IMPACT OF NERICA RICE PROJECT ON SMALL SCALE RICE FARMER FOOD ACCESSIBILITY. A CASE STUDY OF OBAFEMI OWODE LOCALGOVERNMENT AREA, OGUN STATE, NIGERIA.

A Research Project Submitted to Larenstein University of Applied Science in Partial Fulfillment of the Requirements for the Degree of Masters of Development, Specialisation in Rural Development and Food Security.

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Dedication

This thesis is dedicated to the Almighty God for His grace upon my life from the inception of this programme and to my dear Agnes for her words of encouragement.

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I expressed my sincere gratitude to both the staff of Ogun state Agricultural Development Programme and NERICA desk office for the assistance they rendered during the data collection of this thesis in the study area. I am highly indebted to all my friends who one way or the other are contributed to my research work both in Nigeria and Netherlands.

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List of Abbreviations

ADF	Africa Development Fund
FANTA	Food and Nutrition Technical Assistance
GAIN	Global Agricultural Information Network
NERICA	New Rice for Africa
OGADEP	Ogun State Agricultural Development Programme
PVS	Participatory Varietal Selection
T&V	Training and Visiting
UNEP	United Nations Environment Programme
VEAs	Village Extension Agents
WARDA	West Africa Rice Development Authority

ABSTRACT
The study focused on assessing the impact of NERICA rice project on small scale farmers food accessibility who participated in the project in Moloki-Asipa and Oba village in Obafemi Owode local government area in Ogun state Nigeria.

The respondents are small scale farmers who cultivated less than 1 hectare of land and farming system was intercropping. Farming is the main activity in the study area and dominated by men. The large portions of the respondents land were cultivated with local variety, while the small part left for NERICA variety. All the respondents got information about the NERICA through the village extension agent. The major constrain faced by the farmers was the difficulty in selling the NERICA rice in the market was due consumer preference to local rice because of the better taste and aroma. The result of the findings shows that NERICA has better yield than other variety cultivated by farmers.

The research also found out that access to agricultural inputs was not constrained, provision were made to the farmers on credit and 50% subsidy on payment by the project and inability to sell the NERICA rice in the market made it difficult for them to pay back the inputs credit. The farmers continued cultivation of NERICA because they received inputs on credit and used the inputs for the cultivation of the local variety instead.

CHAPTER ONE

Introduction

1.1 Rice Production in Nigeria.

Rice has become important cash crops and one of the major staple foods in Sub-Sahara Africa (WARDA, 2006) and being consumed globally by more than the half of the world population (Daramola, 2005). In 2006 Africa imported 9 million tons of rice, accounting for 32% of global world import and major player in international market (WARDA, 2008). The growth in population at 4% per annum, increasing in incomes and change in consumer preference in favour of rice, especially in urban areas (Balasubramanian et al., 2007), and growth in demand for rice is faster in the region than anywhere in the world (WARDA, 2005).

According to Hardcastle (1959) as cited by Ogundele and Okoruwa (2006), rice production started in Nigeria in 1500 BC with a low yielding indigenous red grain species Oryza glaberrima Stud that was grown in Niger delta area. Rice production is primarily done by small scale farmers that cultivated between less than 1 and 2 hectares (Daramola, 2005) with the average yield of 1.36 tons/ha (Ogundele and Okoruwa, 2006). Rice is grown in different ecosystems in Nigeria, namely; rain fed low land is the most predominate production system, accounting for almost 50% of total land growing area for rice in Nigeria; 30% account for the rain fed upland rice production; while 16% is for high yielding irrigated system, the remaining 4% is for mangrove and deep water system (Adebayo et al., 2009). Nigeria is endowed to produce enough rice to meet the domestic demand and also to export to other countries.

The population of Nigeria is over 150 million, the most populated country in Africa (Brisibe, 2010). The growth in population is one of the combinations of factors that caused increase in rice because it outstripped the agricultural production. Urbanization appears to be most important cause of change in consumer preference to rice in Nigeria. Rice is easier to prepare than other traditional cereals, thereby reducing the chore of food and preparation and fitting more easily in urban lifestyles of rich and poor alike (Adebayo et al. 2009). In order to meet the demand and bridged the supply gap the area under cultivation of rice has been increased from 150,000 hectares in 1965 to 1.8 million hectares in 2009 (Adebayo et. al 2009). According to Brisibe (2010) Nigeria is West Africa largest producer of rice, for the past seven years preceding 2004, rice cultivation is widespread in Nigeria, extending form the northern to southern zones, with most rice grown in the eastern and middle belt of the country. Despite the fact that there is an increase in area of land for rice cultivation, domestic supply has not kept pace with demand. The country resulted in the importation and consumption of foreign rice. Nigeria imported 1.4 million metric tons of rice in 2008/2009 (Brisibe, 2010). In 2010, the total rice imported had increased to 2 million metric tons (GAIN 2011). The importation of rice has brought about the drain of foreign reserve of the country which is also aggravated by downturn of the global economy. The slow rate of rice production relative to consumption has been attributed to a combination of factors such as lack of high yielding varieties, poor post-harvest processing, soil infertility, unreliable rainfall distribution, problems of weeds, incidence of pests and diseases, poor market access, lack or limited access to credit facilities, and inadequate access to farm input.

1.2 Programmes, policies and agencies in rice innovation system in Nigeria.

Rice has become important food commodity in Nigeria economy, Nigeria government has initiated different policies, programmes and established various agencies to increase production so as to bridge the supply and demand gap, reduce importation and prevent the drain of foreign reserve.

1.2.1 National and International programmes and agencies in rice production

According to Emodi and Madukwe (2008), there are several efforts made by the government to meet rice production needs in Nigeria and these resulted in the establishment of different national programmes and also participated in the international programmes and project to increase production of rice. The following are the summary of institutions engaged in rice production and date of their establishments and mandates:

1953- Federal Rice Research Station (FRRS) now the headquarters of the National Cereals Research Institute (NCRI) was established for the development of varieties with improved grain quality, uniform shape and sizes. These are achieved through the introduction and adaptation by the farmers
1972- National Accelerated Food Production Programme (NAFPP) the focus is to effectively design, test and transfer technology package for wheat, rice, millet and wheat
1974- National Cereals Research Institute (NCRI) was established to carry out research on high yielding rice varieties for farmers, on-farm adaptive research, seed multiplication, and training of extension staff.
1976- Operation Feed the Nation (OFN) was established for food sufficiency with the introduction of land use subsidy Decree, seed and fertilizer supply, credit and mechanization in agriculture
1976- River basin development authorities were established to increase production of food crop by providing water to farmers through irrigation
1978- Abakaliki Rice Project was established for the production of rice and processing
1987- Agricultural Development Programme (ADP) established to form link between research and farmers and it has been a channel through which government policies on rice productions were implemented.
1999- The President Rice Initiative with objective to address the widening demand/supply and attain self-sufficiency in rice production.
2005- Multinational New Rice for Africa Rice Dissemination Project (MNRDP) established with the objective to supporting small scale rice producers improve production and their household incomes through the transfer of NERICA varieties and complementary technology from West Africa Rice Development Association (WARDA)

1.2.2 National Policies on Rice

Nigeria rice policies can be summarise under three periods (Akpokodje et al., 2003).
Pre-ban period, (1971-1985). This can be classified into pre-crisis (1971-1980) and crises period (1981-1985). The pre crises period was characterised by liberal policies on the imports, while crisis period, stringent policies were put in place, government policies lowered domestic rice and fertilizer prices relative to the world price level through massive importation of rice resulting in low price of locally produced rice.

Ban period, (1986-1995). Structural Adjustment Programme (SAP) was introduced in 1986 to reinforce the ban placed on rice import. Under SAP, various policies were in place
Post-ban period, (1995-date). This is the period when restriction on importation of rice was lifted with more liberal trade policy put in place. 100% of tariff in 1995, 50% tariff from 1996-2000, 85% tariff in 2001, 100% tariff and 10% le on rice from 2003 – 2007, 50% tariff and 50% levy from 2007–date. 0% duty as special intervention from May 7th to October 31st 2008 due to the food crisis experienced during the first half of 2008. Most of the rice policies relating to rice failed to recongnise the problems of the stakeholders because they are foreign to their tradition and cultural practices (Emordi and Madukwe, 2008).

1.3 Multinational NERICA Rice Dissemination Project (MNRDP)

New rice for Africa (NERICA) is the result of the West Africa Rice Development Association (WARDA) scientist of successful crossing the stain of Oryza glaberrima and Oryza sativa to obtain improved rice varieties with superior performance characteristics. It was claimed that NERICA varieties are better than traditional upland rice varieties as well as some improved varieties being used by small scale farmers because it poses some traits that militate against better yield of rice. The traits such as early maturity, resistance to pests and diseases, ability to compete with weeds, high yield than the traditional varieties, intermediate to tall stature and lodging resistance, resistance to drought and tolerant to acidic soil, good taste and high protein content when compared with traditional rice varieties. NERICA project has been designed to take into consideration the constraint of the existing rice varieties and also the problem experienced by farmers in accessing high yielding varieties (ADF, 2003).

The project was implemented in 7 West Africa countries, Benin, The Gambia, Ghana,Guinea, Mali, Nigeria, and Sierra Leone. In these participating countries, 23 sites were selected. In Nigeria 6 sites were selected are Kaduna, Nasarawa, Ogun, Ekiti, Ondo and Taraba. The rationality besides these selected sites were due to their potential for increased rice production, interest demonstrated by the upland rice farmers during the participatory varietal selection (PVS) programme, existing culture of rice growing and farmers group which are supportive of rice development programme. The project beneficiaries are the upland rice farmers especially women, subsistence farmers who sell the marginal surpluses to meet the household needs. In Nigeria the targeted beneficiaries will be organized into rice farmers group and input (NERICA rice seed, herbicide, fertilizer) will be given to them on credit and to pay back 50% of the input cost after they have sold off their rice. The other beneficiaries of the project were rice research scientist, extension agent, community seed producers, input distributors, rice processors and traders.

The project includes the following components:

(i). Technology transfer- The project provided resources to support adaptive on-farm research to be managed by national agricultural research institutions, supported by WARDA. One of the major areas of focus in this project is participatory variety selection (PVS) this is approach used to provide choices of varieties in their diversity to of socio economic and agro-ecological conditions of the farmers

(ii) Capacity building-The project will encourage beneficiaries to continue the formation of farmers groups, women groups and growers associations and also provides resources for training of the stakeholders

(iii) Production support- The project will strengthen the extension services in the project area to ensure that the project beneficiaries are effectively provided with technical advice.

(iv) Project co-ordination- Ministries responsible for Agriculture in the respective countries will execute the project. Existing component and experienced Project Coordinating Units will be identified to coordinate the project activities (ADF, 2003.)

1.4 Research problem

In order to increase the yield of rice and income of the farmers, NERICA project was introduced by government in partnership with WARDA and sponsored by ADB. The project was focused in supporting small scale farmers to improve their productivity and hence income through the use of improved NERICA seed varieties. Five years have passed since the project commenced hence the need for the research to evaluate the impact of the project on the farmers' income.

1.5 Objective

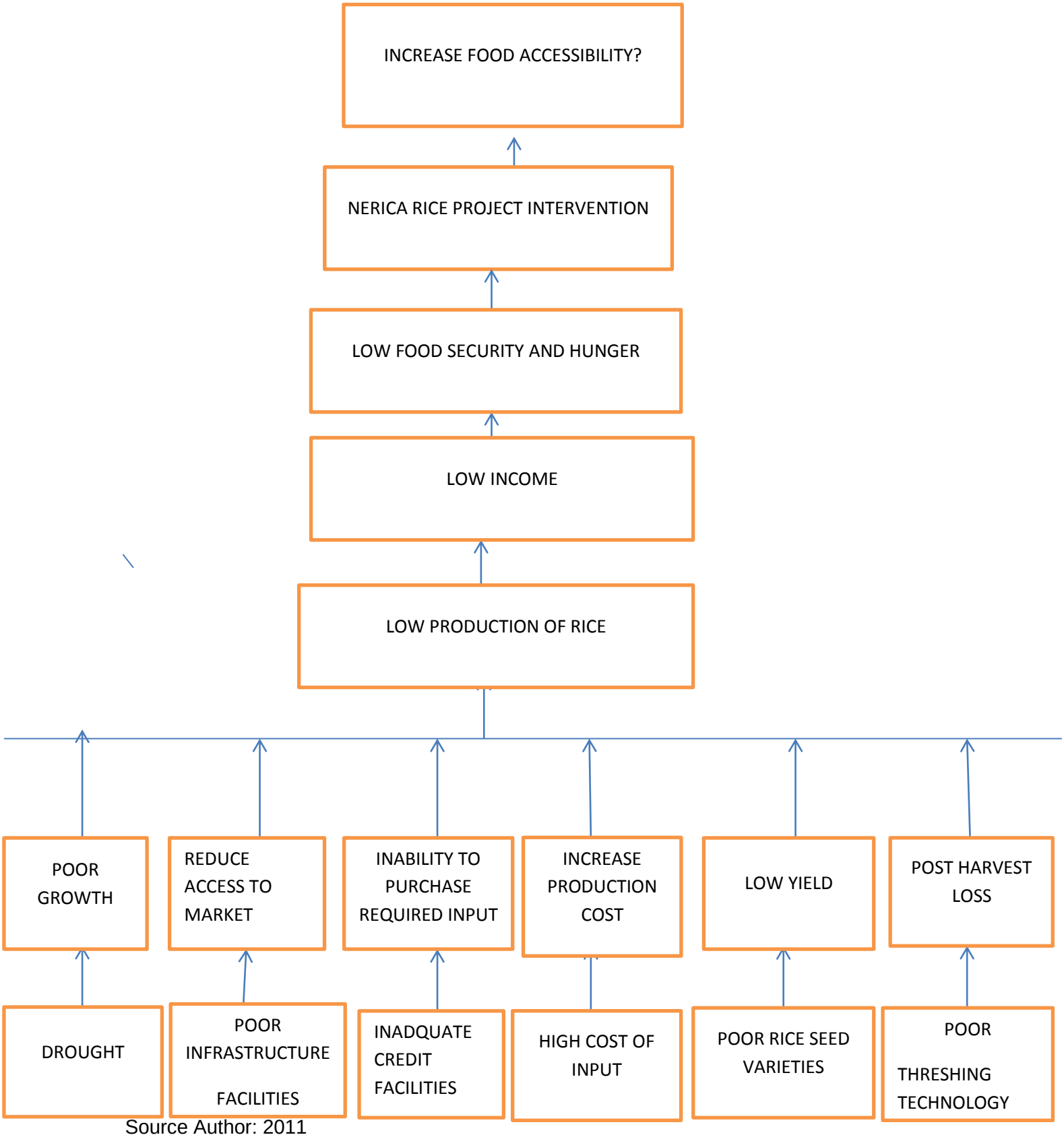
To identifying the contributions of NERICA rice project to the households of small scale farmers.

1.6 Research Questions

1. What are the effects of NERICA rice project on the food accessibility of small scale rice farmers?

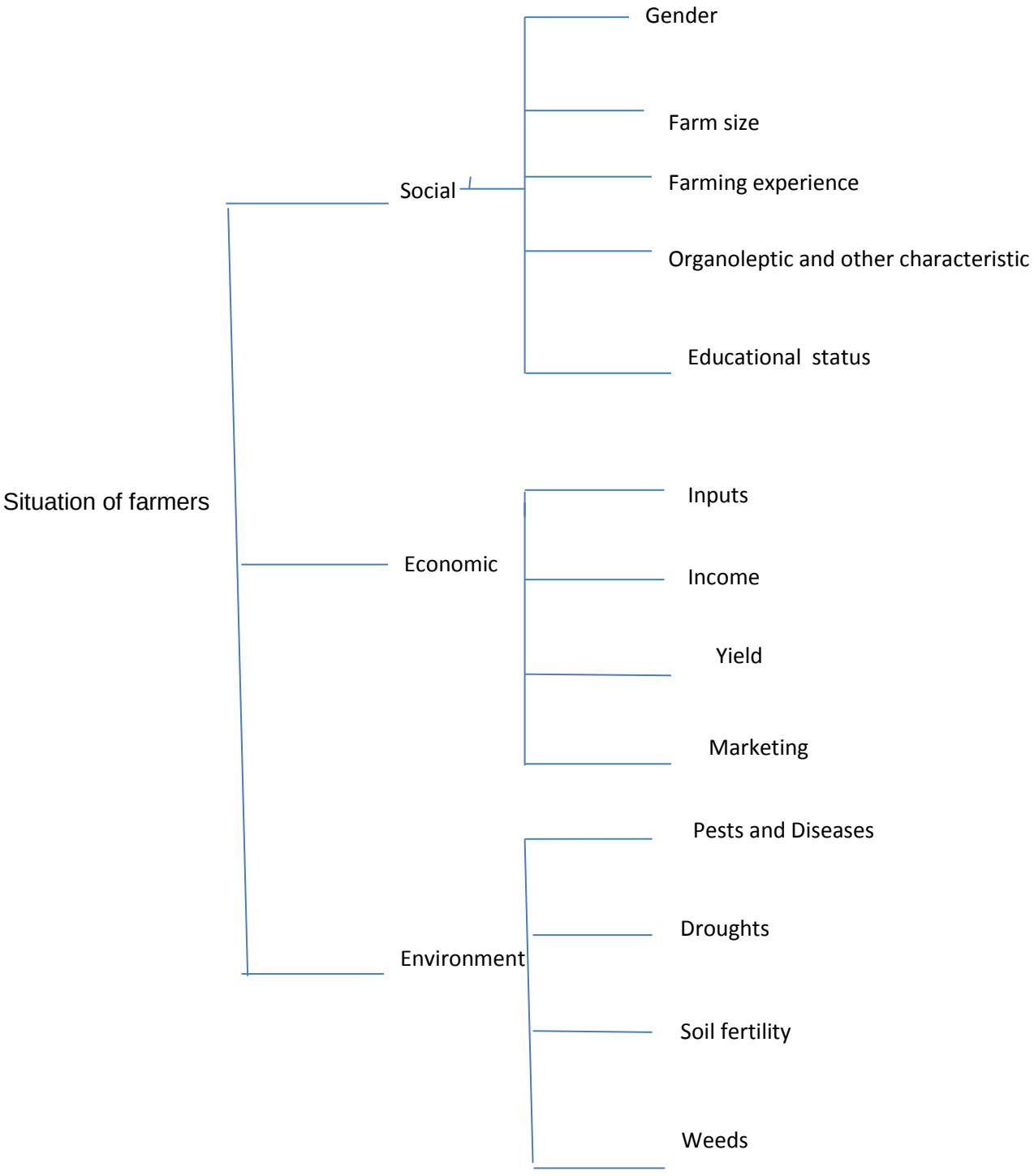
a. What is the contribution of the project to the income of small scale rice farmers?
b. What are the constraints faced by the small scale farmers?
c. How does the small scale farmers access information and knowledge on the NERICA rice production?
d. How accessible are the farming inputs to the farmer?
e. What are the farming systems practices by the small scale rice farmers?

Figure 1: Problem Tree for Rice Cultivation



Source Author: 2011

Figure 2: Unraveling the main concepts



Source Author: 2011

1.7 Definition of concepts

In order to understand how the research problem will be address it is important to define the concept for clarity purpose. The concept such as effects, livelihood, small scale, changes, household and income.

Effect

Effect is the power to bring about a result in doing a particular thing. In the context of this research is the result of participating in the NERICA on the livelihood of small scale farmers.

Small scale farmer

Small scale farmer cultivating more less than 2 hectares with crude implement and the whole farming system is subjected to traditional methods which does not encourage economies of large scale production (Bamiduro and Gbadeyan, 2011). The land cultivated by the farmer can be owned (purchased or inherited) or can be accessed through share cropping or land tenancy.

Changes

Literally mean an event that occurs when something passes from one phase or state to another. Change will be used in this research in related to the output of rice per hectare before and during NERICA rice project.

Income

Income is the gain which proceeds from labour, business, property, or capital of any kind, as the produce of a farm, rent of the houses, the proceeds of professional business, the profits of commerce occupation, or the interest of money or stock in funds.

Food accessibility

Household food access is the ability to acquire sufficient quality and quantity of food to meet the nutritional requirements of all household members (FANTA, 2003). In this study food accessibility when farmers consume part of is harvest and sell the surplus in the market to acquire other food items that are not produce in his /her farm.

CHAPTER TWO

2.1 REVIEW OF LITERATURE

This chapter presents the various studies related to the small scale rice/NERICA rice farmer production. This will provide foundation for the analysis of research findings. The areas reviewed include the economic, social and environment aspect that influence the small scale farmers in rice production. The economic will focus on studies or findings related to the access to agricultural inputs, credit facilities, yield obtained from cultivation of various rice varieties and NERICA rice, marketing of rice and income derived from the rice. The social aspect will covered the gender, farming practice, educational status, farm size, organoleptic and other characteristic of rice and NERICA rice (taste, cooking period, conservation in cooking, and swollen capacity) and labour availability. The environment aspect of this chapter reviewed factors within and outside the control of the farmers that influence small scale farmers rice production. All these are reviewed within the context of the small scale rice farmer's food accessibility in the NERICA rice project

2.2 Economic

This section presents the review of various concepts related economic activities in rice production. This will provide important information for the analysis in the research findings. The areas reviewed include the inputs accessibility, yield, income and marketing. These are very important to the food accessibility of the farmer.

2.2.1 Availability and access to input

The resources we put into the farm business are called input and products which come out are called output (Reader, 2011). Most of the project in the past has not been sustained because of the inaccessibility of the input by the farmer. The input in this study comprises of seeds, fertilizer, herbicides, and pesticides that are used to produce output. Many past studies have stressed on some of the constrains that affect the intervention project on high yielding varieties, lack of money to buy agricultural inputs such as improved seed, fertilizer, herbicides, and pesticide (Awotide et, al. 2010).One of the problems associated with the introduction of the high yielding varieties intervention project is the availability or timely released of the seed to the farmers. Seeds are important source of most food which is of plant origin and with socioeconomic benefit of human welfare (Bamire et.al, 2009). According to Louwarrs and Marrewijk (1999) cited by Bamire et.al (2009), development of high yielding seed varieties have been the technological forces behind the successful green revolution, the availability of foods at prices profitable for farmers and affordable by the populace, and the reduction of rural poverty. Hence, seed provision is essential for increasing food production, improving farmers income, alleviating poverty and ensuring food security both in normal and disaster year. In many intervention project on increase productivity of small scale farmers availability of good quality seed is one of the major constrain, this is supported by Kebbeh et al. (2003) where farmers indicated using seed from the previous harvests or purchasing seed in the local market. It is reported that NERICA rice project supported the establishment of community based seed multiplication system and national seed service will certify the seed produced by seed growers in the project area

before being sold to smallholder farmers in their communities (ADF, 2003) this will make available on time. This is contrary to the viewed of Diagne et, al (2010) that seed productions is still bottleneck in many West and Central Africa where many farmers have no access to improved seed varieties which is the same as the constrains faced by the farmers in the past project.

High yielding varieties required complementary inputs apart from seed, such as fertilizer, herbicide, and pesticides to reach the optimum productivity. Farmers inability to purchase these complementary inputs (Bamire et al. 2009) are one of the constrains that affect the success of most of the intervention project on increasing productivity of small scale farmers. High cost of these complementary inputs and farmers inability to the credit facilities are reasons that caused most of the projects on increase productivity of small scale farmers to fail. From the report gathered at NERICA office, farmers are given all the inputs on credit which they will pay 50%of the cost back after the harvest (NERICA office OGADEP, 2011)

2.2.2 Yield.

Local upland varieties of rice as well as improved varieties used by small scale farmers have low yield about 0.5 metric tons per hectare in the traditional farming system without use of fertilizer. It is reported that under farmers condition where minimal inputs are applied NERICA variety have raised the yields of upland rice by more than 50% and when fertilizer and other inputs are applied is more than 4 metric tons per hectare (ADF, 2003). There is significant increase in the yield of the farmers who adopted NERICA based on the result of the data in 2006 season (WARDA, 2008) this is also in consistent with the founding in Uganda that it has positive effects on productivity and allow farmers to improve their yield (Kijima et al, 2006; Kijima et al, 2008). According to Kijima et al (2006), it was found that average yield of NERICA in Uganda is 2.2 tons per hectare this is as twice as average yield in sub-Sahara Africa. In the studies of Daigne (2009), there is mixed outcome where an impact evaluation suggests that NERICA varieties generated higher yield in Benin, but similar evaluation provide no broad evidence of yield improvement in Cote d'IVoire and Guinea. Other factors that determine yield are timing of planting NERICA varieties and cropping pattern in the previous season (Kimija et al. 2008).

2.2.3 Income

Rice is cultivated as a staple food and cash crop in sub-Sahara Africa (WARDA, 2006) where farmers can use as food and also sell the surplus in the market to generate income to purchase other foods items for household consumption. In Nigeria rice is consumed as a major staple food and also milled for sale to consumers in the country (Brisibe, 2010). From the survey conducted by Adebayo et al.(2009), 20.2 % of rice was sold in the paddy form while 79.8 % was milled, and out of the quantity of paddy rice milled, 21.8 was sold.. The production is characterised by small scale farmers cultivating less than 2 hectares of land with low yield of rice (Daramola, 2005). Among the problems encounter by farmers is lack of improved varieties coupled with high cost of inputs that led to using the sub-optimal proportions resulting in low and poor quality yield (Daramola, 2005), this will have negative impact on the farmer income.

There are several programmes initiated in the past to increase productivity and income of rice farmers in Nigeria, among them is Presidential Initiative of Rice with the objective to enhance household food security, income, eliminate imports and generate surplus for export (Daramola, 2005.). In 2005 NERICA rice project started with the objective to improve rice production of small scale rice farmers and their household income through transfer of NERICA varieties and complementary technology from WARDA (ADF, 2003). In Gambia it was found that NERICA adoption has increased the farmers' daily income for about 10 Dalasi equivalent to 0.34 United State dollars on average (Dibba, 2010). This is supported by another study conducted in Nigeria indicated that NERICA adoption increase farm income of household and per capita expenditures, thereby increasing their probability of escaping poverty (Donstop et al, 2010). In another study of analysis of impact and poverty in Uganda, it shows that NERICA has the potential to increase per capita income and to decrease poverty incidence (Kimija, 2008), and also stressed further by suggesting that NERICA income enhancement can be realized among the poorest of poor in the Eastern Africa.

2.2.4 Marketing

Marketing of rice is the source of income for those involved in the production. Rice marketing can be classified into two broad systems; marketing of locally produced rice and marketing of imported rice (UNEP, 2003). Rice producing household either sell their rice in paddy or processed form. Rice is cultivated as staple and cash crop. The part of the harvest is taken to market to sell so as to get income to purchase other of food items that are not produced by farmers. In Nigeria rice producing household either sell their rice in paddy (unprocessed form) or milled to the trader within or outside the village, the place of transaction varies, which usually taking place within the village, local market or the main market (Erenstein, et al, 2003).

2.3 Social

The social well-being of rice farming household and the communities focusing on the quality of life indicators such as gender differentiation, farming pattern, organoleptic , and labour availability.

2.3.1 Gender Differentiation in rice production

According to Ugwu (2009), globally women have title to only 1% of the land: yet paradoxically women produce half of the world's food and provide significant to unpaid agricultural labour for other crops. The role of women in meeting challenges of agricultural production is prominent but there are many factors that militating against their participation but the most are socio-cultural and economic (Ogunlela and Mukthar, 2009). However, women have numerous factors that hinder their productivity. Among them are illiteracy, poverty, and inaccessibility to resources such as land, appropriate technology and farm inputs, and training has not sufficient to enable them to achieve their full potential (Ugwu, 2009).

However, NERICA project has been acclaimed in one of its objectives that rural women farmers has been their target because they are involved in the upland rice production in West Africa and it has been structured and focused to deal with complex gender issues (ADF, 2003). There is not enough literature on the gender issues on NERICA project. There

are paper were reviewed some information that will help in this section. In the project appraisal report of African Development Fund on multinational NERICA rice dissemination project 2003, where it was stated in the social impact section that women will benefit more, as they form the majority of the upland rice growers, and the varieties are more taller than the local varieties and this will makes harvesting more easier by removing drudgery for women and children who are directly involved in the harvesting operations. It is also reported that the project will pay special attention to women's challenges by ensuring that they are represented and organized into rice farming group and seed producers. The report also go further by emphasising that the project will lead to increase in household incomes, food security and well-being of the beneficiaries, specifically socio- economic advantage to be derived by women are: (i) improvement of level of organization, training and productivity in order to increase women's income; (ii) involvement of women to improve productivity, profitability, and credit management; (iii) introduction and distribution of technological packages, including conservation and conditioning of food crops; (iv) enhanced awareness of rural populations to the prevention of HIV/Aids and malaria.

2.3.2 Farming system and practices.

The cultivation of rice usually started with the land preparation in the form of clearing and burning begins in January and February of every year, while the planting is carried out after the first rain in the last week of March and early April and sowing process involved the use of cutlass or knife and hole is dug and seeds is sown into it (Omofonmwan and Kadiri, 2007).
Mixed farming is practice by most of the Nigeria farms which does not permit for mechanization and the used of herbicide (Ismaila, 2010). Rice is mainly intercropped with other crop to increase the yield (Longtau, 2003) and also insurance against the crop failure (Akinbile, 2007). In his study on effect of intercropping maize and cassava with NERICA rice varieties on stemborer attack in south western, Nigeria, Nwilene et al, (2011) found that apart from the advantage of insect pest control, diversifying cropping systems also help farmers with limited access to land and fertilizer. This is supported by Fawole and Oladele, (2007) that multiple farming goes beyond conservative attitude of farmers but also as a means evolving sustainable livelihood of farmers.

2.3.3 Labour Availability

Family labour is the major source of farm labour in developing Sub-Sahara Africa, Marital status contributes significantly to the household size and, by extension, the size of farm household available for farm work Adebayo, et al (2009). In the study conducted by Odogbola (2006), it is shows that family labour predominantly employed in land clearing is 59.8%, while contractor and exchanged labour and in some circumstances combination of the family labour and contractor are utilized. Labour is important input in smallholder agricultural production and can be sourced within the family, or from labour market (hired labour) and any constraint to the cost and availability can be detrimental to farm productivity (Ogundele and Okoruwa, 2006).

2.3.4 Educational Status

According to Ismaila et al, (2010) majority of Nigeria's farmers cannot read and write which impedes their ability to adopt new technologies that will enhance production of cereals crop. In his study on determinants of productivity level among rice farmers in Ogun state, Nigeria, Akinbile (2007) found that the low level of literacy among respondents may affect their access to information and this is consistent with the finding of Omofonwam and Kadiri (2007) that Nigeria food production faces with many problems among them is illiterate and aging

farming population. Tiamiyu et al (2010) concluded that the analysis of the efficiency indices and socio-economic variables revealed that among the factors that affect the efficiency of rice farmers are education. Education plays an important role in acquisition of skill and technology transfer, enhances the adoption of technology and farmers ability to plan and take risks, which likely make him to be more efficient in the use of inputs than their counterpart with little or no education (Ogundele and Okoruwa, 2006).
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2.3.5. Farm Size and Subsistence Farming

According to Bamiduro and Gbadeyan (2011), agriculture in developing countries have been largely on subsistence basis and farmers only produce for their families and the quantities produce inadequate for growing population. This is characterised by cultivating small area for farming. Most of the farmers are smallholders with average farm size less than 2 hectares (Daramola, 2005). The findings of (Ogundele and Okoruwa 2006), revealed that majority of farmers operate on a small and medium scale cultivating less than 1 hectare and fewer than 10 hectares, and this limit their potential to produce and thus make them to remain at the subsistence level (Akinbile,2007). This shows that the size of the farm can determine the value of output (Nwaobiala, 2010), this is supported by Adegbite et al (2007), stated that the larger the farm size and the more the cost agrochemicals used and the more revenue expected by the farmers.

2.3.6 Taste and consumption pattern

Eranstein et al. (2003) conduct a survey of imported rice consumer's preferences and suggest that imported rice cleanliness is the overwhelming technical feature explaining the expansion of imported rice consumption in Nigeria at the cost of local rice market development. Next to cleanliness are swelling capacity (mostly preferred by restaurants and fast food joints), taste, availability and grain shape. The farmers preferred to cultivate the local rice varieties and abandon the improved varieties as a result of its taste and difficulty to sell at good prices (Akinbile, 2007).

2.4 Environment

According to Narrian and Trez (1988) cited by Eboh et al. (2011), Rice (oryza spp) farming depends greatly on the environmental factors, which are most important among several factors that influence agricultural production. Production of rice depend on the optimum combination of input to achieve remarkable yield, and these input are not limited to the familiar to those use for production but include various environmental factors provided by nature. However, the impact of physical environment cannot be neglected in agricultural production as it constitutes physical environment which affect the yield and survival of organisms (Eboh, et al, 2011).

2.4.1 Drought

Drought is one of the constraints that affect rice production in rainfed areas of Asia and Sub-Sahara Africa. The variation in the rice production in the areas that dependent on rainfall and or surface irrigation is closely related to total annual rainfall, even when there is adequate rainfall in rainfed areas, shortages in the critical period due to the long spell between two rains reduce productivity and causes severe economic loss for some of the world poorest communities (Serraj et al, 2011). According to Mohapatra (2009), drought is particularly devastating to Africa rice production since almost 80% of the region's rice area is rainfed. Various varieties of rice grown in rainfed ecosystems are for irrigation system ecosystems

without screening for drought tolerance. High yielding varieties generally produce poor crops or even fail when exposed to drought (Verukal et al, 2010). Varieties that have combination of drought resistance and high yielding under favourable conditions and quality characteristics preferred by the farmers are urgently needed. (Serraj et al, 2011). NERICA varieties have been reported to be drought resistance because it possesses the characteristics of high resistance to drought, weed, soil iron toxicity, and acidity

2.4.2 Weeds

Weeds play significant role as one of the major loss of yield in upland rice production (Labrada, 2003). Small scale farmers managed weeds in the farm manually by using hoes and cutlass but face high cost as a result of shortage of labour (Elekeme et al, 2008). Weeds control with the use of herbicides for small scale upland rice farmers are very expensive, and labour may not be available at the time when they are needed and farmers may lack the appropriate knowledge to use the herbicide correctly (Elekeme et al, 2008). Utilization of herbicides by farmers may reduce the problem of labour for weeding, but when it is not correctly applied it may bring about environmental problem (Labrada, 2003). In order to attain optimum yield by small scale farmers, the development and integration of more competitive upland rice cultivars for weeds are necessary. According to ADF (2003), NERICA varieties have wide droopy leaves and tend to grow vigorously at seedling and vegetative stages, this help to smother the weeds thereby reducing the requirement for weeding.This is confirmed by ADF (2003), NERICA cultivations reduce pressure on women and children who are directly involved in the weeding operations. Elekeme et al (2008), in the study of response of upland rice cultivar to weed competition of savannas West Africa, suggested that NERICA varieties are more resistant to weed pressure than other cultivars.

2.4.3 Soil Fertility

According to Adetunji et al., (2009), the management of soil fertility is first condition for sustainable crop production and poses a great challenge to farmers in Nigeria, most especially rice farmers. Fragmented ecosystems and inherited low soil fertility hampered agricultural production in Africa (Ismaila et al, 2010). Traditional shifting cultivation of slash and burn are followed by upland rice farmers, this pose no environmental hazard since there was 10-15 years of fallow at initial year (Fashola et al, 2007). Population pressure now forces farmers to crop over crop (Ismaila et al, 2010), this shortened the fallow period to 3-5 years or less (Fashola et al, 2007) and depleting the nutrient in the soil (Ismaila et, al 2010). Land degradation and loss of soil nutrient through continuous cultivation has lowered rice production in many areas, farmers now required to spend resources on fertility enhancement if they are to improve or sustain yield (Olembo, et al., 2010). The resources of small scale farmers is limited to purchase expensive fertilizer and rice has shown decline in yield over non application of fertilizer.

2.4.4 Pests and Diseases

According to Odogola (2006), pests are among the most serious constrains of both lowland and upland rice and if not effectively controlled, can cause considerable loss in crop yield, market and nutritional value. Infestation of pests and diseases seriously affect the production of cereals in Nigeria, and most common among them are locust, birds, termite, mammal and rodents while diseases include smut, blight and root rot (Ismaila et al, 2010).

CHAPTER THREE

3.1 RESEARCH METHODOLOGY

This section presents the research method, research approach and research strategy used in the study for different data collection and analysis method use to fulfill the objective of the research. This includes the description of study area, sampling procedure used and methods of primary and secondary data collection.

3.2 Research Strategy

Case studies were carried out as the main research strategy for the generation of primary data. This strategy was adopted because the research seek to have deeper understanding on the view of both the farmers, the staff of the NERICA rice project and the village extension officers (VEAs) involved in the project. The case studies consist of topic list discussions (interview guide) used for NERICA staff and VEAs while structured interview schedule was used for farmers. The topic lists and interview schedule captured information on the social, economic and environmental factors that affect small scale rice farmers food accessibility who involved in NERICA rice project in the study area.

3.3 Description of the study area.

This study was conducted in Obafemi Owode local government area in Ogun state, southwest, Nigeria. The state was situated in the tropic and have total land mass of 16,409.26 square kilometers with estimated population of about 3 million people (NPC, 2006). Obafemi Owode local government is made up of 104,707.24 hectares (Adegbite et al., 2007) .This local government can be described as the food basket of the state, because of its vast rural agrarian communities. Many arable crops like cassava, melon, maize, rice, banana, yam, and sweet potato are being cultivated in this local government. Cash crops like cocoa, coffee, and kolanut are also being grown. Obafemi Owode is specifically known for the cultivation of an indigenous rice variety known as “ofada’’ which is popular throughout the south western part of Nigeria for its peculiar taste and aroma.

3.4 Site selection.

The rice growing part of Obafemi Owode local government is made of 2 clusters of Oba and Owode. Of the 12 communities in which rice is produced in Owode cluster and 15 communities in Oba cluster, 1 village was selected from each cluster based on the popularity of NERICA rice cultivation in the area. The villages selected are Oba from Oba cluster and Moloko- Asipa from Owode cluster.

3.5 Sampling method.

Random sampling was used to select 10 respondents from the 2 villages who mainly cultivate NERICA rice in the study area. Initially 5 female and 5 male NERICA farmers was planned for but on getting to the community, research discovered that women do not have

separate rice farm apart from the their husband farm, due to the peculiarity of rice production. Men are responsible for land preparation while their wives are responsible for harvesting, processing and marketing of rice. Fortunately, researcher was able to get 1 female that are widow from each community who engage in NERICA cultivation. Therefore 4 men and a woman farmer are selected from each community in the study area. The respondents were selected because they are experienced rice farmers and also more than 3 years participation in NERICA rice project. Their experience could help in finding answers to research questions. The extension agents that covered the study area also interviewed to get in depth knowledge about their role in the project. The NERICA staff was selected to give better understanding on the implementation of the project.

3.6 Data collection.

The primary data was collected with self-administered semi structured questionnaire and topic lists from the respondents in the study area. Information from the key staffs of NERICA rice project and field staff and officials of the state ministry of agriculture were obtained by the use of self-administered topic questions from the topic lists. (see annex)

Secondary data were collected through the desk study with the use of existing literature, journals, internet, and publications from the state ministry of agriculture and NERICA rice project office.

3.7 Limitation of the study

The study was carried out at the fruiting of the rice when the infestation of birds were very high, some farmers did not adequately find enough time to attend to my interview

There was selection problem of the respondent initially equal number of male and female farmers were scheduled by the researcher to interview but the situation on the field was different because female does not personally owned rice farm and the only female selected are widow who inherited the farm from their husband and who also cultivating NERICA

CHAPTER FOUR

4.1 FINDINGS

This chapter presents the findings of this research work. Since the research was mainly qualitative, the findings are presented in a descriptive and narrative form based on the research questions. The findings thus cover the information gathered on the activities of the NERICA rice farmers in the study area. The information bothers on social, economic and environment conditions affecting the small scale NERICA rice farmers with respect to food accessibility.

4.2 Social conditions of small scale NERICA rice farmers

Social conditions under which farmers that are involved in NERICA rice project include the educational status, farm sizes, Labour, cropping and cropping patterns, taste, cooking time, and swollen up of rice when cooking, and aroma.

4.2.1 Educational Status of the respondent in NERICA production

Table 1: Respondents educational status

Education level	Number of farmer
Tertiary	1
Secondary school	4
Primary school	3
Illiterate	2

Source: author

The table 4.1 above shows that nearly half of the respondents are secondary school leaver while tertiary school leaver is the least.

4.2.2 Farm size of the respondent in NERICA production

The table below shows the total farm land in the study area, about one tenth of the land cultivated with NERICA rice while the rest were used for local rice variety.

Table 2: Respondents farm size

	Farm size of the respondent (Hectare)	Size of land cultivated for NERICA (Hectare)	Land cultivated for other crops (Hectare)
	4.00	0.40	3.60
	1.62	0.20	1.42
	0.80	0.40	0.40
	2.00	0.20	1.80
	0.60	0.13	0.47
	13.00	1.00	12.00
	1.62	0.13	1.49
	0.40	0.10	0.30
	0.40	0.13	0.27
Total	24.44	2.69	21.75

Source Author: 2011

4.2.3. Labour utilization by respondent in NERICA production

The table below shows that family constituted the larger part of the labour used in the production of NERICA rice while the mechanised method is the least.

Table 3: Labour Utilization

	Hired Labour (%)	Family (%)	Family and Hired (%)	Mechanised
Land preparation	60	0	30	10
Planting	60	10	30	0
Weeding	40	50	10	0
Bird scaring	60	20	20	0
Harvesting	0	80	20	0
Processing	10	80	10	0
Average	38	40	20	2

Source Author: 2011

Family labour contributed largest proportion of labour used in the study area, but they used combination of family and hired labour at some point in phases of the cultivation cycle. Some of the respondents said that labour was hired in land preparation operation such as land slashing and clearing and the planting of rice, while demand for hired labour during weeding has been reduced and mostly done by family and they emphasized that unlike other varieties NERICA compete with weeds favourably and this reduce the number of time in weeding from 3 to 2 times before harvest. One respondent used tractor to plough. Another reason for hired labour is during the last 30 days of rice on the field before harvest when there are birds invasion on the rice farm. Bird scaring required a lot of labour. Some of the farmers said there was problem of labour availability because they are few and not easy to find, even, when they available the cost of hiring them is very expensive. The shortage has direct repercussion on rice farming. This was evident by most of the farmers especially during the planting of rice. The planting period from the study area spans from early March to April.

However, some of the respondents planted toward the end of April because they have not found any labour to hire and they resulted to plant the rice by themselves. Another finding is that the hired labour is not from the community of the study area, they are from neighbouring Benin republic that simply migrated in search of better way of life.

4.2.4 Farming practice of the respondents cultivating NERICA

The farming practice prevalent in the study area was intercropping, and majority of the respondents intercropped rice with other arable crops. The main arable crops planted with rice are cassava and leafy vegetables. Out of all the respondents only one farmer solely planted rice and was the only respondent that used tractor to plough the land. The planting practice among the farmers was the dibbling where about 8 rice seeds are put in a hole and the rice is planted in rows. This was recommended by the VEAs in the study area because it makes it easy to weed and harvest. Though they complaint that the practice was labour intensive but it give higher yield and reduce seed wastage. One of the respondent said the planting practice he used was broadcasting despite the fact that it is not recommended, the reason was that planting almost over, and it save the cost of labour for planting and also more convenient but stress further that it was more difficult to weed and harvest.

4.2.5 Cooking, Organoleptic and other characteristics of NERICA rice.

The cooking period of the rice and the organoleptic is one of the important factors in its consumption. From the findings of this research carried out, the respondents complained about the longer cooking time of NERICA rice as compared to local and imported rice. Most of the farmers said that it was only when the stock of local variety was emptied that they opted for NERICA. They stress further that the long cooking time cost them more money because it consumed more kerosene before it get done. The organoleptic characteristics of NERICA rice has to do with the taste and aroma in cooking. The respondents confirmed that NERICA is better than polished imported rice both in aroma, and taste and all the respondents agreed that in term of taste and aroma local rice is better but only one respondent disagree with them and said “to me NERICA is better in taste and the aroma is also good”. 9 out of the farmers interviewed agreed that NERICA has a good swollen capacity characteristic during cooking, but the last farmer disagreed with the view. He believed that swollen up characteristic depends on the moisture content of the rice before cooking. The opinion of all the respondents was that conservation of NERICA after cooking is better than other varieties of rice. They said that it take longer time for cooked NERICA rice to get spoilt when compared with other rice.

4.2.6 Farming experience and Year of NERICA rice cultivation

Nearly the respondents have been in the business of farming for more than 10 years. From the findings the majority of the respondents said their parents are the one that motivated them to go into farming because that was what they involved in doing. While a respondent said that after some years of working as civil servant, he resigned and decided to go into farming and stressed further that his parents were farmers and this make him too strongly attached to his community. 6 of the respondents said they started planting NERICA rice from the inception of the project, and remaining said after a year the project has started. When the researcher probed further to ask them why not started with others, they said their thoughts were that the agricultural inputs will not be given on credit as promised.

Year of farming	Number of respondent	percentage
Less than 10	1	10
Less than 20	5	50
Less than 30	3	30
Less than 40	1	10

Source: Author 2011

From the above table it shows that half of the respondents have been in the farming business more than 10 years

4.2.7 Gender issues in NERICA

The findings revealed that the rice farming in the study area was predominantly done by men. More than half of the respondents interviewed are men and in their opinion wife are to support the husband in the farm. The only women that are interviewed said they inherited the farm from their late husbands. They stressed further that when their husbands were alive, we assisted in the farm especially during harvesting, processing and marketing of rice. The NERICA were cultivated mostly by men.

4.3 Economic conditions affecting NERICA rice small scale farmers

From the findings the economic conditions that affect the NERICA rice farmers in the study area includes; access to input and credit facilities, yield, marketing and adequate supply of food in household, and ability to carry out the family obligation.

4.3.1 Access to input and credit facilities by respondents of NERICA production

All the respondents gave opinion that access to agricultural inputs needed for NERICA rice project was not problem to them. The inputs are given on credit which can be pay back after the sales of their harvest. Subsidy of about 50% is also given on these inputs. From the findings due to the poor acceptance of NERICA by consumers and marketers, farmers were unable to pay for all the inputs given to them by NERICA office.

Credit facilities in form of money needed for the cultivation such as land preparation and other agronomic practices is not available to farmers in the study area. According to most of the respondent there are many financial institutions available but are not ready to support farmers, because it take too long to pay back the loan and also no collateral to serve as surety in case there is any default. Many farmers from the study area said their attempt to borrow money from financial institution does not produce any positive result. Personal savings and financial support from marketers are the main source of raising fund for their farming activities.

4.3.2. Perception of respondents on yield of NERICA rice

The majority of the respondents agreed that NERICA produce higher yield than their previous varieties cultivated.9 out of the farmers interviewed agreed that NERICA yield was higher than local variety, except a farmer who believe that with good management NERICA and local varieties yield are the same. One of the respondent said 1 bowl of NERICA seed will give a yield of 40 bowls of paddy rice. Another farmer said the yield from his own farm from a bowl of NERICA seed is 30 bowls of paddy rice. Another farmer is of the view that a bowl of NERICA seed will give 28 bowls of NERICA paddy rice, while another farmer said a bowl of NERICA seed will give 27 bowls of paddy rice. The most educated farmer among them said the yield from NERICA rice field was 1 to 2 ton per hectare depending on the management and weather conditions. Though no accurate information on the quantity of the

rice yield being consumed or dole out as gift, speculation ranges from one tenth to one hundredth depending on the size of the farm cultivated. The respondents said they preferred to give NERICA rice out as a gift because of its market value

4.3.3. Marketing.

Majority of the farmers sold their rice as paddy as well and also as milled rice depending on the financial needs at the time of harvest. But one of the farmers sponsored by the marketers sell his rice as paddy to the sponsor at pre-determine price at the time of planting. Sales of paddy rice according to the respondents takes place in their homes and also in the market. Distances from the villages to the market ranges between 7 to 10 kilometers. 9 out of the farmers interviewed take their processed paddy to the major rice market in the city where the paddy is milled and sold to ready buyer who offered higher than one obtainable in the village market. They also said sale of milled rice is more profitable than selling of the paddy but they always sell the paddy because of cash demand.

Price is determined according to the respondent by market forces and time of marketing (off and on season). Price is higher at the off season than the on-season. NERICA rice attracts lower price than the local ofada rice. According to most of the responds a bowl of milled local rice sold at N4, 500 while NERICA rice of the same measurement is sold at N1, 600. Due to these price differential farmers in the study area face marketing challenges in NERICA rice and this informed the low acreage of land being put to its cultivation in comparison to the local rice variety. Due to the poor acceptance of NERICA rice, 9 out of the respondents mixed NERICA with local variety before they sold it. One of the farmers interviewed mixed one bowl of NERICA with 3 bowls of rice to sell at the same price. The most educated farmer among the respondent engaged in conditional sales. He normally stored his paddy to reduce the moisture content to attract higher price. When ready to sell, a buyer who wants to buy 10 bowls of local rice is compelled to buy 2 bowls of NERICA rice at the same price.

4.3.4 Food adequacy in the household of the respondents cultivating NERICA rice

The opinion of respondents was that NERICA rice variety has the capacity to provide food adequately for their household because of its higher yield and ability to grow in the harsh climatic conditions, but they complained of marketing problem. One of the respondents said “because I planted NERICA rice on small plot of land it cannot provide enough money for me to buy other food stuff for my family”. There was another respondent that say that “if NERICA attracted the same price as the local rice variety in the market he should have afforded me to buy enough food for my household”.

.4.3.5 Ability of the farmers to meet the family obligations

All the respondents gave the same opinion about the project ability to make them meet other family obligations. The NERICA rice project should have afford them to meet other family needs like sending children to school, paying medical bills for ill family member, building house and even marrying more wife if it is accepted in the market like local variety.

4.4 Environmental conditions that affect NERICA production.

The findings revealed that, the environmental factors such as; drought, weeds, soil fertility, and pests and diseases have a great influence on NERICA rice production.

4.4.1 Drought

The farmers interviewed were of the same opinion that NERICA rice has more resistant to the effect of drought compare to other rice variety planted in the study area. However, drought effect according to the respondents was greatly determined by the stage of the NERICA rice life cycle. When drought occur during the filling stage it leads to poor rice quality as most of the unfilled grains will appear black even at the milking stage. Meanwhile, all the respondents agreed that the early maturing of NERICA make its tolerance and capacity to escape drought. The farmers said they have no control or remedy for the drought presently since it beyond our reach but, most of them said the resistance to drought characteristic possess by NERICA can be attained if the seasonal calendar is strictly followed and rice is planted on time to take the advantage of early rain.

4.4.2 Respondents view on NERICA rice on weeds competition.

According to all the respondents in the study area, they said that weeds are second major problem that was affecting the yield of rice after birds. All the 10 farmers agreed that NERICA rice variety can compete with weeds successfully. The farmers said that the higher yield can only be guaranteed when the weeding operation is timely. They all agreed that it is better not to allow any weed to grow. The farmers said during the interviews that weeding consumed a lot of time, labour intensive and also very costly. Majority of the farmers removed weeds from their rice farm manually with the use of cutlass and hoe while one of them used herbicide to control weeds. All the farmers agreed that weeding of their rice was done twice before the harvest, but there was variation in the time. 6 out of the respondents said their weeding time was 2-3 weeks and 5-6 weeks after planting, while the remaining said was between 3-4 weeks and 6-7 weeks. All the farmers interviewed have the same view and said weed problem is minimal when the field the rice sown is well prepared.

4.4.3 Soil fertility maintenance by respondents in NERICA rice production.

All the respondents gave opinion that cultivation of rice was influenced by the availability of fertility in the soil. They claimed that intensification of land over a long period of time reduced fertility in their soil because fertility was maintained through the bush fallow system. The project makes provision for the supply of fertilizer. The only farmer that said he used fertilizer was the one that have large farm size. When the research asked them why they preferred bush fallow to fertilizer to maintain soil fertility, when the fertilizer is readily available on credit with about 50% subsidy, these are their response. Some of the farmers said I have not pay for the input collected last year, others said that the NERICA rice market price is too low. They are complained that the fallow period which is usually between 3 to 5 years has been reduce to about 1 to 3 years this resulted in decline in soil fertility and yield obtained in the rice farm. They also said that NERICA can tolerate soil that have low fertility better than local variety but they stressed further that optimum yield can be obtained if soil fertility is enhanced.

4.4.4 Pests

The opinion of the respondents on pests infestation was one of the constraints in rice that reduce the yield of rice in their farms. The order of their severity are in the findings are as follows

Birds are the most devastating pests that affect the cereals including rice. All the respondents confirmed that birds attack on rice farm was a major problem in rice production in the study area. Every single farmer was complaining of the attacked of birds in their farm.

They said the birds fed on the grain at the milky stage by chewing and squeezing the crop. The damage crop will shows white milky substance covering the grain. The farmers also stressed further that at grain maturation, the birds eat the grain leaving the husk emptied. Some of the farmers said that the only way to control the birds was to have somebody readily available in the farm from 7.am to 7 p.m. for one month starting from the flowering state. All the farmers agreed that bird scaring was labour intensive and very costly. The charge for bird scaring according to the farmers varies and also depends on the source of labour. Some of the respondents said the labour charges between N700 and N1, 000, while others said is between N500 and N800 (N naira the local currency of Nigeria). Some respondents said when there was shortage of labour, they do it themselves with the help of their children when they are not in school. The farmers also said that early maturity of NERICA contributes to less attack of birds compare to local variety. There are several techniques employed by farmers in study area to control birds on the farm. Some farmers said that they used physical chasing coupled with shouting to scare off the birds, while others used beating of sonorous object like tin to scare off the birds. In all the farmers in the study area only a farmer said he did not control the birds in his farm. According to him he said “I make sure that there is not tree in the surrounding of my farm where birds can perch, since they cannot fly a long distance without landing on a tree”.

The farmers in the study area also complaint that apart from birds, rodent family like rats, grass cutters and squirrel causes a lot of economic loss to their rice farm. Some of the respondents said the rodents are found when the farm was surrounded by the bush that was why we make sure that the bush is clear and is a bit far from the field. Majority of the respondents in their opinion said rodents attack the crop by pulling up the germinating seed and also cut down the tiller and chewed it. The perception of some the respondents on the attacks of rodents on NERICA rice was that the damage was not severe because it is ready for harvest between 100 to 110 days after planting than the local varieties which matures between 140 to 160 days. The reason given by them was that late maturation will increase the incidence attack of rice on the field by the rodent, while the other respondents view are quite different, and they said there is no different in the incidence of attack in NERICA and other rice varieties grown by them. When researcher asked the farmers on how they control the rodent in their farms, some of them said we set trap on the farm to kill them, while 2 farmers said they mixed poison with food and traced the path used by the rodent to enter the farm and dropped the poison there to kill them. Most of the respondents claimed that all the means deployed to control the rodents are not successful in eradicating them. Those farmers that used trap said when you killed them this month, the following month you will see another sets coming to your farm and the same comment comes from the farmers that used poison, one of them said that I used poison but the rodents continue to increasing instead of decreasing in number.

Other pest that affects rice in the study area is termite. Though the farmers said the occurrence of their attack is not as severe as rodents and birds, yet it can cause damage to the rice farm. Some farmers said the termite is noticed when the rain stop at the beginning of the season and usually attack rice on the farm at early stage of growing between 2 to 3 weeks after planting. Majority of farmers said termite did not attack their rice farms, while, 3 farmers mentioned of its attacked. Only a farmer out of the 3 that have mentioned about the attacked of termite in their farms controlled it with the pesticide, according to him the

pesticide is very expensive but the only choice is to use it to avoid the loss of the crop, while the remaining 2 said they did not use any means of control for it.

4.4.5. Disease resistant by respondents in NERICA rice production

All the respondents claimed that they have no experience any incidence of disease since they started cultivation of NERICA rice. The farmers in the area of the research study claimed that they do not experience any diseases infection in their farms. Though all the farmers said the village extension agent told them that NERICA rice is disease resistance. They also claimed that the local variety is not also attack by the disease. They said there is no difference in the resistance to disease of NERICA and local variety.

4.5 NERICA office

According to the NERICA staff, the objective of the project is to support small scale rice producers to improve production and their household income through the transfer of NERICA varieties and complementary technologies and also to contribute to poverty reduction and food security. The respondent said that the project was being implemented by provisions of agricultural inputs such as seeds, fertilizers and agrochemicals on credit at subsided rate and training the farmers on recent technology in rice production. The NERICA staff claimed that the stakeholders in the project are small scale rice farmers who are accepted to plant NERICA in their farms. The respondent stressed further that the criteria used in selecting them is that the VEAs identified the rice farmers and also help in distributing inputs to them. He said the main challenges encountered in the project are; farmers inability to pay back the agricultural inputs collected on credit on time, while some them are not ready to pay at all, the equipment for processing rice promised to install in the project area is yet to be fulfill, and finally farmers complaint of marketing problem of NERICA rice is facing in the market which make them to reduce the size of land cultivated for it. All these have started to affects the sustainability of the project. The project has entered the second phase now, and I think all the challenges can be resolved by creating awareness among the consumers about NERICA and other support services promised farmers would be fulfilled in order for the project to be sustained.

4.6 The roles of village extension agent in NERICA project.

There are 2 village extension agents that covered the each community of the study area of the project so for clarity of their own view about the project I gave them names based on the cluster where they carried out their activities.VEAs Oba and VEAs Owode. The 2 VEAs agreed that their role in the project is to help the NERICA office identified the rice farmers who also accepted to plant NERICA variety, distribute agricultural inputs according to the need of the farmers, visiting the farmers in their farms to know about the progress and challenges encountered in the cultivation of the NERICA, and provided solution to them, and also reminded farmers to pay for the inputs collected from NERICA office on credit. The VEAs Oba said he also assisted farmers to arrange where to sell their NERICA rice harvest because most of them complaint about the low acceptable and price offered by consumers. The 2 VEAs claimed that the information is disseminate to the farmers through the training and visiting system (T&V) and is on fortnightly basis, they also stressed further that they deal with farmers individually and as a group. The VEA Oba said the NERICA project motivated them by giving allowances such as top up credit for their mobile phone, motor cycle and fuel, organising trainings, seminars and tours to other countries where the project is being carried

out. The use of mobile phone reduce information gap between their clients and NERICA rice office. They said the project has offered them all the incentives necessary to be efficient and effective in the delivery services to the farmers.

CHAPTER FIVE

ANALYSIS AND DISCUSSION

This chapter covers the analysis and discussions of the findings of the study as presented in chapter four. These findings analyses are those from farmer respondents, village extension agents and NERICA staff in the state office. The findings are also compared with the findings and studies conducted by other researchers as found in the literature some of which is cited in the conceptual framework.

5.1 Social factors of NERICA rice project.

The social factors that affect the NERICA project to the food accessibility of small scale farmers based on the findings of the study conducted are to be analyse and discuss in this section. From the 2 villages selected to evaluate the project after the completion of the phase 1 it were found that the larger numbers of the farmers cultivating land that is less than one hectare with fraction part for NERICA rice. This affected the yield due to the small area of land. The proportion of land apportioned for the improved variety is very small compare to the local variety planted. The reason given was that the local variety is more acceptable in the local market by the consumer and attracted higher price than the NERICA. The farmers now decided to give out small portion of land to NERICA and also used agro-chemicals and fertilizers obtained from the project for the local variety. These show that farmers would stop the cultivation of NERICA rice once the provision of agricultural inputs has stop or after the duration of the project. This implies that it would follow the same path live other previous agricultural intervention programmes that are not sustained after the project. The project need to be re-designed as it is about going to the 2nd phase and participatory varietal selection must be carried out in all the project area. This is necessary to ensure that the variety will meet the social and cultural feeding habit of the farmers and consumers for the sustainability of the project.

The educational status play important role in the food accessibility of the farmers. The tertiary education attained by a farmer in the study shows some characteristics that make him unique from others are: good managerial abilities by cutting all the trees nearby his rice farm to reduce the attacks of birds, also shows some level of efficiency in the use of tractor for land preparation. The only illiterate among the respondents are women this shows the age long tradition on gender with the female at the disadvantage.

Labour plays an important role in the agricultural production especially the small scale farmers. Majority of the labour used in the study area are combination of family members and hired labour. When the family labour is not sufficient for the cultivation in the farm, the farmers resorted to hired labour. The availability of hired labour and the cost depend on the farm wage rate, kind of farm operation and the period of the year (Ogundele and Okoruwa, 2006). Most of the farmers delayed the planting time because during the beginning of planting season there is high demand for hired labour and this will affect the yield of NERICA and food accessibility of the farmers. The labour availability to the farmers is still one of the problems as majority of the labour comes from neighbouring country. The variety has been claimed that it is not labour intensive as other rice varieties but during the period of bird

scaring more labour are needed which are relatively scarce and make farmers to do the job themselves. This would not allow them to engage in other economic activities that can generate income for their household. The project should provide means of control the labour to reduce cost of production and economic loss cause by the bird.

The farming practice adopted by most of the farmers is intercropping. The NERICA rice is intercropped with mainly cassava and leafy vegetables. This farming practice has some advantage because it generated higher yield than in sole cropping and also less subject to damage from the drought at the time when the risk of drought are highest at the ends of the rain.

People strongly attached to their feeding culture including the taste and aroma of food. The acceptance of any newly introduced food is always very difficult especially if its different in taste. The NERICA rice is not an exception; despite of the high protein content the acceptance by the people is very low. Though there are many preference drivers for consumption of rice, among them is the appreciation of local rice taste. The taste of local rice is to many respondents is better than NERICA rice in cooking. The consumers also consider the swollen up of rice during cooking. The swollen up of NERICA is higher than local and imported rice but the acceptability is low by the consumers which have negative effect on the marketing and income and consequently affect food accessibility of the farmers.

There is an adage in my country that says experience is the best teacher. The number of years in farming is one of the important factors in the managerial ability of the farmer and how to use available resources to get optimum production. To practice farming successfully one has to be in the business because it involved a lot of the risks. Farmers who have been in the business for years are more knowledgeable in the pattern of rainfall, the incidence of pests and diseases, climatic and agronomic conditions of the area than someone who just started irrespective of the educational status attained. The farmers in the study area are knowledgeable because all of them have been in the farming business more than 10 years. 2 out of the respondents said they have started farming since secondary school days by combing schooling and farming together. The management practice is not problems because experience garnered by the farmers shows that they have acquired enough knowledge in the cultivation of rice. Knowledge gap for the farmers are not problem but the marketing and acceptability by the consumer is the problem.

From the appraisal report of the ADF it stated that NERICA project will pay attention to women to ensure that they are represented and organized into rice farmers group and seed producers. The findings of the research revealed that majority of the farmers growing rice in the study are men. This may due to socio-cultural and economic conditions in the area. The old tradition of gender inequality still exists. NERICA rice project did not put in consideration the gender issues before the project was designed.

5.2 Economic

The unavailability and inaccessibility of agricultural inputs is one of the constraints that affect agricultural production in Nigeria. There was lot of intervention project on increase agricultural production in the past that failed. This is because the input might not be available to the farmers on time to meet the planting season and even when available they might not have money to access it. The NERICA rice project was designed to provide all the necessary inputs that farmers might need for the cultivation on credit with 50% of the inputs cost are

paid back after harvest. This project has the ability to provide income for the farmers to access other food apart from rice. This supposed to encourage the farmers to increase the size of land cultivated for the NERICA in order to increase their income. The farmers did not take the advantage because they face constraint in the marketing of the rice.

The NERICA has reported that it has higher yield than local variety planted by farmers. This shows that it has potential to provide food and cash for the farmers if the land size allotted to it is bigger than those of local variety. The higher yield of NERICA is not translated to cash because the farmers give small portion of their available land to plant it. This is due to the consumer preference of local rice to the NERICA. The farmers are not planting NERICA for its higher yield but because of the inputs they are getting on credit which they know use to increase the yield of the local rice variety.

The essence of any agricultural intervention is increase the productivity of the farmers in order to increase income. This mean that farmers would get more yield than before on the same size of land by planting the improved/high yield variety and this will lead to increase the farmers income. The NERICA projects focus on the small scale farmers to increase their income through the transfer of improved NERICA technology. The NERICA project has the potential to increase farmers income (Kijima et al, 2008), and this can only be achieved if the farmers can increase the size of land of the variety cultivation. The income generated by the famers in this project cannot assure them of their food accessibility for their household.

The marketing problem is the major constraints that affecting the NERICA rice. This is difficulty faces by farmers planting NERICA in the local market. The market is far from the area of rice production. The rice attracted very low price in the market when compared with the local variety. This is because the consumer preference for the taste of local variety and also the longer cooking period of NERICA affects its marketability as consumed more kerosene/ firewood when cooking it. People that usually in the market are low income or urban poor who cannot afford the price of local rice and other characteristics that gave NERICA some share in the market are swollen capacity because when cooking the same quantity of NERICA and other rice varieties it has the capacity to rise up in the cooking than others. The conservation when cooking also contributed to the share in the market.

The postharvest processing of the rice is one of the factors that are affecting its marketability. There are 3 ways in which rice can be processed after harvesting in Nigeria: traditional hand pounding processing, small and large mills enterprises (Ezedinma, 2003). In the study area rice is processed by the farmers from threshing to drying before milled it by small mills enterprise in the market. During the processing the foreign materials like stones, pebbles and sands mixed with the grains. This introduction of these foreign materials reduced the quality of rice when milled and this will affect the price offered by the consumer. NERICA rice is not in exception. Rice is graded by the quality in relation to the number of broken rice, uniformity in the grains size, and presence of foreign materials. These qualities determine the price in the international market (Ezedinma, 2003), because the demand driven urban consumer require fast food that demand less time for preparation and contain no foreign materials (Tollen, 2007).

The responses from the study indicated that apart from the cash derived from sales of rice, they also depend on it for home consumption (UNEP, 2003). The NERICA variety with its high yield and early maturing has the ability to make food available for farmers household but

this was not the case in the study area. All the farmers in the study area used small portion of their land to cultivate NERICA variety. The farmer should increase the size of land cultivated for the variety if it they want to make the project provide adequate food for their household food accessibility. With the present situation the project cannot provide adequate food because the quantity harvested cannot meet the need of the family.

The obligation of farmers to his/her household is more than providing foods, clothing and shelter it involved other financial expenses. The income from the family usually use for the education of the children, pay medical bills and other expenses for the well-being of their households. The NERICA rice project has the potential to increase income of the farmers to meet the needs of the family. In the findings this is contrary because farmers in the study area are not cultivating NERICA rice to generate enough income to meet their other family obligation.

5.3. Environment

In the last chapter the findings from the study conducted shows that the variety rice in the NERICA project has the capabilities to withstand both the physical, biological and environmental stress. Despite the claimed by most of the respondents that NERICA rice has the ability to grow well during the drought period than other varieties.

Drought is not only affecting the yield but also causes economic loss of the crop in the field. The erratic pattern of rainfall and the climate change have caused problems for farmers to get the optimum yield on their respective field and also affect the income to ensure food accessibility for their household. There are several intervention project in the past initiated by government, non-governmental, international organisations, none have been really addressed the problem of drought affecting poor small scale farmers. The farmers attributed the ability of a NERICA rice variety to early maturing though the proper planting time must be maintained for this to be manifested. With this attribute NERICA still can make meet the needs of the small scale farmers food accessibility if the variety that can matched the taste and aroma of consumer is released to the farmers. This will guarantee its market and also increase farmer's income.

Weeds have been the constraint that is affecting the cereal crops in which rice is not an exception. In upland rice producing countries weeds are the most biological constraint to yield because they compete less with weeds and uncontrolled weeds grow can lead to negligible or zero yield (Johnson, 2009). The NERICA project introduced the upland rice variety that acclaimed to compete successfully with weeds than others improved and local varieties. The planting of this variety will avoid dependence on the herbicide which price is now becoming increasing higher and not stable. This will make the farmers to save enough money for household needs such as paying school fees, medicine, and to purchase other food items that are not grown by farmers. The competitiveness of the NERICA rice not only save the production cost but also make environment free of pollution and preserve the beneficial micro-organisms in the soil through avoidance of the use of herbicide.

The fertility of the soil is very important to obtain optimum yield in agriculture. In the past bush fallow system is used to maintain soil fertility, but the increasing in population has exerted pressure on the land and lead to multiple cropping deplete the soil nitrogen rapidly without allowing fallow period to recovered farmers have depend on the inorganic fertilizer to grow anything on their field (Soong, 2006). The soil fertility is maintained by the farmers

through the fallow system but most of them have been experiencing decline in the soil fertility because the fallow period has been shortened due to the pressure on the use of land. NERICA has been claimed to have traits that is tolerance to salinity and iron toxicity in the soil (ADF, 2003). This shows that NERICA can thrive in the declining soil fertility and gives optimum yield with application of inorganic fertilizer and can increase food accessibility of small scale farmers.

Pests infestation is one of the constraints that affect rice production by reducing the yield and causes economic loss. There are various types but the most prevalent that cause severe damage to rice farm is birds, rodents and termites. Birds are the major pests that cause damages to rice on the field. They attacked the rice crop by removing the seeds from the panicles causing economic loss and reduced the yield. Traditional method of bird scaring are common among the farmers by deflecting the birds to neighbouring growing crops and is labour intensive and costly management strategy. There is no specific control of the bird and information gathered was that the cultural beliefs of the farmers also prevent them to use pesticide because some of the birds are not ordinary. The bird infestation occurred in the last 30 days of the rice on field that is common between July and August of every year. The only way is the use of early maturing variety that will reduce the incidence of the attack. The NERICA mature between 100 to 110 days and this make its less attack than the local variety and stand better chance to provide farmers cultivating it with access to food because of the minimal attacks by the bird. There is a farmer that the attack of birds in his farm is not severe because all the trees surrounding was hewn down and this make it for difficult for birds to build nest very close to his farm. The farmers said the extension agents told them to plant early maturing NERICA rice and all of us planted it based on their advice but after harvesting we find it difficult to sell at the market and this discourage and we decided to use larger part of our land to cultivate the local variety though the attack of bird is severe but it give us more money than NERICA which attacked of bird is not severe but has market problem.

Rodents are other pests that attacked rice crop on the field. The common rodents are bush rat, grass cutter, and squirrel. The farmers perspective from rodents are quite different from birds, because the attacked on rice is not severe as the latter, though they can cause economic loss and reduce the yield of rice. Their management is not labour intensive and costly and means of control is setting trap on the single path they follow to entered rice farm. When caught by trap the farmer can sell it to get cash or consume it to increase protein intake of the household. Only few farmers use lethal poison to control rodent in the farm but is not environmentally friendly. The other pest mentioned is termite but all the farmers are affected and this is caused by presence of termitarium, and decaying log of wood in the farm. Though farmers said they noticed termite when the rain stop at the beginning of the season but failed to mention the presence of decaying log of woods and termite cast.

The incidence of disease are not mentioned by the farmers in the study area, this may due to the fact that NERICA rice is resistant to diseases or the farmers does not know the symptoms on their field. The observation of some rice fields show that there are brown spot on the leaves of some rice plant though the farmers said that they do not seen it as threat because it cause no economic loss. The use of plant of the resistant variety is not enough but integrated strategy of preventive measure that is that is favourable to rice production and proliferation of diseases by appropriate crop management technique (Wopereis et al., 2009).

5.4 NERICA office

The state desk office of NERICA is anchored in headquarter of Ogun state agricultural development programme (OGADEP). The function is to coordinate the activities of the project and also responsible for the distribution of agricultural inputs through the extension agents to the farmers and restocking of inputs. The desk office also involve in the capacity building both the farmers and extension agent in the project through training, workshop and seminar in the NERICA office. The information gathered from NERICA desk office was that farmers are happy and building houses with better way of living because of the yield and income realized from project. This is contrary to what I found out in the area of study, though most of the respondents claimed of higher yield but it faced with the marketing problems. The marketing challenges faced by the NERICA should be addressed on time in order to increase rice production and income of the farmers who cultivated it.

5.5 Extension agent

The role of extension agent is to inform farmers about the project, distribute the inputs and also to give advices to farmer on the management practices of the rice variety. There are link between the NERICA office and the farmers which is similar with the previous agricultural intervention project. The only difference is that they are given responsibilities of identifying the beneficiaries, distribution of inputs and also the recovery of the credits from the farmers. The extension agents were motivated in the NERICA rice project by the provision of motorcycle and fuel allowance to facilitate their mobility, recharge card allowance to but credit to their mobile phone for effective communication between farmers and the NERICA office, organising regular training, workshop and seminar. This will encourage the extension agents to perform effectively but especially in the provision of mobility which is one of the constraint in agricultural extension services in the country. The provision of recharge card to credit there mobile phone will also facilitate communication especially if there is urgent information that need to pass across to farmers and also to know the progress of the NERICA rice variety on the farm. The will reduce communication gap between the farmers and extension agent that usually visit farmers fortnightly with training and visiting system (T&V). The proper monitoring of the extension agent is very essential to know that the facilities provided is judiciously used for the purpose met for and not diverting for personal use which has always been the case in the past.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

This section presented the conclusion of the findings on the NERICA rice project on the small scales farmers in the study area and recommendations on how to improve on it in order for the project to have positive impact on the participants.

6.1 Conclusion

This study was conducted to evaluate NERICA rice project and its impact on the farmers in the research area of study. Based on the findings it is concluded the NERICA rice project has the potential to increase food accessibility of the farmers. The rice variety is of higher yield, can grow under harsh environmental conditions and also early maturing which can allow farmers to grow more than one crop in rainy reason. The project make provisions for agricultural inputs on credit and farmers paid back after the sales of the harvest with 50% subsidy

The research found out that majority of the farmers interviewed are cultivating less than 1 hectare with small part of their land allotted for NERICA rice. The farmers complain that market for NERICA rice is limited and it attracted low price compare with local variety. The consumer preference for local rice is because of the taste and aroma. The farmers were unable to pay back the inputs collected on credit because of the poor market of the NERICA rice. The major pest that causes serious economic loss in rice are birds and can destroy all the farms if not control on time

The study also examined the processing of the NERICA rice, information gathered was farmers still used old traditional method of parboiling and drying which reduce the quality and also they have to travel some kilometers for milling of the. Most of the farmers sell their rice in both paddy and milled form but the latter is preferred because of the higher price it attracted. The market is also far from the village and most of the roads were in bad conditions and they have to pay high transport fares in order to get their goods to the market.

The research also study the linked between NERICA office, agricultural extension agent and farmers. The farmers got information on the rice variety from formally from the extension agent, while the extension agent helps the project identified the rice farmers who are willingly ready to cultivate the rice and distribute inputs to them. Farmers paid for the inputs collected on credit to NERICA office through the extension agent.

6.2 Recommendations

Based on the study, it is concluded that income from NERICA rice project cannot guarantee small scale rice farmers food accessibility at this point in time. Though the rice variety has the potential because of the higher yield and early maturity but its poor market is attributed consumer preference of taste and aroma of local rice in the market. NERICA rice variety should be research and developed further so that it can attain is potential.

The following recommendations are made for the project to achieved is objective

Farmers: Should not be selling the rice individually, they can form association and pool their produce together this can command higher price and also reduce the cost of processing and transportation to the market. The farmers can look for guarantee contract production like hospitals, schools, and prisons since the market of NERICA rice is presently limited.

NERICA rice project office: Since farmers are willingly to cultivate the rice variety but being constrained by the market, the researcher should continue to improve on the present variety released to farmers that are acceptable in the market. The participatory variety selection should be conducted before any new variety would be released in large quantities in order to determine the variety farmers want to grow and also to consider consumer preference. The project should provide processing equipment for the farmers so as to ease the processing of the rice and also to improve the quality so that it can attract better price in the market.

The repair of the feeder roads to the villages is very imperative because the bad roads discourage most of the transporters to come to village and farmers find it very difficult to move their goods to the market. Farmers have to travel several kilometers before they can sell their rice at the market, this increase transition costs because of the higher transport fare paid and reduce their profit, this make the construction of the market very important. Awareness should be created through print and electronic media on the nutritional benefit in consuming the NERICA rice; this can create opportunity for the farmers to get more market for the rice and consumers' willingness to buy it.

REFERENCES

Adebayo et al., 2009. Rice data system in Nigeria. Available at: <http://www.nigeriastat.gov.ng/.../c08a3d0cc916fd007f11ec02866c44ea70> [Accessed 22 June 2011]

Adegbite, D.A., et al. 2010. The Impact of national fadama development project on small scale farmer income in Ogun state: Implication for financial support to farmers. Available at: <http://www.unaab.edu/journal/index.php/seriesC/article/view99> [Accessed 23 June 2011]

Adesanwo, O.O.,et al, 2009. Evaluation of traditional soil fertility management practices for south western Nigeria. Available at: <http://www.idosi.org./aeja/2(2)09/1.pd> [Accessed 11 July 2011]

ADF, 2003. Multinational NERICA dissemination project appraisal report, Agriculture and Rural Development Department. Available at: <http:www.afdb.org/…/Project/…/00465593-ENG-GPN MULTINATIONAL WARD>. [Accessed 18 July 2011]

Akpokodje, G., et al., 2003. The Nigerian economy in a competitive world: Constraints, opportunities and strategic choices. Nigeria's rice policy and development: A review. Available at: <http/://www.hubrural.org/IMG/pdf/Nigeria-rice-policy-and-development.pdf> [Accessed 20 July 2011]

Awotide, B.A., 2010. Farm –level constraints and adoption of improved rice varieties in Nigeria. Available at:<http://www.cedaxlogistics.netfirms.com/…/Farm-level-Constraints-and Adoption-of-> [Accessed 13 July 2011]

Balasubraimanian et al., 2007.Increasing rice production in Sub-Saharan Africa: Challenges and opportunities. Available at: <http://www.sciencedirect.com/science/article/pii/s0065211306940024> [Accessed 27 June 2011]

Bamiduro, J.A. and Gbadeyan, A.R., 2011.Small scale farming and agricultural producs marketing for sustainable poverty alleviation in Nigeria. Available at: <http://www.cscanada.net/index.php/css/article/.../j.css.1923669720110703.020> [Accessed 7 September 2011]

Bamire, S.A. et al., 2009. Assessing the constaints affecting production and deployment of maize seed in DTMA countries of West Africa. Available at: <http:www.dtma.cimmyt.org/index.php/…/96-dtma-seed-sector-analysis-in-wet-africa-> [Accessed 30 June 2011]

Brisibe, T. 2010. A Case study of competitiveness of the Nigeria rice industry. Available at:<http://www.library.athabascau.ca./dir/download.php?filename=mba=10/open/brisit> {Accessed 5 August 2011]

Diagne, A., 2009. Technical change in smallholder agriculture: Bridging the adoption gap by understanding its source. Available at:<http://www.escholarship.org/uc/iem1wf5q4bm> Accessed 16 July 2011]

Daigne, A. et al., 2010. The NERICA success story: Developments, achievements and lessons learned. Available at: <http://www.siteresources.worldbank.org/.../NERICA-Success-Story-11-2010.pdf> [Accessed 11 July 2011] (draft)

Daramola, B., 2005. Government policies and competitiveness of Nigeria rice economy. Available at :< http://www.adrao.org/workshop/Rice Policy/Biyi/Biyi D.Nigeria.pdf > [Accessed 3 July 2011]

Dibba, L., 2010. Estimation of NERICA adoption rates and impact on productivity and poverty of the small scale rice farmers in the Gambia. Available at: <http//www.knust.edu.gh:8080/jspui/…/222/1/Lamin%20Dibba's%Thesis.pdf> [Accessed 19 August 2011]

Dontsop, N., et al., 2011. Impact of improved rice technology on income and poverty among rice farming household in Nigeria. A local average treatment effect (LATE) approach. Available at:<http// www.csae.ox.ac.uk/conference/2011.../247-DontsopNguezet.pdf> [Accessed 18 July 2011]

Edeh, H.O. et al., 2011. Analysis of environmental risk factors affecting rice farming in Ebonyi State south eastern Nigeria. Available at :< http:www.idosi.org/wjds/wjas7 (1)/16.pdf> [Accessed 22 July 2011]

Elemele, F. et al., 2008. Response of upland rice cultivars to weed completion in the Savannas of West Africa. Available at: <http://www.linkinghu.elsevier.com/retrieve/pii/s0201219408001774> [Accessed 11 August 2011]

Emodi, I.A. and Madukwe, M.C., 2009. A review 0f policies, acts, and initiatives in rice innovation system in Nigeria. Available at: <http://www.ajol.info/index.php.jae/article/viewFILE/47052/33436/>. [Accessed 12 August 2011]

Eranstein, O. et al., 2003. The Nigeria rice economy in a competitive world. Available at: http://www.pdf.usaid.gov/pdf_docs/PNADB852.pdf [Accessed 2 August 2011]

Ezedinma, C., 2003. Impact of trade on domestic rice production and the challenge of self-sufficiency in Nigeria. Available at: http://www.warda.org/workshop/RICEPolicy/Chuma.E.Nigeria.Paper.pdf [Accessed 11 August 2011]

FANTA (Food for Nutrition Technical Assurance), 2003. Fulfilling food access objective with multiple intervention. Available at: http://www.fantaproject.org/downloads/pdfs/accessIndicator_Dec03.pdf [Accessed 8 August 2011]

Fashola, O.O. et al., 2007. Water management practices for sustainable rice production in Nigeria. Available at:<http:www.kinki-ecotech.jp/download/kibanS/Ni Ricememo.pdf> [Accessed 20 July 2011]

GAIN (Global Agricultural Information Network), 2011. GON bans rice imports though land borders Available at: http://www.gains.fas.usda.gov/Recent%20GAIN%Publications/Rice%20Trade%20 [Accessed 11 July 2011]

Hardcastle, J.E., 1959. The development of rice production and research in federation of Nigeria tropical agriculture 36: 77-95

Ismaila, U., et al., 2010. Cereals production in Nigeria, problems constraints and opportunities for betterment . Available at: <http://www.academic journals.org/ajar/abstracts/.../Ismaila%20et%20al.htm [Accessed 9 July 2011]

Johnson, D. E., 2009. Weed management in small holder rice production in the tropics. Available at: <http:www.ipmworld.umn.edu/chapters/Johnson.htm> [Accessed 29 August 2011]

Kebbeh, M. et al,.2003. Challenges and opportunities for improving irrigated rice productivity in Nigeria. Available at: <www.usaid.gov.pdf-docs/pnadb849.pdf> [Accessed 25 July 2011]

Kijima, Y. et al., 2006. How revolutionary is the NERICA revolution evidence from Uganda Available at: http://www. onlinelibrary.wiley.com>…> [Accessed 26 July 2011]

Kijima, Y. et al., 2008. Assessing NERICA on income and poverty in central and western Uganda. Available at: <http://www.onlinelibrary.wiley.com>…> [Accessed 26 July 2011]

Labrada, R., 2003. The need for improved weed management. Available at: http://www.fao.org/docrep/006/y4751e/y4751e0l.htm [Accessed 8 August 2011]

Longtau, S.R., 2003. A review and decription of rice production systems in Nigeria. Available at: <http://www.odi.org.uk/resouces/download/3045.pdf> [Accessed 23 July 2011]

Louwaars, M. P. and Marrewijk, G., 1999. Seed supply systems in developing countries. CTA Available at: <http://www.warda.cigar.org/publications/policy/section6.pdf> [Accessed 6 August 2011]

Mohapatra, S., 2009. Drought proof rice for Africa farmers. Available at: <http://www.africarice.org/.../rice_today/SCIENCE_drought_proof_for_africa> [Accessed 16 July 2011]

Nwaobiala, C. U., 2011. Economic analysis of swamp rice production in Ebonyi south agricultural zone. Available at: http://www.ajol.info/index.php/jasr/article/view/67538

[Accessed 14 August 2011]

Nwilene, F.E. et al., 2011. Effect of intercropping maize and cassava with upland rice. Available at: http://www.docsdrive.com/pdfs/academicjournals/je2011/417-418.pdf

[Accessed 29 August 2011]

Odogola, R., 2006. Final survet report on rice production, procesing and marketing in Uganda. Available at: <http://www.mofa.go.jp/gaiko/oda/bunya/agriculture/.../Uganda_report.pdf/> [Accessed 17 July 2011]

Ogundele, O.O. & Okoruwa , V. O., 2006. Technical efficiency differential in rice production technologies in Nigeria. Available at :< http://www.aercafrica.org/documents/RS154.pdf> [Accessed 11 July 2011]

Olembo, N. et al., 2010. The case of rice in sub=Saharan Africa. Available at <http:www.absfafrica.org/downloads/Rice%20BOOK%series.pdf> [Accessed 18 August 2011].

Omofonmwan, S.I., & Kadiri, A.I, 2007. Problems and prospects of rice production in central Edo state Nigeria. Avaialble at: <http//:www.krepublishers.com/…/JHE-22-2-123-07-1524-Samson-I-OTt.pdf> [Accessed 8 August 2011]

Reader, 2011. Farm Economics . Van Hall University of Applied Sciences, unpublished.

Serraj, R., et al., 2011. Drought resistance improvement in rice: An integrated genetic improvement. Available at: <http//:www.jstage.jst.go.jp/article/pps/14/1/14_1/_article> [Accessed 19 August 2011]

Soong, J., 2006. Soil fertility and changes in fertilizer use for intensive rice cultivation. Available at: <http://www.digitalcollections.sit.edu/cgi/viewcontenet.cgi?article=13458content -15p [Accessed 29 August 2011]

Tiamiyu, et al., 2010. Production efficiency among growers of new rice for Africa in the savanna zone of Nigeria. Available at: http://www.agriculturaits.czu.cz_files/vol_43_2_pdf/tiamiyu.pdf [Accessed 22 July 2011]

Tollen, E., 2006. Markets and instituions fro promoting rice food security and poverty reduction in Sub Saharan Africa. Available at : <http:www.biw.kuleuven.be/aee/clo/wp/tollens2006pdf>[Accessed 17 July, 2011]

Treitz,W., & Narain, T.M., 1988. Conservation and management of the environment and natural resources in developing countries. Available at: <http:www.crcnetbase.com/doi/pdf/10.12019781420072785.ch1. [Accessed 27 July 2011]

UNEP (United Nations Environment Programme), 2003. Integrated assessment of the impact of trade liberalisation: A country study of the Nigeria rice sector. Available at: http://www.unep.ch/etb/publications/intAssessment/Nigeria.pdf [Accessed 18 July 2011]

Verulkara, S.B., et al., 2010. Breeding resilient and productive genotypes adopted to drought prove. Available at: http://www.lininghub.elsevier.com/retrieve/pii/S037842901000638 [Accessed 29 August 2011]

WARDA (West Africa Rice Development Authority), 2005. Rice trends in Sub-Saharan Africa. Available at: http://www.warda.cigar.org/publications/Rice%20Trends.pdf [Accessed 6 July 2011]

WARDA (West Africa Rice Development Authority), 2008. New rice for Africa compendium. Available at: <http://www.issuu.com/africariceceter/docs/nerica> [Accessed 11 July 2011]

Wopereis, M.C.S. et al., 2009. Reference 24 major diseases in rice. Available at: http://www.warda.cigar.org/publications/PLAR/technicalmanual/reference24.pdf [Accessed 31 August 2011]

List of Appendices

APPENDIX 1

In interview guide for farmer

Name----------

Sex----------

Name of the village----------

Household size----------

Social aspect

1. Education attainment
2. Farm size
3. How long have you been farming?
4. When did you start the NERICA project
5. Farm size for NERICA cultivation
6. How do you come about NERICA rice
7. Crop(s) cultivated apart from NERICA rice
8. Farming system practice

9. How are qualities NERICA rice has (taste, aroma cooking time, conservation in cooking and swelling capacity)

10. The labour used in farm

Economic aspect

1. Access of inputs used in NERICA rice project

2. The credit facility (formal or informal)

3. The yield from NERICA rice

4. Method of harvesting

5. How do you process your rice

6. Quantity consumed or as gift to family members or neighbour

7. Method use to sell rice (measure/bag)

8. How do you sell your rice

9. If it is market what is the distance to the village

10. The price to sell NERICA rice

11. This project enables your enable your household adequate food

12. The family needs from the project

13. What are the economic activities you carried out apart from NERICA rice cultivation.

Environment

1. Competitiveness of NERICA rice with weeds

2. Resistance of NERICA to pests and diseases

3. The ability of NERICA rice to withstand droughts

4. Challenges of soil fertility on NERICA rice

5. How many times you cultivated NERICA rice in a year