired t statistic of average income after and before	4.3^{***}	6.51***
Paired t statistic of changes in average income	1.64^{NS}	

NB: *** P < 0.01, NS Implies not significant

The result of the Double Difference Estimate (DDE) in the income of the pooled sample of farmers in the study area as shown in Table 4.11 revealed that the difference in the average income of the beneficiaries of NPFS after and before the commencement of NPFS(N239, 410.54) was higher than that of the non-beneficiaries of NPFS (₦ 70, 617.20) and consequently the percentage change of average income of the beneficiaries of NPFS after and before the commencement of NPFS (612.92) was higher than that of the non-beneficiaries of NPFS (208.96) implying that although there was an increase in the income of both categories of farmers prior to the commencement of the expanded phase of NPFS in 2007 to 2013, the increase in the income of the beneficiaries of NPFS was

higher than that of non-beneficiaries of NPFS. The difference in changes of the average income of the beneficiaries and non-beneficiaries of NPFS (₦ 168, 793.34) was statistically significant at 1% probability level. This implies that NPFS had a positive impact on the income of the beneficiaries in the three states and hence, the goal of NPFS in the area of enhancing income of farmers in the study area has been achieved. This result agrees with Ayoade (2010) who found that the NSPFS in Oyo state had increased farmers income after their participation in the programme. The average income before project (₦14, 765.09) and after (₦48,743.40) was statistically significant at 1% probability level. This implies that participation in the programme enables the participants to generate more income from higher output. This increase in income will reduce poverty level, improve their standard of living and help them to plan their lives in a more organized way. Therefore, further investment in NPFS to establish other sites across the nation will serve as an opportunity for increasing the income of farmers' especially small holder farmers who are responsible for the bulk of agricultural production activities in the nation.

Table 4.11: Double difference estimate (DDE) result of farmers (pooled sample)

Double difference variables	**Beneficiaries**	**Non-beneficiaries**
Average income before (₦)	39, 060.18	33, 795.02
Average income after (₦)	278, 470.72	104, 412.22
Difference of average income after and before (₦)	239, 410.54	70, 617.20
Difference of changes in average income(₦)	168, 793.34	
Percentage change of average income after and before	612.92	208.96
Paired t statistic of average income after and before	4.13***	15.46***
Paired t statistic of changes in average income	2.95***	

NB: *** P < 0.01

4.2.1 Test of hypothesis of differences in income of beneficiaries and non-beneficiaries of NPFS

Based on the results of the Double Difference Estimates of the pooled sample, the hypothesis which states that 'the NPFS has no impact on the income of farmers in the study area' was tested. The result of the paired t test in Table 4.11 shows that although the changes in average income of the beneficiaries and non-beneficiaries of NPFS were significant at 1% as indicated by t statistic of 4.13 and 15.46 respectively, there was a significant difference in the changes in the average incomes of the two categories of farmers at 1% as indicated by a paired t statistic of 2.95. This implies that the change in the average income of the beneficiaries before and after the NPFS intervention was greater than the changes in the average income of the non-beneficiaries before and after the NPFS intervention and therefore, the null hypothesis is rejected and the alternative accepted. This indicates that NPFS contributed in improving the income status of its beneficiaries. This result compares favourably with that of Ayoade *et al*. (2011) who reported that NSPFS in Oyo state has increased the purchasing power of its beneficiaries as a result of increased productivity and disposable income before and after participation in the programme.

4.3 Impact of NPFS on the Technical Efficiency of Farmers in the Study Area

4.3.1 Impact of NPFS on the technical efficiency of farmers in Kano state

The study revealed that the NPFS had a positive impact on the technical efficiency of the beneficiaries. The MLE estimates of the parameters of the stochastic frontier production function as presented in Table 4.12 shows that the estimated sigma squared for farmers (0.2708) was significantly different from zero at 1% probability level. This indicates a good fit and the correctness of the specified distributional assumption of the composite error terms in the estimated model. The value of gamma

(0.8584) was significant at 1% probability level suggesting that 86% of the shortfall below the frontier output of the farmers was due to the inefficiencies of the farmers.

The factors of production that had significant influence on the output of the farmers were seed, agrochemicals (herbicide/insecticide), fertilizer and labour. Seed and agrochemicals were significant at 1% probability level and positively related to the output of the farmers. This implies that a unit increase in the quantity of seeds and agrochemicals will increase the output of the farmers by 0.3615 and 0.0776 respectively. The positive relationship between agrochemicals and output was equally obtained by Omonona *et al*. (2010). Fertilizer and labour were negatively related to the output of the farmers but fertilizer was significant at 10% probability level while labour was significant at 1% probability level. This implies that a unit increase in the quantity of fertilizer and labour will decrease the output of the farmers by 0.0097 and 0.7854 respectively and this could be attributed to over utilization or misapplication of these resources. The negative relationship between labour and output agrees with the finding of Baruwa and Oke (2012) who reported that labour was negative and significant at 5% probability level in a study on Technical Efficiency of Small-holder Cocoyam Farms in Ondo state, Nigeria.

In order to determine the impact of NPFS on the technical efficiency of the farmers, the determinants of technical inefficiency of the farmers were estimated with the NPFS variable being the principal variable of interest. The result of the inefficiency model shows that NPFS variable was significant at 5% probability level and negatively related to the technical inefficiency of the farmers. This implies that NPFS had significant influence in enhancing the technical efficiency of the farmers and hence, expansion of NPFS in the study area is a viable option that can be used towards enhancing the technical efficiency of the farmers. However, despite the positive impact

of NPFS on the technical efficiency of the farmers, the farmers were yet to attain the frontier output as their mean technical efficiency was 76%. This implies that the farmers could increase present level of technical efficiency by 24% through efficient utilization of their resources.

Other variables that were significant in influencing the technical inefficiency of the farmers were education, extension, association, household size and credit. Education was positive and significant at 1% probability level indicating that a unit increase in education has the tendency of increasing the technical inefficiency of the farmers and this could be attributed to the tendency of engaging in other non-farm income generating activities. As education increases to tertiary level, it limits the involvement of the farmers in the day to day activities on their farms as they engage in white collar jobs. This result agrees with the finding of Ogunniyi and Ajao (2011) in their study of technical efficiencies of swine farming in Nigeria.

Extension had an expected negative coefficient and was significant at 1% probability level. This implies that increasing access to extension service will enhance the technical efficiency of the farmers. Membership of association was negative and significant at 1% probability level indicating that a unit increase in this variable has the tendency of increasing the technical efficiency of the farmers. This result agrees with the findings of Ataboh *et al.* (2014) who found a negative and significant relationship between membership of association and technical inefficiency of rice farmers in Kogi state.

Household size was positive and significant at 1% probability level indicating that a unit increase in household size has the tendency of increasing the technical inefficiency of the farmers. This could be attributed to more under aged and elderly members who are not economically active and therefore, do not contribute to family

labour. This result agrees with the finding of Onyenweaku and Effiong (2005) who found out that household size increased the technical inefficiency of pig farmers in Akwa Ibom state.

Accessibility to credit was positively related to the technical inefficiency of the farmers and was significant at 1% probability level. This suggests that access to credit could increase the tendency of technical inefficiency of the farmers and this could be as a result of the tendency of diversion of credit meant for production to other uses that are not productive e.g. spending it on food rather than acquiring farm assets. This result agrees with the findings of Baruwa and Oke (2012) in their study of technical efficiency in Ondo state.

Table 4.12: Maximum Likelihood Estimates of the parameter of the Stochastic Frontier Production Function of farmers in Kano state

Variables	Coefficient	Standard error	T value
General model			
Intercept	17.2767	0.4821	35.8398
Seed	0.3615***	0.0410	8.8208
Herbicide	0.0776***	0.0085	9.1980
Fertilizer	-0.0097*	0.0057	-1.6992
Labour	-0.7854***	0.0466	-16.8784
Inefficiency model			
Intercept	-0.5160	0.5788	-0.8916
Age	0.0310	0.0272	1.1388
Education	0.0928***	0.0250	3.7235
Farming experience	-0.0250	0.0155	-1.6181
Extension	-0.3074***	0.0550	-5.5940
Association	-0.1925***	0.0295	-6.5310
Household size	0.0001***	0.0001	7.1567
NPFS	-0.8858**	0.3852	-2.3001
Credit	0.1116***	0.0111	10.0994
Variance parameters			
Sigma	0.2708***	0.0379	7.1586
Gamma	0.8584***	0.0234	36.7274
Log likelihood	-30.4608		
LR	361.6073		
Mean efficiency	0.76		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.3.2 Impact of NPFS on the technical efficiency of farmers in Kaduna state

The NPFS also had a positive impact on the technical efficiency of the beneficiaries in the state. The result as presented in Table 4.13 shows the MLE estimates of the parameters of the stochastic frontier production function. The estimated sigma squared for the farmers (0.4192) was significantly different from zero at 1% probability level. This indicates a good fit and the correctness of the specified distributional assumption of the composite error terms in the estimated model. The value of gamma (0.0653) was significant at 1% probability level suggesting that 7% of the shortfall below the frontier output of the farmers was due to the inefficiencies of the farmers.

The input factor that had significant influence on the output of the farmers was fertilizer. This was significant at 10% probability level and had a positive relationship with the output of the farmers. This implies that a unit increase in the quantity of fertilizer used by the farmers will increase the output of the farmers by a unit all things being equal. This agrees with the finding of Tijani (2006) who reported that fertilizer was positively related to the output of rice farmers in Osun state.

Other input factors such as seed and labour were negatively related to the output of the farmers but were not significant. This implies that a unit increase in the quantity of seed and labour will decrease the output of the farmers by 0.0717 and 0.0967 respectively and this could be attributed to over utilization and misapplication of these resources.

In order to determine the impact of NPFS on the technical efficiency of the farmers, the determinants of technical inefficiency of the farmers were estimated with the NPFS variable being the principal variable of interest. The result of the inefficiency model shows that NPFS variable was significant at 5% probability level and negatively related to the technical inefficiency of the farmers. This implies that NPFS had

significant influence in enhancing the technical efficiency of the farmers and hence, expansion of NPFS in the study area is a viable option that can be used towards enhancing the technical efficiency of the farmers. However, despite the impact of NPFS on the technical efficiency of the farmers, the farmers were yet to attain the frontier output as their mean technical efficiency was 80%. This implies that the farmers could increase present level of technical efficiency by 20% through efficient utilization of their resources.

Other variables that were significant in influencing the technical inefficiency of the farmers were age, association and household size. The coefficient of age was negative and significant at 1% probability level indicating that a unit increase in this variable has the tendency of increasing the technical efficiency of the farmers. This result is in line with the finding of Ataboh *et al.* (2014) who found that age was negatively related to the technical inefficiency of Rice farmers in Kogi state. This is true up to a certain level (usually 60 years) beyond which the farmers productivity begins to decline. Membership of association was positively related to the technical inefficiency of the farmers and was significant at 1% probability level. This implies that a unit increase of this variable has the tendency of increasing the technical inefficiency of the farmers.

Household size was negative and significant at 1% probability level indicating that a unit increase of this variable has the tendency of increasing the technical efficiency of the farmers. This agrees with the finding of Rahman and Umar (2008) who reported that household size was negatively related to the technical inefficiency of crop production in Nassarawa state and was significant at 5% probability level. This could be because majority of the household members are in their economic active age bracket which means they provide labour for farming activities. Therefore, household

size could have a positive or negative relationship with technical efficiency depending on the age of majority of the members (Amaza *et al*., 2006).

Table 4.13: Maximum Likelihood Estimates of the parameter of the Stochastic Frontier Production Function of farmers in Kaduna state

Variables	**Coefficient**	**Standard error**	**T value**
General model			
Intercept	13.0206	0.9509	13.6941
Seed	-0.0717	0.0688	-1.0422
Herbicide	0.0042	0.0148	0.2789
Fertilizer	0.0300*	0.0164	1.8272
Labour	-0.0967	0.0925	-1.0456
Inefficiency model			
Intercept	0.6483	0.2054	3.1571
Age	-0.0721***	0.0193	-3.7467
Education	-0.0112	0.0076	-1.4716
Farming experience	-0.0343	0.0284	-1.2070
Extension	0.0336	0.0264	1.2737
Association	0.0390***	0.0154	2.5305
Household size	-0.0001***	0.0001	-3.0074
NPFS	-0.1247	0.0920	-1.3560
Credit	0.0159	0.0106	1.4951
Variance parameters			
Sigma	0.4192***	0.0516	8.1372
Gamma	0.0653***	0.0183	3.5659
Log likelihood	-133.0303		
LR	39.4824		
Mean efficiency	0.80		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.3.3 Impact of NPFS on the technical efficiency of farmers in Katsina state

The result of the findings in this state showed that the NPFS also had a positive impact on the technical efficiency of the beneficiaries. MLE estimates of the parameters of the stochastic frontier production function as presented in Table 4.14 shows that the estimated sigma squared for the farmers (0.6807) was statistically significant at 1% probability level. This indicates a good fit and the correctness of the specified distributional assumption of the composite error terms in the estimated model. However, the value of gamma (0.0399) was not significant.

The factors of production that had significant influence on the output of the farmers were agrochemicals, fertilizer and labour. Agrochemicals and fertilizer were negatively related to the output of the farmers and were significant at 10% and 5% probability levels respectively. This implies that a unit increase in the quantity of agrochemicals and fertilizer used by the farmers will decrease the output of the farmers by 0.0606 and 0.1336 respectively. A plausible explanation for this could be due to the incidence of over utilization and wrong application of these resources by the farmers and hence, any additional unit of these resources will only bring about a decrease in the output of the famers.

Labour was found to be positively related to the output of the farmers and was significant at 1% probability level. Its coefficient of 0.7495 implies that a unit increase in the quantity of labour used by the farmers will increase the output of the farmers by 0.7495. This is in consonance with Okon *et al*. (2010) who reported that labour was positively related to output of garden egg in Akwa Ibom state and was significant at 5% probability level. Herbicide and fertilizer were negatively related to the output of the farmers but were not significant. This implies that a unit increase in the quantity of herbicide and fertilizer will decrease the output of the farmers by 0.0606 and 0.1336

respectively and this could be attributed to over utilization and misapplication of these resources.

In order to determine the impact of NPFS on the technical efficiency of the farmers, the determinants of technical inefficiency of the farmers were estimated with the NPFS variable being the principal variable of interest. The result of the inefficiency model shows that NPFS variable was negatively related to the technical inefficiency of the farmers but was not statistically significant. This implies that although NPFS variable had a negative relationship with the technical inefficiency of the farmers suggesting that it enhances the technical efficiency of the farmers but its influence was not strong enough to be considered significant. This further suggests that NPFS had no tangible impact on the technical efficiency of the farmers in the study area and this could be attributed to the slow pace of implementation of NPFS activities in the study area as a result of financial constraints.

The variables that were significant in influencing the technical inefficiency of the farmers were extension, membership of association and credit. Membership of association and credit were negatively related to the technical inefficiency of the farmers and were both significant at 1% probability level. This implies that a unit increase in membership of association and amount of credit obtained by the farmers will decrease their technical inefficiency by 0.1563 and 0.9143 respectively. Membership of association and access to credit increased the technical efficiency of the farmers. This is in line with Baruwa and Oke (2012) study in Ondo state.

Extension was positively related to the technical inefficiency of the farmers and was significant at 1% probability level and this implies that a unit increase in extension contacts could have the tendency of increasing the technical inefficiency of the farmers by 0.1563. A plausible explanation for this could be that the extension message passed

to the farmers was not appropriate and hence, it became counterproductive. This agrees with the finding of Tijani (2006) who also found that extension was positively related to technical inefficiency and was significant at 5% probability level. The farmers were yet to attain the frontier output as their mean technical efficiency was 71%. This implies that the farmers could increase their present level of technical efficiency by 29% through efficient utilization of their resources.

Table 4.14: Maximum Likelihood Estimates of the parameter of the Stochastic Frontier Production Function of farmers in Katsina state

Variables	Coefficient	Standard error	T value
General model			
Intercept	5.0670	1.4100	3.5938
Seed	0.1627	0.1650	0.9865
Herbicide	-0.0606*	0.0337	-1.7972
Fertilizer	-0.1336**	0.0573	-2.3316
Labour	0.7495***	0.2956	2.5356
Inefficiency model			
Intercept	0.8359	0.2153	3.8831
Age	-0.0151	0.0406	-0.3698
Education	-0.0017	0.0315	-0.0538
Farming experience	-0.0537	0.0906	-0.5921
Extension	0.1563***	0.0271	5.7659
Association	-0.0991***	0.0149	-6.6896
Household size	0.0036	0.0770	0.0465
NPFS	-0.0014	0.0158	-0.0891
Credit	-0.9143***	0.3043	-3.0050
Variance parameters			
Sigma	0.6807***	0.1794	3.7940
Gamma	0.0399	0.5285	0.0755
Log likelihood	-65.5149		
LR	9.4645		
Mean efficiency	0.71		

NB: * P < 0.1, ** P < 0.05, *** P < 0.0

4.3.4 Impact of NPFS on the technical efficiency of farmers (pooled sample)

The impact of the NPFS on the technical efficiency all the respondents (pooled sample) was evaluated and presented in Table 4.15. The MLE estimates of the parameters of the stochastic frontier production function show that the estimated sigma squared for the farmers (0.8067) was significantly different from zero at 1% probability level. This indicates a good fit and the correctness of the specified distributional assumption of the composite error terms in the estimated model. The value of gamma (0.6827) was significant at 1% probability level suggesting that 68% of the shortfall below the frontier output of the farmers was due to the inefficiencies of the farmers.

The factors of production that had significant influence on the output of the farmers were seed and labour. Seed with a coefficient of 0.1916 was positively related to the output of the farmers and significantly different from zero at 1% probability level. This implies that a unit increase in the quantity of seeds used by the farmers will increase the output of the farmers by a unit of 0.1916. This agrees with the result of Okon *et al*. (2010) study which found a positive relationship between seed and technical efficiency of garden egg farmers in Akwa Ibom state. Labour with a coefficient of -0.3884 was negatively related to the output of the farmers and was significant at 1% probability level. This implies that a unit increase in the quantity of labour will decrease the output of the farmers by a unit of 0.3884 and this could be attributed to over utilization of labour by the farmers in their farm operations. This agrees with the study of Baruwa and Oke (2012) in Ondo state.

In order to determine the impact of NPFS on the technical efficiency of the farmers, the determinants of technical inefficiency of the farmers were estimated with the NPFS variable being the principal variable of interest. The result of the inefficiency model shows that NPFS variable was significant at 1% probability level and negatively

related to the technical inefficiency of the farmers. This implies that NPFS had significant influence in enhancing the technical efficiency of the farmers and hence, expansion of NPFS in the study area is a viable option that can be used towards enhancing the technical efficiency of the farmers. Therefore, policy framework aimed at expanding NPFS to accommodate new sites in the three states and across the nation will serve as a veritable strategy for enhancing the technical efficiency of the farmers through the proper implementation of the NPFS modules. However, despite the impact of NPFS on the technical efficiency of the farmers, the farmers were yet to attain the frontier output as their mean technical efficiency was 68%. This implies that the farmers could increase their present level of technical efficiency by 32% through efficient utilization of their resources.

Other variables that were significant in influencing the technical inefficiency of the farmers were farming experience, membership of association, household size, and credit. Farming experience, membership of association and household size were negatively related to the output of the farmers and were significant at 1%, 10% and 5% probability levels respectively. This implies that a unit increase in farming experience, membership of association and household size will decrease the technical inefficiency of the farmers by a unit of 0.1139, 0.0611 and 0.0001 respectively. The negative relationship between household size and technical inefficiency of farmers was in line with the finding of Ataboh *et al*. (2014). Credit was positively related to the technical inefficiency of the farmers and was significant at 1% probability level. This indicates that an increase in the amount of credit obtained by farmers will tend to increase the technical inefficiency of the farmers. A plausible explanation for this could be that there was high incidence of loan diversion to mainly consumption purposes. Credit obtained for farming purpose was diverted to other activities therefore; it could not yield the

much needed influence on the technical efficiency of the farmers. This agrees with Baruwa and Oke (2012) who reported that a positive and statistically significant relationship was found between access to credit and technical inefficiency in a study on the Technical Efficiency of Small-holder Cocoyam Farms in Ondo state, Nigeria.

Table 4.15: Maximum Likelihood Estimates of the parameter of the Stochastic Frontier Production Function of farmers (pooled sample)

Variables	Coefficient	Standard error	T value
General model			
Intercept	14.5934	0.6832	21.3622
Seed	0.1916***	0.0404	4.7523
Herbicide	0.015	0.0096	1.5666
Fertilizer	0.0104	0.0096	1.0937
Labour	-0.3884***	0.0612	-6.3549
Inefficiency model			
Intercept	1.1251	0.3483	3.2311
Age	-0.0326	0.0201	-1.6273
Education	-0.0041	0.012	-0.3378
Farming experience	-0.1139***	0.0312	-3.6499
Extension	0.0331	0.0238	1.3931
Association	-0.0611*	0.0330	-1.8544
Household size	-0.0001**	0.0001	-2.1886
NPFS	-0.2721***	0.0963	-2.8274
Credit	0.0456***	0.0130	3.5305
Variance parameters			
Sigma	0.8067***	0.1290	6.2537
Gamma	0.6827***	0.0574	11.9049
Log likelihood	-421.39208		
LR	159.96961		
Mean efficiency	0.68		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.4 Impact of NPFS on the Food Security of Farmers in the Study Area

The analysis of the impact of NPFS on the food security of the farmers in the study area was disaggregated into Kano, Kaduna, Katsina states and the pooled states analysis. However, the food insecurity line (the cost of buying the minimum daily calorie intake per adult equivalent) for the study area was established before undertaking the disaggregated analysis. The result presented in Table 4.16 shows the estimated regression coefficients for calorie intake on expenditure which is required for the estimation of the cost of buying the minimum daily calorie intake. The R-Squared of 28% indicates that 28% of the variation in the expenditure of the farmers is influenced by their level of calorie intake. The estimated coefficient of calorie intake is positively related to the expenditure of the farmers and was significant at 10% probability level. This implies that a unit increase in the calorie intake of the farmers will increase their food expenditure.

The result of the estimation of the food insecurity line in the three states is presented in Table 4.17. Based on the slope and the coefficient of calorie intake in Table 4.16 as well as the recommended minimum daily calorie intake per adult equivalent (2260 Kcal), the cost of buying the minimum daily calorie intake per adult equivalent was estimated to be ₦408.24 therefore, the food insecurity line is ₦408.24. This implies that farmers with daily consumption expenditure of ₦408.24 and above are considered to be food secure since they were able to purchase the recommended minimum daily calorie intake per adult equivalent while farmers whose daily consumption expenditure is below ₦408.24 are considered to be food insecure. This is against the finding of Olagunju *et al*. (2012) who reported that the food insecurity line was ₦67.82 per day per adult equivalent in their study undertaken in Oyo state.

Table 4.16: Estimated regression coefficients for calorie intake on expenditure in study area

Variable	Coefficient	Standard error	T value
Intercept	6.0118	1.2085	4.9746
Calorie intake	0.2547E-7*	0.1533E-7	1.6614
R- squared	28		

NB: *** P < 0.01

Table 4.17: Estimation of cost of buying the minimum daily calorie intake (food insecurity line) in study area

Steps
$\ln E = a + bC$
$\ln E = 6.0118 + 0.2345E\text{-}7C$
$Z = e^{\wedge(a+bL)}$
$Z = e^{\wedge(6.0118 + 0.2547E\text{-}7 \times 2260)}$
$Z = 408.24$

4.4.1 Impact of NPFS on the food security of farmers in Kano state

Based on the study findings, the result of the food insecurity indices of the sampled farmers in Kano state is presented in Table 4.18. The estimated head count of the NPFS beneficiaries and non-beneficiaries were 34.4% and 65.6% respectively and this indicates that 34.4% of the NPFS beneficiaries were food insecure while 65.6% of the non-beneficiaries were food insecure. The estimated short fall index of 0.20 and 0.60 for the NPFS beneficiaries and non-beneficiaries respectively implies that the extent of short fall below the food insecurity line for the NPFS beneficiaries was lower compared to the non-beneficiaries and hence, it would be easier for the NPFS beneficiaries to move out of the food insecurity trap than the non-beneficiaries. The estimated severity index of the NPFS beneficiaries and non-beneficiaries were 0.11 and 0.39 respectively and this indicates that the severity of food insecurity was higher among the NPFS non-beneficiaries compared to the beneficiaries.

Based on the estimated indices of food insecurity in Kano state, NPFS beneficiaries are more food secured than the non-beneficiaries and this may be attributed to their participation in NPFS activities in the study area.

Table 4.18: Estimation of food security indices of farmers in Kano state

Food security Indices	**Beneficiaries**	**Non-beneficiaries**
Head count (%)	34.4	65.6
Shortfall index	0.23	0.60
Severity index	0.11	0.39

In order to determine the impact of NPFS on the food security of the farmers, the determinants of food security of the farmers were examined with the NPFS variable being the principal variable of interest. From the result of the probit regression analysis presented in Table 4.19, the Log likelihood ratio of -171.716 is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.74 implies that 74% of the variation in the food security status of the farmers is explained by the explanatory variables of the model. With regards to the accuracy of the model in prediction of the food security status of the farmers, the overall percentage of the food security status of the farmers that is correctly predicted by the model seems good at 95% in comparison to the 100% prediction of a perfect model.

The estimated coefficient of NPFS variable (3.7232) was positively related to the food security status of the farmers and was statistically significant at 1% probability level indicating that NPFS had positive influence on the food security status of the farmers. This implies that NPFS was instrumental in enhancing the food security status of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to enhancing the food security of its beneficiaries have been

achieved in the study area. This further suggests that enhancing the delivery of its modules to farmers and also, the active participation of farmers in the NPFS activities will enhance their food security status. Ayoade et al (2011) found that participation in NSPFS enhanced the beneficiaries' food security. Therefore, NPFS can be regarded as a panacea for food insecurity in the study area.

The other significant determinants of the food security status of the farmers were age, farming experience, household size, assets and non-food expenditure. The coefficient of the age of the farmers (0.0688) was positive and significant at 10% probability level. This implies that a unit increase in the age of the farmers will increase the food security of the farmers by a magnitude of 0.0688. This agrees with the finding of Olagunju *et al*. (2012) who posited that increase in the age of the household head decreases the likelihood for the household to become food insecure Oyo state.

The coefficient of farming experience (0.1600) was positively related to the food security status of the farmers and was significant at 1% probability level indicating that the food security of the farmers will increase by a magnitude of 0.1600 as a result of a unit increase in the farming experience of the farmers. A plausible explanation for this is that an increase in farming experience tends to increase the technical knowledge of farmers in agronomic practices and farm management which will enhance their production. This invariably will improve the food security of the farmers. This result agrees with Oluyole *et al*. (2009) who found out in a study on food security among cocoa farmers in Ondo state that farming experience was positive and significant at 5% probability and that a unit increase in farming experience of household head increases the probability of the household being food secure by 0.0088.

The coefficient of household size (0.5775) was negative and significant at 1% probability level. This implies that a unit increase in the household size of the farmers

has the tendency of reducing their food security by a magnitude of 0.5775. The reason for this is that an increase in household size brings about an increase in the quantity of food necessary to meet the food requirement of the household members and if the household members are largely dependents, it could lead to the incidence of food insecurity. This result is in consonance with a study on food security among rural households in north central Nigeria by Babatunde *et al.* (2007) who reported that household size was negative and significant at 5% implying that as the household size gets larger, the probability of being food secure decreases. It also agrees with Idiaye and Omonona (2014) who noted that household size increased the probability of food insecurity in a study of NSPFS in Oyo state.

The coefficient of assets owned by the farmers was positively related to their food security status and was significant at 1% probability level. This implies that a unit increase in the assets of the farmers tends to increase their food security. This is because an increase in the assets of the farmers especially farm assets will enhance their farm productive capacity which will lead to an increase in their productivity and income generation. It will also enable the farmers to meet their food requirements. It also enhances the household resilience in times of food crisis (Amaza *et al*., 2009).

The coefficient of non-food expenditure was negative and significant at 1% probability level suggesting that an increase in the non-food expenditure of the farmers has the tendency of reducing their food security and this is because an increase in non-food expenditure could bring about a decrease in food expenditure which will adversely affect the food security status of the farmers. According to Amaza *et al*. (2006), expenses on children education adversely affected household food security in their study of determinants of food security in Borno state.

Table 4.19: Probit regression estimates of the determinants of food security of the farmers in Kano state

Variable	Coefficient	Standard error	T value
Intercept	-2.3385	1.7461	-1.339
NPFS	3.7232**	1.5208	2.448
Age	0.0688*	0.0353	1.953
Education	0.0264	0.0509	0.518
Farming experience	0.1600***	0.0531	3.012
Extension	-0.0162	0.0529	-0.305
Association	-0.0084	0.1780	-0.047
Household size	-0.5775***	0.1032	-5.595
Credit	0.9553D-05	0.1345D-04	0.710
Farm size	-0.9242	0.9007	-1.026
Market distance	0.0398	0.0350	1.136
Assets	0.2521D-04 ***	0.4630D-05	5.444
Income	-0.2238D-05	0.1789D-05	-1.251
Non-food expenditure	-0.4554D-05***	0.1150D-05	-3.958
Likelihood ratio	-171.716***		
Correct prediction (%)	95.20		
McFadden Pseudo R squared	0.74		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.4.2 Impact of NPFS on the food security of farmers in Kaduna state

The impact of the NPFS on the food security status of the respondents in Kaduna state was investigated and the result of the food insecurity indices of the farmers is presented in Table 4.20. The estimated head count of the NPFS beneficiaries and non-beneficiaries were 39.1% and 44.9% respectively and this indicates that 39.1% of the NPFS beneficiaries were food insecure while 44.9% of the non-beneficiaries were food insecure. The estimated short fall index of 0.62 and 0.67 for the NPFS beneficiaries and non-beneficiaries respectively implies that the extent of short fall below the food insecurity line for the NPFS beneficiaries was lower compared to the non-beneficiaries hence; it would be easier for the NPFS beneficiaries to move out of the food insecurity trap than non-beneficiaries. The estimated severity index of the NPFS beneficiaries and non-beneficiaries were 0.43 and 0.50 respectively and this indicates that the severity of food insecurity was higher among the non-beneficiaries compared to the beneficiaries. Based on the estimated indices of food insecurity in the study area, NPFS beneficiaries are more food secure than the non-beneficiaries and this may be as a result of their participation in NPFS activities in the study area. This agrees with Amaza *et al* (2009) study which discovered that the PROSAB project in Borno state enhanced the food security status of participants.

Table 4.20: Estimation of food security indices of farmers in Kaduna state

Food security Indices	**Beneficiaries**	**Non-beneficiaries**
Head count (%)	34.4	65.6
Shortfall index	0.23	0.60
Severity index	0.11	0.39

In order to determine the impact of NPFS on the food security status of the farmers, the determinants of food security were examined with the NPFS variable being the principal variable of interest. From the result of the probit regression analysis presented in Table 4.21, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.66 implies that 66% of the variation in the food security status of the farmers is explained by the explanatory variables of the model. With regards to the accuracy of the model in prediction of the food security status of the farmers, the overall percentage of the food security status of the farmers that is correctly predicted by the model seems good at 90.6% in comparison to the 100% prediction of a perfect model.

The estimated coefficient of NPFS variable was positively related to the food security status of the farmers and was statistically significant at 5% probability level indicating that NPFS had positive influence on the food security status of the farmers. This implies that NPFS was instrumental in enhancing the food security status of the farmers through the delivery of its modules to them hence, the objective of NPFS with respect to enhancing the food security of its beneficiaries have been achieved in the study area. Therefore, NPFS can be regarded as a panacea for food insecurity in the study area. This agrees with Idiaye and Omonona (2014) who posited that participation in NSPFS enhanced the food security status of beneficiaries in Oyo state.

The other significant determinants of food security for the farmers were age, extension, household size, market distance and non-food expenditure. The coefficient of the age of the farmers was negative and significant at 10% probability. This implies that a unit increase in the age of the farmers will have the tendency of reducing their food security by a magnitude of 0.0463. This could be as a result of the inability of the

farmers to participate actively in the day to day management of their farm activities as they grow older beyond the economically active age bracket (60years). Hence, their production level tends to decrease and this could adversely affect the food security status of the farmers. This result is in tandem with the finding of Ojogho (2010) who found that household size, age and dependency ratio increase household food insecurity in Edo state.

Extension was positively related to the food security status of the farmers and was significant at 5% probability level. This implies that a unit increase in extension contacts could have the tendency of increasing the food security of the farmers. The result implies that enhancing the farmers' accessibility to extension will have the tendency of enhancing their food security status stemming from the increase in food production as a result of access to extension. This is in line with the findings of Amaza *et al*. (2006) who found that access to extension service enhanced the food security status of farmers in Borno state.

The coefficient of household size (0.2036) was negative and significant at 1% probability level. This implies that a unit increase in the household size of the farmers has the tendency of reducing their food security by a magnitude of 0.2036. The reason for this is that an increase in household size brings about an increase in the quantity of food needed to meet the food requirement of the household members especially if they are largely dependents which could lead to the incidence of food insecurity. According to Mequanant *et al*. (2014), large household size tends to exert more pressure on consumption than the labour it contributes to production. This shows that households with large sizes had higher probabilities of being food insecure than those with smaller sizes, and vice versa. This agrees with Olagunju *et al*. (2012) who noted that the probability of being food insecure increases with an increase in family size.

The coefficient of market distance was positively related to the food security status of the farmers and was significant at 10% probability level. This implies that a unit increase in distance to output market tends to increase the food security status of the farmers. This is because prices of farm produce at the farm gate are usually lower compared to prices obtainable far from the farm gate and this implies that sales of produce far from the farm gate generates greater returns for meeting the food needs of the farmer and his household members. This agrees with Amaza *et al.* (2009) who reported a positive relationship between market distance and food security.

The coefficient of non-food expenditure was negative and significant at 10% probability level suggesting that an increase in the non-food expenditure of the farmers has the tendency of reducing their food security status and this is because an increase in non-food expenditure could bring about a decrease in food expenditure which will adversely affect the food purchasing power of the farmers and invariably the food security status of the farmers in the long run. Amaza *et al*. (2006) found that spending on children's education and health adversely affected the food security status of some households in their study in Borno state.

Table 4.21: Probit regression estimates of the determinants of food security of the farmers in Kaduna state

Variable	Coefficient	Standard error	T value
Intercept	3.1294	1.3437	2.329
NPFS	1.6175**	0.6662	2.428
Age	-0.0463*	0.0252	-1.845
Education	-0.0490	0.0497	-0.989
Farming experience	-0.0372	0.0240	-1.556
Extension	0.1538**	0.0639	2.411
Association	0.1001	0.0909	1.102
Household size	-0.2036***	0.0596	-3.420
Credit	0.2316D-04	0.1848D-04	1.253
Farm size	0.3088	0.2305	1.340
Market distance	0.0759*	0.0385	1.973
Assets	0.3190D-05	0.2669D-05	1.195
Income	0.1247D-05	0.1979D-05	0.630
Non-food expenditure	-0.5823D-05*	0.3179D-05	-1.832
Likelihood ratio	-93.557***		
Correct prediction (%)	90.60		
McFadden Pseudo R squared	0.66		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.4.3 Impact of NPFS on the food security of farmers in Katsina state

The impact of the programme on the food security status of respondents in the state was investigated and evaluated. The result of the food insecurity indices of the farmers in Katsina state is presented in Table 4.22. The estimated head count of the NPFS beneficiaries and non-beneficiaries were 48.1% and 55.6% respectively and this indicates that 48.1% of the NPFS beneficiaries were food insecure while 55.6% of the non-beneficiaries were food insecure. The estimated short fall index of 0.68 and 0.69 for the NPFS beneficiaries and non-beneficiaries respectively implies that the extent of short fall below the food insecurity line for the NPFS beneficiaries was slightly lower

than that of the NPFS non-beneficiaries hence, it would be easier for the NPFS beneficiaries to move out of the food insecurity trap than the non- beneficiaries. The estimated severity index of the NPFS beneficiaries and non-beneficiaries were 0.59 and 0.79 respectively and this indicates that the severity of food insecurity was higher among the NPFS non-beneficiaries compared to the beneficiaries. Based on the estimated indices of food insecurity in the study area, NPFS beneficiaries are more food secure than the non-beneficiaries.

Table 4.22: Estimation of food security indices of farmers in Katsina state

Food security Indices	**Beneficiaries**	**Non-beneficiaries**
Head count	48.1	55.6
Shortfall index	0.68	0.69
Severity index	0.59	0.79

In order to determine the impact of NPFS on the food security status of the farmers, the determinants of food security of the farmers were examined with the NPFS variable being the principal variable of interest. From the result of the probit regression analysis presented in Table 4.23, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.56 implies that 56% of the variation in the food security status of the farmers is explained by the explanatory variables of the model. With regards to the accuracy of the model in prediction of the food security status of the farmers, the overall percentage of the food security status of the farmers that is correctly predicted by the model seems good at 83.3% in comparison to the 100% prediction of a perfect model.

The estimated coefficient of NPFS variable was negatively related to the food security status of the farmers and was not statistically significant. This implies that NPFS had negative influence on the food security status of the farmers and hence, the objective of NPFS with respect to enhancing the food security of its beneficiaries was not achieved in the state. This could be attributed to the poor implementation of NPFS activities in the state largely due to the problem of poor funding which adversely affected the delivery of NPFS modules to the beneficiaries. Therefore, NPFS was not statistically significant in improving the food security status of the beneficiaries in the state.

The significant determinants of food security for the farmers were household size, market distance, assets and income of the farmers. The coefficient of household size of the farmers (0.4641) was negative and significant at 1% probability. This implies that a unit increase in the household size of the farmers has the tendency of reducing their food security by a magnitude of 0.4641. This shows that households with large sizes had higher probabilities of being food insecure than those with smaller sizes, and vice versa. This result is in agreement with Idrisa *et al*. (2008) who found that the incidence and severity of food insecurity were higher among families with large household size than among those with small household size.

The coefficient of market distance was negatively related to the food security status of the farmers and was significant at 10% probability level. This implies that a unit increase in distance to output market tends to decrease the food security status of the farmers. This suggests that farmers who sell their produce at the farm gate tend to be more food secure than those who sell far away from the farm gate as farm gate sales generates timely returns to meet the food expenditure of the farmer and his household. It also reduces the cost of marketing.

The coefficient of acquisition of assets was positive and significant at 10% probability level suggesting that an increase in the assets of the farmers especially farm assets has the tendency of increasing their food security status. This is possible through enhancement of their farm production by efficient utilization of farm assets leading to increased income generation and the ability to purchase the required quantity of food to meet the nutritional requirement of the farmers and their households. This is in consonance with the findings of Amaza *et al*. (2009) in a study on household food security and poverty in Borno state which found that acquisition of assets enhanced the food security status of the respondents.

The coefficient of income was positive and significant at 10% probability level and this implies that an increase in the income of the farmers has the tendency of increasing their food security status. The justification for this is that as the income of the farmers increases, their ability to meet their consumption needs and that of their household members increases. This is in line with Olagunju *et al*. (2012) who found that households that have access to better off- farm income opportunities are less likely to become food insecure than those households who had no or little access.

Table 4.23: Probit regression estimates of the determinants of food security of the farmers in Katsina state

Variable	Coefficient	Standard error	T value
Intercept	-4.056	3.0147	-1.345
NPFS	-1.2425	0.999	-1.244
Age	0.0710	0.0674	1.055
Education	0.0109	0.0880	0.123
Farming experience	0.0694	0.0471	1.474
Extension	0.1716	0.1194	1.437
Association	0.1987	0.1432	1.387
Household size	-0.4641***	0.1735	-2.675
Credit	0.8846D-05	0.8068D-05	1.096
Farm size	0.0076	0.1241	0.061
Market distance	-0.0989*	0.0584	-1.695
Assets	0.1276D-04*	0.7314D-05	1.745
Income	0.2734D-05*	0.1654D-05	1.653
Non-food expenditure	-0.3007D-06	0.2045D-05	-0.147
Likelihood ratio	-37.393***		
Correct prediction (%)	83.33		
McFadden Pseudo R squared	0.56		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.4.4 Impact of NPFS on the food security of farmers (pooled sample)

The impact of the NPFS on the food security status of the respondents in the study was investigated and evaluated. The result of the food insecurity indices of the pooled sample farmers in this study is presented in Table 4.24. The estimated head count of the NPFS beneficiaries and non-beneficiaries were 37.6% and 57.9% respectively and this indicates that 37.6% of the NPFS beneficiaries were food insecure while 57.9% of the non-beneficiaries were food insecure with the non-beneficiaries having higher food insecurity by a magnitude of 20.3% over the food insecurity level of the NPFS beneficiaries. This compares favourably with the finding of Amaza *et al.*

(2009) who reported that 49% of households were classified as food insecure in the participating communities and 61% of households in the non-participating communities of Promoting Sustainable Agriculture in Borno state (PROSAB) project intervention in Borno State indicating that food insecurity level is relatively higher in the non-PROSAB communities by 12%. The estimated short fall index of 0.43 and 0.64 for the NPFS beneficiaries and non-beneficiaries respectively implies that the extent of short fall below the food insecurity line for the food insecure NPFS beneficiaries was lower compared to the food insecure non-beneficiaries and hence, it would be easier for the food insecure beneficiaries to move out of the food insecurity trap than the food insecure non-beneficiaries. The estimated severity index of the NPFS beneficiaries and non-beneficiaries were 0.29 and 0.45 respectively and this indicates that the severity of food insecurity was higher among the NPFS non-beneficiaries compared to the beneficiaries. Based on the estimated indices of food insecurity in the study area, NPFS beneficiaries were more food secure than the non-beneficiaries and this is attributed to their participation in NPFS activities. This is in line with the findings of Ayoade *et al*. (2011) and Yakasai *et al*. (2013) in their studies in Oyo and Niger states respectively. They found that participation in NPFS increased the food security status of the beneficiaries.

Table 4.24: Estimation of food security indices of farmers (Pooled sample)

Food security Indices	**Beneficiaries**	**Non-beneficiaries**
Head count	37.6	57.9
Shortfall index	0.43	0.64
Severity index	0.29	0.45

In order to determine the impact of NPFS on the food security status of the farmers, the determinants of food security for the farmers were examined with the NPFS variable being the main variable of interest. From the result of the probit regression analysis presented in Table 4.25, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.34 implies that 34% of the variation in the food security status of the farmers is explained by the explanatory variables of the model. With regards to the accuracy of the model in prediction of the food security status of the farmers, the overall percentage of the food security status of the farmers that is correctly predicted by the model seems good at 78.5% in comparison to the 100% prediction of a perfect model.

The estimated coefficient of NPFS variable was positively related to the food security status of the farmers and was statistically significant at 1% probability level indicating that NPFS had positive influence on the food security status of the farmers. This implies that NPFS was instrumental in enhancing the food security status of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to enhancing the food security of its beneficiaries have been achieved in the study area. It further suggests that enhancing the delivery of its modules to farmers and also, the active participation of farmers in the NPFS activities will enhance their food security status. Therefore, NPFS can be regarded as a panacea for food insecurity in the study area. This finding is in line with the result of Amaza *et al.* (2009) who reported that the coefficient of the PROSAB project intervention in Borno state was positive and significant at 1% probability level indicating that the project activities, such as farmers' training on crop management practices, marketing, adoption of improved crop varieties by farmers and their links to inputs and output markets positively

contributed to enhancing food security. It also agree with the studies of Yakasai *et al* (2013) and Idiaye and Omonona (2014) on NSPFS in Niger and Oyo states which found that the programme improved the food security status of the participants.

The other significant determinants of food security for the farmers were age, education, membership of association, household size, credit, farm size, assets and non-food expenditure. The coefficient of the age of the farmers (0.0171) was negative and significant at 10% probability. This implies that a unit increase in the age of the farmers will have the tendency of increasing their food insecurity by a magnitude of 0.0171. This could be as a result of the inability of the farmers to participate actively in the day to day management of their farm activities as they grow older beyond their economically active age bracket. Hence, older farmers' productivity level tends to decrease and this could adversely affect the food security status of the farmers. This agrees with the finding of Oluyole *et al.* (2009) who found out that the older the household head is, the lower the probability of the household being food secure.

Education with a coefficient of 0.0426 was positively related to the food security status of the farmers and was significant at 1% probability level and this implies that a unit increase in educational level of the farmers could have the tendency of increasing their food security status by a magnitude of 0.0426. This is because education enhances farmers understanding and application of improved farm management practices which will enhance their farm productivity and invariably their ability to meet their food consumption needs and that of their household members. This is in line with the finding of Amaza et *al*. (2009) in a study on food security status of PROSAB beneficiaries in Borno State who found that education enhanced their food security. Idiaye and Omonona (2014) also found that education enhanced the food security status of beneficiaries of NSPFS in Oyo state.

The coefficient of membership of association was positive and significant at 5% probability level suggesting that a unit increase in their membership of farmers association could have the tendency of increasing their food security status. This could be attributed to the timely accessibility to farm inputs at reduced cost, marketing services, credit facilities, and other benefits derived from their active participation in their respective farmers association. This agrees with Olagunju *et al*. (2012) who found that households whose heads were members of cooperative or other farmers organizations had higher probability of being food secure than those whose heads were not.

The coefficient of household size (0.1625) was negative and significant at 1% probability level. This implies that a unit increase in the household size of the farmers has the tendency of reducing their food security by a magnitude of 0.1625. The reason for this is that an increase in household size brings about an increase in the quantity of food necessary to meet the food requirement of the household members and if the household members are largely dependents, it could lead to the incidence of food insecurity. This shows that households with large sizes had higher probabilities of being food insecure than those with smaller sizes, and vice versa. This is in line with the finding of Oluyole *et al.* (2009) in their study on food security in Ondo state.

The coefficient of credit was positively related to the food security status of the farmers and was significant at 5% probability level. This implies that a unit increase in the amount of credit obtained by the farmers tends to increase their food security status. This is because the availability of timely credit helps the farmers to meet up with the financial obligations of their farms in good time thereby ensuring that their farm activities and invariably, their productivity is not adversely affected due to lack of

finance. This agrees with the findings of Amaza *et al* (2006) in their study on the determinants of food security in Nigeria that access to credit enhances food security.

The coefficient of farm size (0.2273) was negative and significant at 1% probability level. This implies that a unit increase in the farm size of the farmers has the tendency of reducing their food security by a magnitude of 0.2273. This result agrees with the finding of Babatunde *et al.* (2007) in their study on food security in north central Nigeria. This could be as a result of the inability of the farmers to efficiently utilize their present farm holdings and as such, any increase in their current level of farm holding would only be counterproductive as their limited resources would not suffice for the management of larger farms. This is in line with Bifarin *et al.* (2010) who noted that there is potential possibility to raise productivity by improving efficiency without necessarily developing new technologies or increasing the resource base. Therefore, it would be better to efficiently utilize their present farm holdings for enhanced productivity and invariably food security rather than seeking for larger farm holdings that they would not be able to manage.

The coefficient of assets was positive and significant at 1% probability level suggesting that an increase in the assets of the farmers especially farm assets has the tendency of increasing their food security status. Efficient use of farm assets can enhance the farmers' productivity and reduce household food insecurity. This agrees with Olagunju *et al*. (2012) who noted that the higher the value of household assets, the lower the probability of food insecurity.

The coefficient of non-food expenditure was negative and significant at 10% probability level suggesting that an increase in the non-food expenditure of the farmers has the tendency of reducing their food security status and this is because an increase in non-food expenditure could bring about a decrease in food expenditure which will

adversely affect the food purchasing power of the farmers and invariably the food security status of the farmers in the long run. Amaza *et al*. (2006) found that expenses on children's education increases household food insecurity because parents sometimes sell food stock to pay school fees which exposes them to food shortages. Mequanant *et al*. (2014) found that expenses on farm inputs negatively affected household food security in their study in Ethiopia.

Table 4.25: Probit regression estimates of the determinants of food security of the farmers (pooled sample)

Variable	**Coefficient**	**Standard error**	**T value**
Intercept	0.9738	0.4343	2.242
NPFS	0.6186***	0.2477	2.497
Age	-0.0171*	0.0096	-1.783
Education	0.0426***	0.0153	2.788
Farming experience	0.0029	0.0095	0.302
Extension	-0.0067	0.0109	-0.616
Association	0.0530**	0.0257	2.067
Household size	-0.1625***	0.0183	-8.898
Credit	0.7032D-05**	0.2935D-05	2.396
Farm size	-0.2273***	0.0566	-4.022
Market distance	0.0106	0.0125	0.842
Assets	0.8608D-05***	0.1202D-05	7.164
Income	0.4671D-06	0.5111D-06	0.914
Non-food expenditure	-0.6791D-06*	0.3844D-06	-1.766
Likelihood ratio	-303.537***		
Correct prediction (%)	78.5		
McFadden Pseudo R squared	0.34		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.4.4.1 Test of hypothesis of no significant difference in the food security of the beneficiaries and non-beneficiaries of NPFS

Based on the study findings, the hypothesis which states that the" NPFS has no impact on the household food security status of the farmers" was tested. The result of the Z test as presented in Table 4.26 shows that the calculated z value (2.682) is greater than the table z value of 1.64 at one tail and 1.96 at two tail respectively and it is significant at 1% probability level. This implies that there is a significant difference in the food security level of the beneficiaries and non-beneficiaries of NPFS therefore, the null hypothesis is rejected and the alternative accepted. This is an indication that NPFS contributed in improving the food security status of its beneficiaries.

Table 4.26: Test of hypothesis of the food security of the beneficiaries and non-beneficiaries of NPFS

Variable	**Food security of beneficiaries**	**Food security of non-beneficiaries**
Mean of calorie intake	1425.510	649.310
Known Variance	17887186.00o	621283.700
Observations	221	221
Hypothesized Mean Difference	0	
Z	2.682***	
P(Z<=z) one-tail	0.004	
z Critical one-tail	1.645	
P(Z<=z) two-tail	0.007	
z Critical two-tail	1.960	

NB: ***= significant at 1%

4.5 Impact of NPFS on the Poverty Status of Farmers in the Study Area

4.5.1 Impact of NPFS on the poverty status of farmers in Kano state

In order to evaluate the impact of the programme on the poverty status of the respondents, the FGT weighted class of poverty indices as shown in Table 4.27 was computed from the poverty line of ₦18, 474.72 which was estimated using two-third mean per capita household expenditure of the pooled sample of farmers. This means that farming households in the study area whose monthly food and non-food expenditure is below ₦18, 474.72 are considered poor.

Based on the findings of the study for Kano state, the poverty head count (poverty incidence) of the NPFS beneficiaries was 33% while that of the NPFS non-beneficiaries was 56%. This implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries indicating that the proportion of beneficiaries that cannot afford to buy a basic basket of goods to meet the consumption needs of their households is lower than that of the non-beneficiaries. Therefore, the beneficiaries are less poor than the non-beneficiaries in the study areas. The depth of poverty (poverty gap index) of poor NPFS beneficiaries (0.29) was lower than that of poor NPFS non-beneficiaries (0.89). This indicates that the poor NPFS non-beneficiaries are farther away from the poverty line than the poor beneficiaries. The implication is that it is easier for the poor beneficiaries to move above the poverty line than the poor non-beneficiaries who are farther from the poverty line. Also, the degree of inequality (poverty severity) among the poor NPFS beneficiaries given by the estimated severity of poverty (0.11) was equally lower than that of the poor non-beneficiaries (0.81). This shows that the poor beneficiaries are better off as their poverty severity is lower than the poor non-beneficiaries. This agrees with the findings of Idiaye and Omonona (2014) in their study

of NSPFS in Oyo state. The poverty incidence of the beneficiaries was 38.5% while it was 44.2% among the non- beneficiaries.

Table 4.27: Poverty status of farming households in Kano state

Items	**Beneficiaries**	**Non-beneficiaries**
Poverty line(₦)	18474.72	18474.72
Poverty headcount	0.33	0.56
Poverty gap	0.29	0.89
Poverty severity	0.11	0.81
Poor (%)	33	56
Non-poor (%)	67	44

In order to determine the impact of NPFS on the poverty status of the farmers, the determinants of poverty of the farmers were examined with the NPFS variable being the main variable of interest. From the result of the logit regression analysis presented in Table 4.28, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.75 implies that 75% of the variation in the poverty status of the farmers is explained by the explanatory variables of the model.

The estimated coefficient of NPFS variable was negatively related to the poverty status of the farmers and was statistically significant at 1% probability level indicating that NPFS had negative influence on the poverty status of the farmers. This implies that NPFS was instrumental in alleviating poverty of the beneficiaries through the delivery of its modules to them therefore, the objective of NPFS with respect to reduction of poverty of its beneficiaries have been achieved in the study area. This further suggests that enhancing the delivery of NPFS modules to farmers and also, the active participation of farmers in the NPFS activities will aid in reducing their poverty and thereby, enhance their well-being. Idiaye and Omonona (2014) found out that the

NSPFS variable reduced the probability of the beneficiaries being poor by 6% in their study in Oyo state. Therefore, NPFS can be regarded as a veritable programme for reducing poverty amongst farming households in the study area.

The other significant determinants of the poverty for the farmers were age, farming experience, household size, extension, credit, farm size, assets and income. The coefficient of age was positive and significant at 5% probability level indicating that a unit increase in the age of the farmers will have the tendency of increasing their poverty level. An explanation for this is that as the farmers exceed their productive age level (60 years), their active involvement in farming activities tends to reduce considerably thereby reducing their farm productivity, income generation and invariably affecting their poverty status. This agrees with the result of Igbalajobi *et al*. (2013) which found age to be positive and significant to farmers' poverty levels in their study in Ondo state.

The coefficient of farming experience was negative and significant at 1% probability level indicating that a unit increase in the farming experience of the farmers will have the tendency of decreasing their poverty level. This is in line with *a priori* expectation implying that increase in farming experience brings about a reduction in poverty as a result of increase in productivity due to acquisition of sound practical knowledge of farm management practices over time. Adekoya (2014) found that farming experience was significant in reducing the poverty levels of farmers in Ogun state.

The coefficient of household size was positive and significant at 1% probability level indicating that a unit increase in the household size of the farmers will have the tendency of increasing their poverty level. This is because an increase in the household size leads to increase in expenditure to meet the needs of the members especially for households with high dependents which could eventually adversely affect their well-

being. This finding agrees with that of Idiaye and Omonona (2014) in their study of NSPFS in Oyo state.

The coefficient of extension was negative and significant at 1% probability level and this implies that a unit increase in the number of extension contacts of the farmers will have the tendency of reducing their poverty level. This is because an increase in the accessibility of the farmers to extension services will increase their accessibility to improved farming practices and other vital farming information that will enhance their farm productivity, income and ultimately their welfare. Apata *et al.* (2010) found access to extension service was significant in reducing the poverty level of farmers in southwest Nigeria.

The coefficient of credit was negative and significant at 1% probability level and this implies that a unit increase in the credit of the farmers will have the tendency of reducing their poverty level. This is because an increase in accessibility to credit by the farmers enhances their productive capacity, income generation and invariably reducing their poverty level. This agrees with the finding of Igbalajobi *et al.* (2013) who found that the coefficient of access to credit was negative and significant at 5% probability level in a study undertaken in Ondo state.

The coefficient of farm size was negative and significant at 5% probability level and this implies that a unit increase in the farm holdings of the farmers will have the tendency of reducing their poverty level. This agrees with Awotide *et al*. (2010) who reported area of land owned by the respondents in their study in southwest Nigeria was statistically significant and negatively related to the probability of a household being poor.

The coefficient of assets was negative and significant at 1% probability level and this implies that a unit increase in the assets of the farmers will have the tendency of

reducing their poverty level. The explanation for this is that increase in asset holdings of the farmers especially farm assets enhances their farm productive capacity thereby enhancing their farm income generation to meet their needs. This agrees with Amaza *et al*. (2009) who found that asset acquisition reduced the probability of PROSAB beneficiaries in Borno state of being poor.

The coefficient of income was negative and significant at 1% probability level and this implies that a unit increase in the income of the farmers will have the tendency of reducing their poverty level. This is because as the income of the farmers increases, the ability to meet their consumption needs increases thereby enhancing their well-being. This is in line with the study of Ogwumike and Akinnibosun (2013) in their study on poverty among farming households in Nigeria.

Table 4.28: Logit regression estimates of poverty status of farmers (Kano state)

Variable	Coefficient	Standard error	T value
Intercept	1.5250	4.0278	0.379
Age	0.2064**	0.0868	2.380
Education	-0.0581	0.1589	-0.366
Farming experience	-0.2120***	0.0791	-2.680
Household size	41.4019***	9.2710	4.466
NPFS	-1.0570***	0.2242	-4.715
Extension	-0.9720***	0.2179	-4.462
Membership of association	-0.4048	0.4198	-0.964
Credit	-0.0003***	0.7104D-04	-4.050
Farm size	-4.1690**	1.8384	-2.268
Assets	-0.1226D-04***	0.3329D-05	-3.683
Income	-0.1172D-04*	0.6594D-05	-1.777
Likelihood ratio	260.643***		
Correct prediction (%)	99.2		
McFadden Pseudo R squared	0.75		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.5.2 Impact of NPFS on the poverty status of farmers in Kaduna state

The FGT weighted class of poverty indices as shown in Table 4.29 was computed from the poverty line of ₦18, 474.72 which was estimated using two-third mean per capita household expenditure of the pooled sample of farmers. This means that farming households in the study area whose monthly food and non-food expenditure is below ₦18, 474.72 are considered poor.

The study revealed that the poverty head count (poverty incidence) of the NPFS beneficiaries in Kaduna state was 55% while that of the NPFS non-beneficiaries was 62%. This implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries indicating that the proportion of beneficiaries that cannot afford to buy a basic basket of

goods to meet the consumption needs of their households is lower than that of the non-beneficiaries. The depth of poverty (poverty gap index) of poor NPFS beneficiaries (0.48) was lower than that of poor non-beneficiaries (0.54). This indicates that the poor NPFS non-beneficiaries are farther away from the poverty line than the poor NPFS beneficiaries. The implication is that it is easier for the poor NPFS beneficiaries to move above the poverty line than the poor non-beneficiaries who are far away from the poverty line. Also, the degree of inequality (poverty severity) among the poor NPFS beneficiaries given by the estimated severity of poverty (0.27) was equally lower than that of the poor non-beneficiaries (0.34). This shows that the poor beneficiaries are better off as their poverty severity is lower than the poor non-beneficiaries. This is in line with the finding of Idiaye and Omonona (2014) who found that poverty incidence and severity was more among non-beneficiaries of NSPFS in Oyo state.

Table 4.29: Poverty profile of farming households in Kaduna state

Items	**Beneficiaries**	**Non-beneficiaries**
Poverty line(₦)	18474.72	18474.72
Poverty headcount	0.55	0.62
Poverty gap	0.48	0.54
Poverty severity	0.27	0.34
Poor (%)	55	62
Non-poor (%)	45	38

In order to determine the impact of NPFS on the poverty status of the farmers, the determinants of poverty for the farmers were examined with the NPFS variable being the main variable of interest. From the result of the logit regression analysis presented in Table 4.30, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the

model. The McFadden Pseudo R squared of 0.42 implies that 42% of the variation in the poverty status of the farmers is explained by the explanatory variables of the model.

The estimated coefficient of NPFS variable was negatively related to the poverty status of the farmers and was statistically significant at 1% probability level indicating that NPFS had negative influence on the poverty status of the farmers. This implies that NPFS was instrumental in alleviating poverty of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to reduction of poverty of its beneficiaries have been achieved in the study area. This further suggests that enhancing the delivery of NPFS modules to farmers and also, the active participation of farmers in the NPFS activities will aid in reducing their poverty and thereby enhance their well-being. Therefore, NPFS can be regarded as a veritable programme for reducing poverty amongst farming households in the study area. This is in line with the study of Ayoade *et al*., (2011) who found that participation in NPFS significantly reduced the poverty level of the beneficiaries in Oyo state.

The other significant determinants of the poverty for the farmers were farming experience, farm size and income. The coefficient of farming experience was negative and significant at 1% probability level indicating that a unit increase in the farming experience of the farmers will have the tendency of reducing their poverty level. This is attributed to the increase in the farm income generation from the increase in productivity of the households as their farm experience increases. This agrees with Adekoya (2014) who found out that the more the farming experience the less the probability of the farmers being poor in Ogun state.

The coefficient of farm size was positive and significant at 1% probability level and this implies that a unit increase in the farm holdings of the farmers will have the tendency of increasing their poverty level. The tendency of increase in farm size

leading to increase in poverty could be attributed to the inability of the farmers to efficiently utilize their present farm holdings and as such, any increase in their current level of farm holding would only be counterproductive as their limited resources would not suffice for the management of larger farms. This is in line with Ibrahim and Umar (2008) who noted that size of the farm alone may not translate into higher yields and income. This is because the productivity of the land is equally very important in obtaining higher yields and, subsequently, higher incomes and lower incidence of poverty.

The coefficient of income was negative and significant at 10% probability level and this implies that a unit increase in the income of the farmers will have the tendency of reducing their poverty level. This is because as the income of the farmers increases, the ability to meet their consumption needs increases thereby enhancing their well-being. This is in line with Ibrahim and Umar (2008) who reported that number of income sources were likely to decrease the vulnerability of the farming households in Nasarawa State to poverty.

Table 4.30: Logit regression estimates of poverty status of farmers (Kaduna state)

Variable	Coefficient	Standard error	T value
Intercept	2.6162	1.3573	1.928
Age	-0.019	0.0287	-0.661
Education	0.0731	0.0574	1.273
Farming experience	-0.121***	0.0380	-3.189
Household size	0.5994	0.7815	0.767
NPFS	-0.3204***	0.1036	-3.094
Extension	-0.0179	0.0711	-0.251
Association	0.0253	0.0940	0.268
Credit	-0.1860D-04	0.1973D-04	-0.942
Farm size	1.0494***	0.2825	3.716
Assets	-0.3112D-05	0.3591D-05	-0.867
Income	-0.4828D-05*	0.2764D-05	-1.747
Likelihood ratio	78.244***		
Correct prediction (%)	81.16		
McFadden Pseudo R squared	0.42		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.5.3 Impact of NPFS on the poverty status of farmers in Katsina state

The FGT weighted class of poverty indices as shown in Table 4.31 was computed from the poverty line of ₦18, 474.72 which was estimated using two-third mean per capita household expenditure of the pooled sample of farmers. This means that farming households in the study area whose monthly food and non-food expenditure is below ₦18, 474.72 are considered poor.

The study showed that in Katsina state, the poverty head count (poverty incidence) of the NPFS beneficiaries was 48% while that of the NPFS non-beneficiaries was 63%. This implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries indicating that the proportion of beneficiaries that cannot afford to buy a basic basket of goods to meet the consumption needs of their households is lower than that of the non-

beneficiaries. Therefore the NPFS beneficiaries are less poor than the non-beneficiaries. The depth of poverty (poverty gap index) of poor NPFS beneficiaries (0.49) was lower than that of poor non-beneficiaries (0.56). This indicates that the poor NPFS non-beneficiaries are farther away from the poverty line than the poor NPFS beneficiaries and the implication is that it is easier for the poor NPFS beneficiaries to move above the poverty line than the poor non-beneficiaries who are far away from the poverty line. Also, the degree of inequality (poverty severity) among the poor NPFS beneficiaries given by the estimated severity of poverty (0.31) was equally lower than that of the poor NPFS non-beneficiaries (0.37). This shows that the poor NPFS beneficiaries are better off as their poverty severity is lower than the poor NPFS non-beneficiaries. Idiaye and Omonona (2014) found that poverty incidence and severity was lower among NSPFS beneficiaries in Oyo state.

Table 4.31: Poverty status of farming households in Katsina state

Items	**Beneficiaries**	**Non-beneficiaries**
Poverty line(₦)	18474.72	18474.72
Poverty headcount	0.48	0.63
Poverty gap	0.49	0.56
Poverty severity	0.31	0.37
Poor (%)	48	63
Non-poor (%)	52	37

In order to determine the impact of NPFS on the poverty status of the farmers, the determinants of poverty status of the farmers were examined with the NPFS variable being the main variable of interest. From the result of the logit regression analysis presented in Table 4.32, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the

model. The McFadden Pseudo R squared of 0.60 implies that 60% of the variation in the poverty status of the farmers is explained by the explanatory variables of the model.

The estimated coefficient of NPFS variable was negatively related to the poverty status of the farmers and was statistically significant at 10% probability level indicating that NPFS had negative influence on the poverty status of the farmers. This implies that NPFS was instrumental in alleviating poverty of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to reduction of poverty of its beneficiaries have been achieved in Katsina state. This further suggests that enhancing the delivery of NPFS modules to farmers and also, the active participation of farmers in the NPFS activities will aid in reducing their poverty and thereby, enhance their well-being. Idiaye and Omonona (2014) found that participation in NSPFS significantly reduced the poverty level of beneficiaries in Oyo state. Therefore, NPFS can be regarded as a veritable programme for reducing poverty amongst farming households in the state.

The other significant determinants of poverty for the farmers were age, education, farming experience, household size, credit, and assets. The coefficient of age was positive and significant at 5% probability level indicating that a unit increase in the age of the farmers will have the tendency of increasing their poverty level. A plausible explanation for this is that as the farmers exceeds their productive age level, their active involvement in farming activities tends to reduce considerably thereby reducing their farm productivity, income generation and invariably affecting their poverty status. This result agrees with Igbalajobi *et al*. (2013) who reported that the coefficient of age was positively related to the poverty status of rural farmers in Ondo state and was significant at 1% probability level.

The coefficient of education was negative and significant at 1% probability level indicating that a unit increase in the educational level of the farmers will have the tendency of reducing their poverty level and this is in line with the findings of Apata *et al.* (2010) and Ogwumike and Akinnibosun (2013) who noted in their different studies on poverty in Nigeria that the more educated the household head is the less the probability of the household being poor. This supports the notion that education is a key instrument in poverty reduction.

The coefficient of farming experience was negative and significant at 10% probability level indicating that a unit increase in the farming experience of the farmers will have the tendency of reducing their poverty level. The tendency of increase in farming experience leading to a reduction in poverty is as a result of increase in productivity induced by increase in farming experience which will improve their farm income generation and consequently, their welfare. Adekoya (2014) noted that the more experienced the farmer is the less the probability of his being poor in a study of poverty in Ogun state.

The coefficient of household size was positive and significant at 5% probability level indicating that a unit increase in the household size of the farmers will have the tendency of increasing their poverty level. This is because an increase in the household size leads to increase in expenditure to meet the needs of the household members especially for households with high dependents and this could eventually adversely affect the well-being of the households. This result is in consonance with Awotide *et al*. (2010) who reported that the size of the farming households increases the probability of a household being poor.

The coefficient of extension was negative and significant at 1% probability level and this implies that a unit increase in the number of extension contacts of the farmers

will have the tendency of reducing their poverty level. This agrees with the finding of Apata *et al*. (2010) in their study of poverty among farming households in south west Nigeria. This is because an increase in the accessibility of the farmers to extension services will increase their accessibility to improved farming practices and other vital farming information that will enhance their farm productivity, income and ultimately their welfare.

The coefficient of credit was positive and significant at 5% probability level and this implies that a unit increase in the credit of the farmers will have the tendency of increasing their poverty level. This could be attributed to incidence of credit diversion meant for production purposes to unproductive uses thereby keeping the farmers in the debt trap. This is not in line with the result of Igbalajobi *et al.* (2013) who noted that the coefficient of access to credit was negative and significant at 5% probability level in a study of determinants of poverty in Ondo state.

The coefficient of assets was negative and significant at 5% probability level and this implies that a unit increase in the assets of the farmers will have the tendency of reducing their poverty level. A plausible explanation for this is that increase in asset holdings of the farmers especially farm assets enhances their farm productive capacity thereby enhancing their farm income generation to meet their needs thereby reducing poverty. This is in conformity with Apata *et al*. (2010) who found that the value of livestock assets was negatively related to poverty and significant at 1% in South west Nigeria

Table 4.32: Logit regression estimates of poverty status of farmers (Katsina state)

Variable	Coefficient	Standard error	T value
Intercept	1.8909	2.3914	0.791
Age	3.954**	1.8044	2.191
Education	-0.4219**	0.1946	-2.169
Farming experience	-0.1240*	0.0688	-1.803
Household size	0.3002D-04**	0.1473D-04	2.038
NPFS	-0.1948*	0.1174	-1.660
Extension	0.2563	0.1855	1.382
Association	-0.2307	0.2733	-0.844
Credit	0.8943D-04**	0.3947D-04	2.266
Farm size	-0.3486	0.2674	-1.304
Assets	-0.8309**	0.3945	-2.106
Income	-0.4215D-05	0.4037D-05	-1.044
Likelihood ratio	44.146***		
Correct prediction (%)	90.74		
McFadden Pseudo R squared	0.60		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.5.4 Impact of NPFS on the poverty status of farmers (pooled sample)

The FGT weighted class of poverty indices as shown in Table 4.33 was computed from the poverty line of ₦18, 474.72 which was estimated using two-third mean per capita household expenditure of the pooled sample of farmers. This means that farming households in the study area whose monthly food and non-food expenditure is below ₦18, 474.72 are considered poor.

The impact of the NPFS on the poverty status of all the respondents (pooled sample) was investigated and the result showed that the poverty head count (poverty incidence) of the NPFS beneficiaries was 42% while that of the non-beneficiaries was 59%. This implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries

indicating that the proportion of beneficiaries that cannot afford to buy a basic basket of goods to meet the consumption needs of their households is lower than that of the non-beneficiaries. Therefore, the NPFS beneficiaries are less poor than the non-beneficiaries. The poverty incidence of beneficiaries compares favourably with incidence of poverty of 47% reported in a study on poverty in Osun state by Adetunji (2012). The depth of poverty (poverty gap index) of poor NPFS beneficiaries (0.39) was lower than that of poor non-beneficiaries (0.56). This indicates that the poor NPFS non-beneficiaries are farther away from the poverty line than the poor beneficiaries. The implication is that it is easier for the poor NPFS beneficiaries to move above the poverty line than the poor non-beneficiaries who are far away from the poverty line. Also, the degree of inequality (poverty severity) among the poor NPFS beneficiaries given by the estimated severity of poverty (0.20) was equally lower than that of the poor non-beneficiaries (0.36). This shows that the proportion of poor NPFS beneficiaries are better off as their poverty severity is lower than the poor non-beneficiaries. The result of the poverty indices compares favourably with that of Idiaye and Omonona (2014) in a similar study on National Special Programme for Food Security (NSPFS) and poverty among farming households in Oyo state, Nigeria. The poverty incidence among the beneficiary households was 38.5% while the non-beneficiary households exhibited a higher poverty incidence of 44.2%. Average multidimensional poverty index for the beneficiary households was 0.299 while that of the non-beneficiary households was 0.3499 indicating a greater poverty depth among the non-beneficiary households.

Table 4.33: Poverty status of farming households (pooled sample)

Items	Beneficiaries	Non-beneficiaries
Poverty line(₦)	18474.72	18474.72
Poverty headcount	0.42	0.59
Poverty gap	0.39	0.56
Poverty severity	0.20	0.36
Poor (%)	42	59
Non-poor (%)	58	41

In order to determine the impact of NPFS on the poverty status of the farmers, their determinants of poverty were examined with the NPFS variable being the main variable of interest. From the result of the logit regression analysis presented in Table 4.34, the Log likelihood ratio is significant at 1% probability level and this indicates the joint significance of the independent variables included in the model. The McFadden Pseudo R squared of 0.28 implies that 28% of the variation in the poverty status of the farmers is explained by the explanatory variables of the model. This does not imply that the model is poor as the pseudo R squared measures do not correspond in magnitude to what is familiar from R squared for ordinary regression (Bo Hu *et al*., 2006).

The estimated coefficient of NPFS variable was negatively related to the poverty status of the farmers and was statistically significant at 1% probability level indicating that NPFS had negative influence on the poverty status of the farmers. This implies that the NPFS was able to alleviate poverty in the study area. This result corroborates the finding of Idiaye and Omonona (2014) who reported that the coefficient of participation in NPFS was negative and significant at 1% probability level and that it reduced the incidence of multidimensional poverty by 6 % among the beneficiaries.

Also, Ayoade *et al*. (2011) found that the coefficient of level of participation in NSPFS was statistically significant at 1% implying that participation has a significant effect on poverty alleviation among the women beneficiaries of NSPFS in Oyo state.

The result of this study implied that NPFS was instrumental in alleviating poverty of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to reduction of poverty of its beneficiaries have been achieved in the three states. This further suggests that enhancing the delivery of NPFS modules to farmers and also, the active participation of farmers in the NPFS activities will aid in reducing their poverty and thereby, enhance their well-being. As noted by Ayoade *et al*. (2011) and Idiaye and Omonona (2014) in their different studies of NSPFS in Oyo state, participation in the project significantly reduced the farmers poverty levels. Therefore, NPFS can be regarded as a veritable programme for reducing poverty amongst farming households in the study area.

The other significant determinants of poverty for the farmers were education, association, credit, assets and income. This is in line with Idiaye and Omonona (2014) who also established that other than NSPFS, there were other significant determinants of poverty among the farmers and they included educational attainment, food expenditure, household size, age of household head, non-food expenditure and days of incapacitation.

The coefficient of education was negative and significant at 1% probability level indicating that a unit increase in the educational level of the farmers will have the tendency of reducing their poverty level. This is in line with *a priori* expectation implying that increase in education produces a reduction in their poverty status hence, education is important in poverty alleviation as access to education does result in increase in the stock of human capital, and in turn labour productivity and wages which

in turn results in reduction of poverty in the households. Akerele and Adewuyi (2013) also reported that poverty was higher among households with secondary education in a study conducted in Ekiti state and that it could be that these households harbour larger household size with more dependents who do not contribute to household income.

The coefficient of membership of association was negative and significant at 5% probability level indicating that a unit increase in year of participation in association will have the tendency of decreasing their poverty level. This could be attributed to the accessibility to farm inputs, credit facilities, marketing information and other benefits accruable to the farmers due to their participation in the activities of farmer's associations. This agrees with the finding of Ogbonna *et al*. (2012) who found that the coefficient of membership to farmers' groups was negative and significant at 10% probability level in a study undertaken in South-eastern Nigeria.

The coefficient of credit was positive and significant at 1% probability level and this implies that a unit increase in the credit of the farmers will have the tendency of increasing their poverty level. This could be attributed to incidence of credit diversion meant for production purposes to unproductive uses thereby keeping the farmers in the debt trap thereby adversely affecting their well-being. This is in line with the finding of Oni and Olaniran (2009) who found in a study conducted in Oyo state that credit utilization status was positive and significant at 5% probability level indicating that availability of credit does not reduce the probability of being poor.

The coefficient of farm size was negative and significant at 5% probability level and this implies that a unit increase in the farm holdings of the farmers will have the tendency of reducing their poverty level. This agrees with the study of Adekoya(2014) in Ogun state which that increase in farm size reduced the probability of being poor. The coefficient of assets was negative and significant at 1% probability level and this

implies that a unit increase in the assets of the farmers will have the tendency of reducing their poverty level. A plausible explanation for this is that increase in asset holdings of the farmers especially farm assets enhances their farm productive capacity thereby enhancing their farm income generation to meet their needs. This agrees with Akerele and Adewuyi (2013) whose result also showed that poverty reduces with increased level of household assets; emphasizing the important role of productive assets in income generation and poverty.

The coefficient of income was negative and significant at 1% probability level and this implies that a unit increase in the income of the farmers will have the tendency of reducing their poverty level. This is because as the income of the farmers increases, the ability to meet their consumption needs increases thereby enhancing their welfare status. This agrees with Igbalajobi *et al.* (2013) who reported that farm income had negative coefficient and significantly affect the level of poverty among rural farmers in Ondo state. Yakasai *et al* (2013) noted that participation in NSPFS significantly increased the beneficiaries' income and reduced their poverty level in Niger state.

Table 4.34: Logit regression estimates of poverty status of farmers (Pooled sample)

Variable	Coefficient	Standard error	T value
Intercept	1.0577	0.5643	1.874
Age	0.0048	0.0149	0.320
Education	-0.1542***	0.0272	-5.686
Farming experience	-0.0219	0.0151	-1.452
Household size	0.393	0.3896	1.009
NPFS	-0.2142***	0.0322	-6.661
Extension	0.0262	0.0178	1.467
Association	-0.1052**	0.0449	-2.346
Credit	0.2581D-04***	0.7505D-05	3.439
Farm size	-0.0551**	0.0914	0.602
Assets	-0.1720D-05***	0.6607D-06	-2.604
Income	-0.2494D-05***	0.1001D-05	-2.490
Likelihood ratio	169.685***		
Correct prediction (%)	78.30		
McFadden Pseudo R squared	0.28		

NB: * P < 0.1, ** P < 0.05, *** P < 0.01

4.5.4.1 Test of no significant difference in the poverty status of the beneficiaries and non-beneficiaries of NPFS

Based on the findings of the study, the hypothesis which states that "the NPFS has no impact on the poverty status of farmers in the study area" was tested using the Z-statistic. The result of the Z test as presented in Table 4.35 shows that the calculated z value (2.485) is greater than the table z value of 1.64 at one tail and 1.96 at two tail respectively and it is significant at 1% probability level. This implies that there is a significant difference in the poverty status of the beneficiaries and non-beneficiaries of NPFS and therefore, the null hypothesis is rejected and the alternative accepted. This suggests that NPFS has contributed in poverty reduction amongst the beneficiaries.

Table 4.35: Test of hypothesis of poverty status of the beneficiaries and non-beneficiaries of NPFS

Variable	Poverty status of beneficiaries	Poverty status of non-beneficiaries
Mean of per capita expenditure	26349.030	21183.463
Known Variance	890693539.900	64577155.400
Observations	221	221
Hypothesized Mean Difference	0	
Z	2.485***	
P(Z<=z) one-tail	0.006	
z Critical one-tail	1.645	
P(Z<=z) two-tail	0.013	
z Critical two-tail	1.960	

NB: ***= significant at 1%

4.6 Constraints in the Implementation of NPFS in the Study Area

The constraints militating against the effective implementation of NPFS in the study area is presented in Table 4.36. Untimely supply of inputs as indicated by 71.2% of the beneficiaries in Kano state ranked as the first constraint to the implementation of NPFS in the State. This was followed by untimely training, insufficient credit availability and lack of cooperation among the beneficiaries. In Kaduna state, insufficient credit availability as indicated by 84.1% of the beneficiaries ranked first, non-involvement of beneficiaries in planning ranked second and untimely supply of inputs ranked third. In Katsina state, insufficient credit availability as indicated by 84.1% of the beneficiaries ranked first, inadequate extension services ranked second and non-involvement of beneficiaries in planning ranked third. This shows that there was variation in the ranking of constraints to the implantation of NPFS in Kano, Kaduna and Katsina states.

In the pooled sample of beneficiaries of NPFS, untimely supply of inputs as indicated by 59.3% of the beneficiaries in the study area ranked as the first constraint to the implementation of NPFS, this was followed by insufficient credit availability which ranked second as indicated by 52% of the farmers, untimely training which ranked third as indicated by 39.4% of the farmers and gender bias ranked as the tenth constraint as indicated by 6.8% of the farmers in the pooled sample. This finding is in line with Chukelu (2009) who reported that inadequate loan from NPFS, lack of adequate infrastructure, nonchalant attitude of facilitators amongst others were the constraints encountered in the implementation of NPFS in Anambra state. Similarly, Ayoade *et al*. (2011) reported that the constraints identified by the NSPFS beneficiaries in Oyo state were insufficient loan which ranked first among the problems encountered by the participants. Next to this was lack of input supply, followed by batch disbursement of fund, top-bottom approach of administration amongst others. Also, Uchenna and Olabisi (2012) reported that the constraints identified in implementation of NPFS in Enugu state were insufficient fund, late disbursement of loan, group disintegration, and weak enterprise management amongst others.

Table 4.36: Distribution of farmers based on constraints in NPFS implementation

	Kano		Kaduna		Katsina		Pooled	
Constraints	**Freq (%)**	**Rank**	**Freq (%)**	**Rank**	**Freq (%)**	**Rank**	**Freq (%)**	**Rank**
Non-involvement of beneficiaries in planning	29 (23.2)	5th	42 (60.9)	2nd	15 (55.6)	3rd	86 (38.9)	4th
Untimely training	55 (44.0)	2nd	25 (36.2)	4th	7 (25.9)	9th	87 (39.4)	3th
Excessive bureaucracy	-		24 (34.8)	5th	12 (44.4)	5th	36 (16.3)	7th
Untimely supply of inputs	89 (71.2)	1st	28 (40.6)	3rd	14 (51.9)	4th	131 (59.3)	1st
Inadequate extension services	12 (9.6)	6th	5 (7.2)	10th	16 (59.3)	2nd	33 (14.9)	8th
Gender bias	-		6 (8.7)	9th	9 (33.3)	6th	15 (6.8)	10th
Poor attitude of NPFS facilitators	-		13 (18.8)	8th	8 (29.6)	7th	21 (9.5)	9th
Lack of proper coordination	12 (9.6)	6th	23 (33.3)	6th	8 (29.6)	7th	43 (19.5)	6th
Lack of cooperation among NPFS beneficiaries	34 (27.2)	3rd	16 (23.2)	7th	7 (25.9)	9th	57 (25.8)	5th
Insufficient credit availability	34 (27.2)	3rd	58 (84.1)	1st	23 (85.2)	1st	115 (52.0)	2nd
Total	265*		240*		119*		624*	

NB: Total frequency exceeded sample size because multiple response was allow

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The broad objective of the study was to evaluate the impact of NPFS on the incomes, technical efficiency, food security and poverty status of small holder farmers in Kano, Kaduna and Katsina states. The specific objectives were to describe the socioeconomic characteristics of the farmers, determine the impact of NPFS on their income, determine the impact of NPFS on the technical efficiency of the farmers, determine the impact of NPFS on their food security status, determine the impact of NPFS on the poverty status of the farmers and identify the constraints militating against the effective implementation of the programme. A multi-stage sampling technique was used to select 442 respondents for the study comprising of 221 beneficiaries and non-beneficiaries of NPFS in the study area. Primary data collected using a structured questionnaire was used for the study and data collected was based on 2013 cropping season, the year for before project was 2008 and after was 2013. The structured questionnaire was pre-tested before it was administered to the farmers that were sampled. The tools of analysis that were employed to analyze the data were descriptive statistics, stochastic frontier production model, Foster, Greer and Thorbecke food insecurity and weighted poverty index, double difference estimator, logit regression analysis, probit regression analysis, the paired t- test and Z statistic.

Based on the study finding, the result of the socioeconomic characteristics of the farmers showed that majority of the beneficiaries (96.4%) and non-beneficiaries (73.8%) of NPFS were married. Majority (34.8%) of the beneficiaries of NPFS were within the age bracket of 50 – 59 years with a mean age of 49 years while 26.7% of the non-beneficiaries

were within the age bracket of 40 – 49 years with a mean age of 46 years. Majority (37.1% and 40.3% for the NPFS beneficiaries and non-beneficiaries respectively) of farmers in the study area had no formal education. Majority (58.8% and 68.3% for the NPFS beneficiaries and non-beneficiaries respectively) of farmers in the study area had household size of 1 – 10 persons with a mean household size of 9 persons. Most of the farmers (93.2% and 91.9% of the beneficiaries and non-beneficiaries of NPFS respectively) had small farm holding of 0.1 – 3 ha and only about 1% of the beneficiaries had farm size of more than 9ha and none of the non-beneficiaries had farm size of more than 9ha. Majority of both categories of farmers had farming experience of 11 – 20 years as indicated by about 41% and 57% of the beneficiaries and non-beneficiaries of NPFS respectively in the study area. Majority (76.5% and 94.6% for the NPFS beneficiaries and non-beneficiaries respectively) of farmers in the study area were into crop farming enterprises. The beneficiaries of NPFS largely benefitted from the crop intensification and livestock modules of NPFS as indicated by 54.8% and 41.6% of the beneficiaries respectively.

The study revealed that there was a difference in the incomes of both the beneficiaries and non-beneficiaries. The result of the double difference estimate (DDE) in the income of the pooled sample of the respondents indicated that the difference in changes of average income between the beneficiaries and non-beneficiaries of NPFS (₦ 168, 793.34) before and after the NPFS intervention was statistically significant at 1% probability level. This implies that NPFS had a positive impact on the income of the beneficiaries and hence, the goal of NPFS in the area of enhancing income of the farmers has been achieved. Therefore, further investment in NPFS to establish other sites across the nation will serve as an opportunity for increasing the income of farmers' especially small holder farmers who are responsible for the bulk of agricultural production activities in the nation.

The findings further revealed that the inefficiency model of NPFS variable was significant at 1% probability level and negatively related to the technical inefficiency of the farmers. This implies that NPFS had significant influence in enhancing the technical efficiency of the farmers and hence, expansion of NPFS in the three states is a viable option that can be used towards enhancing the technical efficiency of the farmers. Therefore, policy framework aimed at expanding NPFS to accommodate new sites in the study area and across the nation will serve as a veritable strategy for enhancing the technical efficiency of the farmers through the proper implementation of the NPFS modules. However, despite the impact of NPFS on the technical efficiency of the farmers, the farmers were yet to attain the frontier output as their mean technical efficiency was 68%. This implies that the farmers could increase their present level of technical efficiency by 32% through efficient utilization of their resources.

It was also discovered that the food insecurity indices of the pooled sample of farmers in the study indicated that the estimated head count of the NPFS beneficiaries and non-beneficiaries were 37.6% and 57.9% respectively and this indicates that 37.6% of the NPFS beneficiaries were food insecure while 57.9% of the non-beneficiaries were food insecure. The estimated coefficient of NPFS variable (0.6186) was positively related to the food security status of the farmers and was statistically significant at 1% probability level indicating that NPFS had positive influence on the food security status of the farmers. This implies that NPFS was instrumental in enhancing the food security status of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to enhancing the food security of its beneficiaries have been achieved in the study area.

It was further discovered that the poverty head count (poverty incidence) of the NPFS beneficiaries was 42% while that of the NPFS non-beneficiaries was 59%. This

implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries indicating that the proportion of beneficiaries that can afford to buy a basic basket of goods to meet the consumption needs of their households is higher than that of the non-beneficiaries. The share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries. Therefore, the beneficiaries are less poor than the non-beneficiaries. The estimated coefficient of NPFS variable (0.2142) was negatively related to the poverty status of the farmers and was statistically significant at 1% probability level indicating that NPFS had negative influence on the poverty status of the farmers. This implies that NPFS was instrumental in alleviating poverty of the farmers through the delivery of its modules to them therefore, the objective of NPFS with respect to reduction of poverty of its beneficiaries have been achieved in the study area.

Finally, the constraints militating against the effective implementation of NPFS from the pooled sample of beneficiaries in the study area were untimely supply of inputs as indicated by 59.3% of the beneficiaries in the study area and this ranked as the first constraint to the implementation of NPFS, this was followed by insufficient credit availability which ranked second as indicated by 52% of the farmers, untimely training which ranked third as indicated by 39.4% of the farmers and gender bias ranked as the tenth constraint as indicated by 6.8% of the beneficiaries in the pooled sample.

5.2 Conclusion

Based on the findings of the study, it can be concluded that NPFS was instrumental in enhancing the technical efficiency, income, food security and reduction of poverty of beneficiaries.

This indicates that the expansion of NPFS sites is a viable option that can be used towards enhancing the technical efficiency, income, food security and reduction of poverty of beneficiaries of the programme. Therefore, policy framework aimed at expanding NPFS to accommodate new sites in the study area and across the nation will serve as a veritable strategy for enhancing the technical efficiency, income, food security and reduction of poverty of the beneficiaries through the proper implementation of the NPFS modules and active participation of the beneficiaries. However, the expanded phase of NPFS in Katsina state has not made any remarkable achievement and this could be attributed to the slow pace of implementation of NPFS activities in the state largely due to financial limitation. The major constraints militating against the effective implementation of NPFS were untimely supply of inputs, insufficient credit availability, untimely training amongst others which deserves to be properly addressed so as to enhance its subsequent implementation and achieving its goals.

5.3 Recommendation

Some recommendations have been put forward based on the findings of this study. These include:

i. The study revealed that NPFS had a significant positive influence on the technical efficiency, income, food security and reduction of poverty of beneficiaries in the study area. Therefore, it is recommended that NPFS should be scaled up to cover the whole local governments in the country. This is because it is a viable option for enhancing food security and alleviating poverty among farmers.

This is necessary as it has become expedient for programmes with the potential for improving the welfare of small scale farmers to be strengthened so as to ensure sustainability in food production by them in order to improve their food security.

ii. It also revealed that the implementation of NPFS was largely to crop and livestock farmers therefore, other categories of farmers especially agro forestry and fishery farmers did not benefit as much as the crop farmers did. In the light of this, it is recommended that NPFS should ensure that other agricultural enterprises as well health and nutrition modules are fully accommodated like the crop farmers in its implementation so that the farmers can benefit immensely from the project. This is very necessary as agroforestry, fishery, agro processing and livestock production are equally as important as crop production and hence, farmers who are into these enterprises have to be properly integrated in the scheme of work of NPFS.

   The study also showed that there was no emphasis on implementing the module on health and sanitation as very few activities mainly trainings on HIV sensitization were carried out in the study area. It is suggested that more trainings be conducted for the beneficiaries on environmental and water sanitation and also prevention of communicable diseases.

iii. The study showed that untimely supply of inputs to farmers was the major constraint to the implementation of NPFS in the study area. Hence, it is recommended that in order to enhance the achievement of its goals especially with respect to food security and poverty reduction, NPFS should facilitate timely release of inputs to farmers so that the production of the farmers will not be adversely affected by untimely supply of inputs.

iv. The beneficiaries ranked non- involvement in planning as the fourth most important constraint to the implementation of the NPFS activities. In order to facilitate the effective implementation of NPFS towards achieving its goals in the study area, the beneficiaries should be fully involved in the planning of the subsequent phase of the programme through their farmers associations so that there felt needs can be properly addressed by NPFS and thereby ensuring bottom up approach which is the main strategy of the programme implementation.

v. Despite the impact of NPFS on the technical efficiency of the farmers, the farmers were yet to attain the frontier output as their mean technical efficiency was 68%. Hence, it is recommended that the challenges of untimely training and inputs supply should be addressed so farmers can be properly trained in good time in order to improve their technical know-how towards enhancing their present level of technical efficiency. Timely input supply will result in farmers starting their farming operations on time

vi. The study revealed that the expanded NPFS phase in Katsina state did not make remarkable achievement like in Kano and Kaduna states due to the slow pace of implementation of NPFS activities in the state. This is largely due to financial constraint arising from non-release of funds from the state and the federal governments. Therefore, it is recommended that subsequent interventions on food security and poverty related issues in the state have to be properly funded so as to ensure that the goals of the interventions are achieved.

vii. The study also revealed that membership of association, asset acquisition and education had a positive impact on the food security status and poverty alleviation of the beneficiaries across sites while household size had a negative impact. Non-food expenditure increased probability of food insecurity across sites while farming experience reduced poverty. Therefore, it is recommended that farmer based association/cooperatives formation should be strengthened in future programs. Adult education should also be incorporated in such programs because of its effect in increasing farmer's health and productivity which are important in improving household food security and poverty reduction.

5.4 Contribution to knowledge

The contributions of this study to the body of knowledge are:

i. The study has shown that the difference in changes of average income between the beneficiaries and non-beneficiaries of NPFS (₦ 168, 793.34) before and after the NPFS intervention was statistically significant at 1% probability level. This implies that NPFS had a positive impact on the income of the beneficiaries in the study area.

ii. The study revealed that the poverty incidence (poverty head count) of the NPFS beneficiaries was 42% while that of the NPFS non-beneficiaries was 59%. This implies that the share of the population of beneficiaries whose income and consumption falls below the poverty line is lower than that of the non-beneficiaries indicating that the proportion of beneficiaries that can afford to buy a basic basket of goods to meet the consumption needs of their households is higher than that of the non-beneficiaries. This shows that the beneficiaries are less poor than the non-beneficiaries. This indicates that NPFS was successful in alleviating poverty in the study area.

iii. The study also revealed that the estimated food insecurity head count of the NPFS beneficiaries and non-beneficiaries were 37.6% and 57.9% respectively. This indicates that 62.4% of the NPFS beneficiaries were food secure while only 32.1% of the non-beneficiaries were food secure suggesting that NPFS beneficiaries were more food secure than the non-beneficiaries.

iv. The study also showed that the farmers were yet to attain the frontier output as their mean technical efficiency was 68%. This implies that the farmers could increase their present level of technical efficiency by 32% through efficient utilization of their resources.

v. The study revealed that membership to associations, asset acquisition and education increased probability of household food security and reduced poverty while household size increased them across sites. Non-food expenditure increased probability of food insecurity across sites.

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APPENDIX

DEPARTMENT OF AGRICULTURAL ECONOMICS AND RURAL SOCIOLOGY,
FACULTY OF AGRICULTURE,
AHMADU BELLO UNIVERSITY, ZAIRA, NIGERIA.

FARMERS RESEARCH QUESTIONNAIRE

TOPIC: ECONOMIC EVALUATION OF THE NATIONAL PROGRAM FOR FOOD SECURITY AND ITS IMPACT ON POVERTY REDUCTION AMONG SMALL SCALE FARMERS IN NORTH WEST NIGERIA

Dear Respondent,

This questionnaire is designed by the bearer who is a student in the above-named department. Please, provide the necessary information required in the questionnaire which will be treated with utmost confidentiality and used strictly for academic purpose.

Thank you for your cooperation.

BACKGROUND INFORMATION ON THE QUESTIONNAIRE

(i) Name of respondent.....

(ii) State……...

(iii)Site …….....

(iv)Date of interview.....

SECTION A: SOCIO-ECONOMIC, DEMOGRAPHIC AND INSTITUTIONAL CHARACTERISTICS OF FARMERS

(1) Age of the respondent..... years

(2) Gender

(i) Male ( ) (ii) Female ( )

(3a) Marital status

(i) Married ( ) (ii) Single ( )

(3b) If single, tick the one that best describes your condition

(i) Widow ( )

(ii) Widower ( )

(iii) Divorced ( )

(4) Educational qualification

(i) No formal education ( )

(ii) Primary ( )

(iii) Secondary ( )

(iv) Tertiary ( )

(v) Others specify .....

(5) Total number of years spent in school…….. years

(6) How long have you been involved in farming ..... years

(7) Did extension staff visit you in the last one year

(a) Yes ( ) (b) No ( )

(8) If yes, how many times did extension staff visit you last cropping season.....

(9) Do you belong to farmers' association or cooperative society?

(a) Yes ( ) (b) No ( )

(10) If yes, how long have you been in the association or cooperative ..... years

(11) How many of your household members fall in the following age group

Age group (in years)	Number of males	Number of female
0-10		
11-20		
21-30		
31-40		
41-50		
51-60		
60 and above		

(12) Did you have access to credit in the last one year?

(a) Yes ( ) (b) No ( )

(13) If yes indicate from which source and the amount obtained

(i) Agricultural bank (BOA) ₦.....

(ii) Commercial bank ₦.....

(iii) Cooperative ₦.....

(iv) Friend/Relatives ₦.....

(v) Others specify ..... ₦.....

(14) Land ownership type of farmer

(a) Borrowed ( )

(b) Purchased ( )

(c) Gift ( )

(d) Rented ( )

(e) Inherited ( )

(15) If rented, how much do you pay per hectare …….

(16) If purchased, cost of purchase per hectare ……

(17) Kindly give an estimate of the total size of land cultivated ..... ha.

(18) Did you use improved varieties of seeds/planting materials in any crop production enterprise?

(i) Yes ( ) (ii) No ( )

(19) If yes to the above, indicate the sources of improved seeds/planting materials

(a) Friends/relatives ( )

(b) Seed company ( )

(c) Research institute ( )

(d) NGO ( )

(e) Others ……..

SECTION B: NPFS MODULES

(20) Indicate the NPFS module(s) that you have benefitted from

(i) Crop intensification ( )

(ii) Water use and control ( )

(iii) Soil fertility management ( )

(iv) Agro-forestry ( )

(v) Livestock production ( )

(vi) Fisheries development ( )

(vii) Extension ( )

(viii) Credit ( )

(ix) Agro processing ( )

(x) Off farm income generating activities ( )

(xi) Nutrition and health ( )

(xii) Rural infrastructure development ( )

(21) Perception of the benefits of NPFS modules

(i) Beneficial ( ) (ii) Undecided ( ) (iii) Not beneficial ( )

(22) What NPFS module is most beneficial to you? Ps number in order of importance from 1(high) to 5(not important)

(i) Crop intensification ( )

(ii) Water use and control ( )

(iii) Soil fertility management ( )

(iv) Agro-forestry ( )

(v) Livestock production ( )

(vi) Fisheries development ( )

(vii) Extension ( )

(viii) Credit ( )

(ix) Agro processing ( )

(x) Off farm income generating activities ( )

(xi) Nutrition and health ( )

(xii) Rural infrastructure development ( )

(23) Have you undergone any training through NPFS?

(i) Yes ( ) (ii) No ( )

(24) Indicate the type(s) of training

(a) Agronomic practices

(b) Pests and disease management

(c) Post harvest practices

(d) Livestock management

(e) Others……..

(25) Perception of the timeliness of the training

(i) Timely ( ) (ii) Untimely ( )

(26) Have you had access to agricultural inputs/facilities through NPFS?

(i) Yes ( ) (ii) No ( )

(27) If yes, indicate the input(s) you have accessed through NPFS

(i) Improved seeds ( )

(ii) Fertilizer ( )

(iii) Agro chemicals ( )

(iv) Farm machineries ( )

(v) Processing facilities ( )

(vi) Credit facilities ( )

(28) What was your estimated annual income before joining NPFS…….

SECTION C: INCOME GENERATING ACTIVITIES OF FARMERS

(29) Tick the farm enterprises you are into

(i) Crop ( )

(ii) Livestock ( )

(iii) Fishery ( )

(v) Forestry ( )

(30) Do you engage in non-farm income generating activities?

(i) Yes ( ) (ii) No ( )

(31) If yes, what type(s) of non-farm activities do you engage in?

(i) ……..

(ii) ……..

(iii) ……..

(iv) ……..

(v) ……..

(32) How much did your household earn last year from the following sources of income?

SN	Income Source	Amount (₦)
1	Crop production income	
2	Livestock production income	
3	Fishery production income	
4	Forestry production(trees, firewood) income	
5	Non-farm self-employment(trading, tailoring, carpentry, crafts, bricklaying, blacksmithing, barber's work, shoe cobbling, repairing motorcycles etc.	
6	Wage employment	
7	Remittance (money sent by children, friends or relatives on a regular basis)	
9 Others Specify		

(33) What was your estimated annual income in 2006 ……..

(34) Where did you sell the larger portion of your agricultural produce?

(i) On farm ( ) (ii) Market ( )

(35) If in the market, what is the distance from the farm to the market …… km

SECTION D: FARMING HOUSEHOLDS FOOD CONSUMPTION

(36) Kindly provide information on the following crops as applicable to you

	Item purchased last season for household		Amount produced last cropping season (Quantity)	Amount consumed from own production (quantity)	Value of Foods eaten outside the household last one week (₦)
	Quantity	Amount paid			
Maize					
Grain					
Flour					
Sorghum					
Grain					
Flour					
Rice					
Cassava					
Yam					
Cocoyam					
Groundnut					
Soybean					
Grain					
Flour					
Cowpea					
Okra					
Tomato					
Onion					
Pepper					
Egg plant					
Carrot					
Pumpkin					
Green leaves					
Guava					
Citrus					
Mango					
Others specify:					
1					
2					
3					

NB: units: 1 = kg, 2= litres, 3 = tiya, 4 = mudu, 5 = baskets, 6 = wheel barrow

(37) Indicate the amount purchased of the following items for household consumption in the last one week

Item	**Quantity purchased**	**value (₦)/unit**
Salt/Potash/Maggi		
Groundnut oil		
Palm oil		
Other oils, specify:		
1.		
2.		
Fish (Fresh/dried/smoked)		
Meat (beef/mutton etc)		
Sugar		
Bread		
Drinks, specify:		
1.		
2.		
3.		

NB: units: 1 = kg, 2= litres, 3 = tiya, 4 = mudu

(38) Kindly indicate the assets you own before and after NPFS.

	Number of assets owned before NPFS commencement (i.e in 2006)	Estimated unit price (₦)	Number of assets presently owned (i.e in 2013)	Estimated unit price (₦)
Cart				
Tractor				
Plough				
Sprayer				
Grain mill				
Pump				
Hoe				
Cutlass				
Shovel				
Radio				
CD player				
Television				
Refrigerator				
Mobile phone				
Bicycle				
Motorcycle				
Car				
Others……..				
Others ….				
Others…….				
Others ……				
Others ……				

(39) Kindly indicate how many livestock you own before and after NPFS.

	Number of livestock owned before NPFS commencement (i.e in 2006)	Estimated unit price (₦)	Number of livestock presently owned (i.e in 2013)	Estimated unit price (₦)
Cattle				
Sheep				
Goats				
Pigs				
Chickens				
Ducks				
Guinea fowls				
Others ……				
Others ……				
Others ……				
Others ……				
Others ……				

SECTION E: INPUTS AND OUTPUT OF AGRICULTURAL PRODUCTION

(40) Kindly provide information on the inputs and output of the following crops you cultivated in the last one year.

Crop	Quantity Produced last cropping season (Kg)	Land area cultivated/(ha)	Quantity of seeds used/Cost of seeds (₦)	Quantity of organic fertilizer used/cost of fertilizer used (₦)	Quantity of inorganic fertilizer used/ Cost of inorganic fertilizer used (₦)	Quantity of plant protection chemicals/Cost of plant protection chemicals (₦)
Maize						
Sorghum						
Millet						
Rice						
Cowpea						
Groundnut						
Soyabean						
Cassava						
Yam						
Sweet potatoes						
Irish potatoes						
Cocoyam						
Tomatoes						
Onion						
Okra						
Pepper						
Egg plant						
Carrot						
Pumpkin						

Amaranthus						
Pumpkin						
Guava						
Mango						
Others Specify						
1						
2						
3						
4						
5						

NB: Input units: 1 = kg, 2= litres, 3 = tiya 4 = mudu, 5 = baskets, 6 = wheel barrow

(41) Did you hire labour for any of your farm operation in the last cropping season?

(i)Yes ( ) (ii) No ( )

(42) If yes, what was the average daily wage rate paid for hired labour ₦……

(34) Did you use tractor for land preparation in the last planting season?

(i)Yes ( ) (ii) No ( )

(43) If yes, what was the hours spent by the tractor per hectare…….

Price per ha for tractor usage…….

(44) Did you use oxen for land preparation in the last planting season?

(i)Yes ( ) (ii) No ( )

(45) If yes, what was the hours spent by the oxen per hectare…….

Price per ha for oxen usage……..

(46) Kindly indicate the hours of labour for all the crops you cultivated in the last cropping season

	Land preparation and planting		Weeding		Inorganic fertilizer application		Organic fertilizer application		Pesticide application		Harvesting	
	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour	Family labour	Hired labour
Maize												
Sorghum												
Millet												
Rice												
Cowpea												
Groundnut												
Soyabean												
Cassava												
Yam												
Cocoyam												
Tomatoes												
Onion												
Okra												

Pepper												
Egg plant												
Carrot												
Pumpkin												
Amaranthus												
Pumpkin												
Guava												
Mango												
Others Specify												
1												
2												
3												
4												
5												

SECTION F: FARMING HOUSEHOLDS CONSUMPTION EXPENDITURE

(47) Kindly provide information on your households' food and non-food consumption expenditure.

Item	Amount(₦)
Food	Monthly expenditure
House rent	Monthly expenditure
Electricity/water bills	Monthly expenditure
School expenses (School fees, textbooks, writing materials etc.)	Annual expenditure
Medical expenses	Annual expenditure
Clothing expenses	Annual expenditure
Communication expenses (G.S.M calls, recharge cards etc.)	Monthly expenditure
Transportation expenses	Monthly expenditure
Social expenses (wedding, naming ceremony etc.)	Annual expenditure
Religion (offerings, contributions etc.)	Monthly expenditure

Others……

SECTION F: CONSTRAINTS IN THE IMPLEMENTATION OF NPFS

(48) Kindly indicate the constraints in the implementation of NPFS activities.

i. Non-involvement of beneficiaries in planning ( )

ii. Untimely training ( )

iii. Excessive bureaucracy ( )

iv. Untimely supply of inputs ( )

v. Inadequate extension services ( )

vi. Lack of proper coordination ( )

vii. Gender bias ( )

viii. Poor attitude of NPFS facilitators ( )

ix. Lack of cooperation among beneficiaries of NPFS ( )

x. Insufficient credit availability ( )

Kindly specify other constraints in the implementation of NPFS activities.

1. .....
2. .....
3. .....
4. .....
5. .....

(49) Suggest possible solutions to the constraints associated with the implementation of NPFS activities

1. ....
2. .....
3. .....
4. .....
5. .....