RICE PRODUCTIVITY AND FOOD SECURITY AMONG SMALLHOLDER FARMERS IN KATCHA AND BIDA LOCAL GOVERNMENT AREAS OF NIGER STATE, NIGERIA.

FINAL REPORT BY:

BLESSING VICTORIA ADEGOKE

Supervised by

Dr Olawale Olayide

Centre for Sustainable Development, University of Ibadan

Dr Matthew Ahmed & Dr Fatima Yisa

Value Chain Development Programme

International Fund for Agricultural Development, Nigeria

FEBRUARY, 2020

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

My ultimate and profound gratitude goes to the Almighty God who made this project a huge success.

I would like to express my sincere gratitude to Dr. Olawale Olayide for the continuous support, patience, motivation, and immense knowledge. His guidance helped me in all the time of research. I could not have imagined having a better supervisor and coach for my study.

I would also like to appreciate Prof. Olanrewaju Olaniyan, the Director, Centre for Sustainable Development as well as the entire staff of CESDEV, University of Ibadan, Nigeria.

Special thanks goes to International Fund for Agricultural Developmment for the grant and opportunity afforded me. A big thank you to Dr. Lucia Rodriguez, Global MDP Director, Earth Institute, Columbia University, USA for the coordination of the IFAD-Universities Win-Win Partnership.

My heartfelt appreciation goes to Dr. Matthew Ahmed, the State Project Coordinator IFAD-VCDP Niger State, and Dr. Fatima Yisa, the Monitoring and Evaluation Officer IFAD-VCDP Niger State. Thank you all for the support, patience and for the on-site supervision.

How can I say thank you enough to my darling husband, Engineer Oluwatimilehin Banjo for the love, prayers, support and encouragement, I love and cherish you with all my heart.

To my wonderful and superb siblings, Bright, Betty and Benedicta Adegoke, you mean so much to me, thanks for the encouragement and love. You are the best siblings ever.

Special thanks goes to my parents Elder and Deaconess Olufemi Adegoke for their love, support and continuous encouragement, Mum and Dad your endless prayers made this possible, you are so dear to my heart and I will never trade you for anything.

ACRONYMS

ADB	Africa Development Bank
CESDEV	Centre for Sustainable Development
EU	European Union
FAO	Food and Agricultural Organisation
FGD	Focus Group Discussion
FSN	Food Security Network
GDP	Gross Domestic Product
IFAD	International Fund for Agriculture and Development
IBRD	International Bank for Reconstruction and Development
IFPRI	International Food Policy Research Institute
MDGs	Millennium Development Goals
UI	University of Ibadan, Nigeria
UN	United Nations
USDA	United States Department of Agriculture
VCDP	Value Chain Development Programme
WFP	World Food Programme
WHO	World Health Organization

EXECUTIVE SUMMARY

Food security is important for the survival of mankind and his economic activities including food production. Rice has increasingly become a major staple food for a lot of Nigerians, it has become necessary to meet the demand of Nigeria's current population growth rate, and the means for achieving this aim is to increase rice productivity, wherever possible. Local rice production is increasingly being promoted in the country to reduce the dependence on imports, ensure stable and sustainable low-prices, improve rice self-sufficiency and create employment. In the light of the above, this research was done to investigate rice productivity and food security among smallholder farmers in Katcha and Bida local government areas of Niger State, Nigeria.

The methods adopted for obtaining data for the study were purely primary and secondary, quantitative and qualitative data were collected through the use of android based questionnaire. The quantitative data was analyzed using descriptive and inferential statistics and qualitative data was gathered using focused group discussions and key informant interviews, selection of rice farmers was done by simple random sampling from beneficiaries and non beneficiaries rice farmers in the areas. In all, a total of 193 farmers were administered questionnaire.

The result showed that majority of the rice farmers are male and most of the farmers are between the active and economically viable age. Coping strategy Index of 9.63 was obtained sing a 4 point Likert type rating scale which showed that the farmers are food insecure. The coefficient of household size was positive and significant at 1% level of probability. This implies that increase in the farmers' household size holding other variables constant will make them more food insecure. In essence, age, farm size, years of farming, crop output, sex of household head, land ownership and household size were the significant factors influencing food security of smallholder rice farmers in the study area.

The result showed that the level of productivity of the smallholder farmers in the study area is low. However, adoption of modern irrigation strategies, mechanised agriculture, pest control methods and agricultural seminars and workshops by agricultural extension should be given to the farmers.

Keywords: Smallholder Farmers, Food Security, Productivity

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The major engine for growth in Africa has been Agriculture. However, since majority of the African farmers practice subsistence or smallholders farming characterized by low skilled labour force and family units, there is a high incidence of yield gaps, in addition to poor soils and other obstacles to sustainable farming incomes (Gyimah-Brempong, Johnson & Takeshima, 2016). Harold and Tabo (2015) also noted that rice is the single most important source of dietary energy in West Africa and third most important for Africa as a whole. It is evident from their study that despite the increased in local rice production there is still the persistence of the shortage of local production compared to the excess demand for the commodity (Harold & Tabo, 2015; Gyimah-Brempong, Johnson & Takeshima, 2016).With the fast growing population and the rising food demand, it is important that African continent graduates from the level of food shortage to food surplus. This could be realized by making the challenges confronting the agricultural sector a major priority which must be vigorously and earnestly resolved through strong determination from the political class, exhibiting the right mind set towards agriculture by the private and government bodies and incorporation of youth and women in agriculture. Through this platform the Africa rice framework for Africa's Agricultural Transformation Agenda could be adequately embraced and implemented in various states, agricultural establishments and agencies (Harold & Tabo, 2015).

Despite the economic dependence on agriculture, agriculture in Sub-Saharan Africa has shown a very low productivity level. An indicator that measures agricultural productivity is the agriculture value added per worker, which is the total value of output less the value of intermediate inputs that one worker produces. Although agriculture plays a key role in sub-Saharan Africa's economy, its productivity is very low and an improvement in the sector isneeded. The low agricultural yield in Africa represents the main challenge to guaranteeing food security and economic growth in the region (World Bank, 2008). Food security is the state of having stable access to affordable and nutritious food. As the economy in sub-Saharan African countries is dominated by subsistence agriculture, economic growth would positively impact the value of agricultural production. Raising smallholder farmers' productivity is one of the major challenges for most developing countries. One strategic answer to raising smallholder farmers' productivity as Jerven (2014) observes, has been to

subsidize agricultural inputs and thereby increase agricultural yields. Jerven (2014) notes that governments of poor as well as rich countries have tended to subsidize agricultural inputs such as seeds and fertilizers.

1.2 Problem Statement

Access to and use of improved varieties of agriculture inputs are critical inputs to increase crop yields and improve agriculture productivity (World Bank, 2014). Given Nigeria's discovery of crude oil in commercial quantity, agriculture that was once the prime mover of Nigeria's economy suffered great neglect. The resultant effects include: sharp decline in agricultural production, and increasing reliance on food import to meet the domestic demand. The low productivity of rice farmers is occasioned by the use of low technologically empowered agricultural equipment which do not support large scale production. Fasoyiro and Yaiwo (2012) noted that in Nigeria, rice is mainly produced by small-scale farmers whose production are characterised by low output resulting from production inefficiency, aging farming population, and low technological know-how. Uduma, Samson and Mure (2016) also observed the inability of local supply to meet up with rice demand has given rise to the high importation of rice in Nigeria. There has been a phenomenal rise in imports of three hundred thousand tons annually in recent times which on the average with an estimated cost of three hundred million naira annually in foreign reserves. They further observed the huge cost to the Nigerian economy, rice imports exposes the country to international market shocks with its associated risk implications on food security. Ogunsumi, Ajayi, Amire and Williams (2013) also made an assertion on the gap between local demand and supply of rice in Nigeria. The author explained the level of rice consumption in Nigeria increases with about 10 percent per annum as a result of changing consumer preferences amidst other factors.

1.3 Research Questions

The research questions are:

1. What are the socio economic characteristics of the rice farmers in the study area?
2. What is the level of productivity of smallholder rice farmers in the study area?
3. What is the level of food security of smallholder rice farmers in the study area?
4. What are the factors influencing productivity and food security of smallholder rice farmers in the study area?

1.4 Research Objectives

1.4.1 General objectives

The general objective of this study was to investigate the rice productivity and food security of Value Chain Development Practice rice production beneficiaries in Katcha and Bida Local governments of Niger state, Nigeria.

1.4.2 The specific objectives of the study were:

1. to describe the socio-economic characteristics of smallholder rice farmers in the study area;
2. to assess the level of productivity of smallholder rice farmers in the study area;
3. to assess the level of food security of smallholder rice farmers in the study area;
4. to assess the factors influencing productivity of smallholder rice farmers in the study area.
5. to assess the factors influencing food security of smallholder rice farmers in the study area.

1.5 Research Hypotheses

Based on the objectives of the study, the following hypotheses are stated in the null form:

1. there is no significant difference between rice productivity of the smallholder farmers before and after the intervention of VCDP.
2. there is no significant difference between the food security of smallholder farmers before and after the intervention of VCDP.
3.

1.6 Significance of the Study

In the world today, rice is one of the most important annual crops. This crop can be cultivated subsistently and commercially. It can be planted and cultivated by the poor and also the rich, in a small scale of farmland or in a large scale of farmland. Millions of vulnerable people around the world are facing starvation due to food shortages and increased food prices. Overall, the poorest people in developing countries who rely on marginal lands to grow crops and rear animals and who spend most of their income on basic food commodities are the most affected by food insecurity. Like many developing countries, Nigeria faces fundamental challenges with regard to food security. This research is important because it focuses on smallholder farmers. This group of farmers has been described as the most disadvantaged and

vulnerable with high levels of poverty. This research will address the challenge of food security and rice productivity in Katcha and Bida Local governments areas of Niger State, Nigeria. Of the developing world's 5.5 billion people, 3 billion live in rural areas, nearly half of humanity. Of these rural inhabitants, an estimated 2.5 billion are in households involved in agriculture, and 1.5 billion are in smallholder households (World Bank, 2007b, p. 3).

Thus, this research seeks new insights into the role of smallholder agriculture in terms of rice productivity and food security in Katcha and Bida local governments areas of Niger State, Nigeria. By determining the effect of IFAD –VCDP on the productivity and food security of farmers, this research provides guidance to the IFAD-VCDP stakeholders. As such, it helps administrators make more informed decisions on how to promote IFAD-VCDP within the study area and beyond.

CHAPTER TWO

LITERATURE REVIEW

2.1 Review of Theory

2.1.1 Agricultural Productivity

Agricultural productivity has been defined by several scholars with reference to their own views and disciplines. Agriculturalists, agronomists, economists and geographers have interpreted it in different ways. Agricultural productivity is defined in agricultural geography as well as in economics as "output per unit of input " or "output per unit of land area", and the improvement in agricultural productivity is generally considered to be the results of a more efficient use of the factors of production, viz. physical, socioeconomic, institutional and technological. Singh and Dhillion (2000) suggested that the "*yield per unit*" should be considered to indicate agricultural productivity. Productivity improvement creates the wealth that can be used to meet present needs and for investments to better meet the needs of the future. Productivity in its broad sense is a measure of how efficient and effective resources are used as inputs to produce products and services needed by the society in the long run. It is the rate of flow of output when compared with rates of flow of resources used in producing the output of goods and services. In financial terms, productivity is the value of output divided by the cost of inputs used in a given period.

For many years, productivity has been a key issue for agricultural development strategies because of its impact on economic and social development. It is generally believed that the surest means through which mankind can raise itself out of poverty to a condition of relative material affluence is by increasing productivity. Agricultural productivity is frequently associated with the attitude towards work, thrift, industriousness and aspirations for a high standard of living (Singh and Dhillion, 2000). The basic resource inputs consist of labour, capital and natural resources. Since resource inputs seldom grow much faster than population, obviously the main source of increase of output per capita is through the growth in productivity. Food available from domestic production is key when the economy is developing. Domestic agriculture is still the main provider of food in many developing countries, and is the main sector of employment, and is therefore a crucial source of income in most rural areas (FAO, IFAD and WFP, 2014). According to Thirtle et. al (2003) there exists a close relationship between agricultural productivity and poverty. Agriculture has been playing significant role in the development of nations for centuries. The World

Development Report 2008 states that agriculture can "produce faster growth, reduce poverty and sustain the environment" if it is made to work in concert with other sectors of the economy (World Bank, 2007:2). In fact, the report stipulates three ways through which agriculture contributes to development: 1) as an economic activity, 2) as a livelihood and 3) as a provider of environmental services (World Bank, 2007). In countries such as China, Egypt, Bangladesh and Malawi, smallholder farms with less than two hectares of farm land account for 95% of the total. Therefore, "the potential of agriculture to contribute to growth and poverty reduction depends on the productivity of small farms" (World Bank, 2007:90)

1.1.2 Food Security

The concept of food security covers not only the amount of food required to guarantee the absence of hunger, but also the right choice of nutritional intake to avoid malnutrition and health issues (Barrett, 2002). FAO (2009) defined food security as when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their daily needs and food preferences for an active and healthy life. Food access is determined in part by availability, while utiliasation is determined in part by availability Food access can be negatively influenced by physical insecurity such as conflict, loss of coping options, such as border closure preventing seasonal job migration, or the collapse of safety net institutions that protected people with low incomes.

Food security is used to describe a country's self-sufficiency, meaning that a country could produce the amount of food needed after the populations demand (Pinstrup-Andersen 2008). In order to avoid the most severe impacts of shocks and maintain adequate food access during the period of scarcity, households and communities employ coping strategies. Poorer people with fewer resources tend to have less capacity for coping with external stresses and hazards and most times adopt harmful coping practices, such as selling their only money-earning assets, withdrawing children from school, and undertaking income-generating activities that damage the environment. (WFR, 2017).

1.1.3 Rice Production in Nigeria

Rice (*Oryza sativa*) a cereal belonging to the Gramineae, a large monocotyledonous family of some 600 genera and around 10,000 species, is valued as the most important staple food for over half of the world population and ranks third after wheat and maize in production on world basis. More than half of the world's population depends on rice as the major source of calories. Two species have emerged as the most popular cultivated rice, *Oryza sativa* and

Oryza glaberrima; Oryza sativa is produced more widely of the two species. Ebuehi et al. (2007) discovered that most Nigerians prefer to consume imported rice brands as compared to local rice varieties. The reason is that most Nigerian rice processors lack adequate technology of rice processing to meet international standard.

Rice is one of the most consumed staples in Nigeria, with consumption per capita of 32kg. In the past decade, consumption has increased 4.7%, almost four times the global consumption growth, and reached 6.4 million tonnes in 2017 accounting for 20% of Africa's consumption. As at 2011, rice accounted for 10% of household food spending, and 6.6% of total household spending. Given the importance of rice as a staple food in Nigeria, boosting its production has been accorded high priority by the government in the past 7 years.

Significant progress has been recorded; rice production in Nigeria reached a peak of 3.7 million tonnes in 2017. Despite this, Nigeria's rice statistics suggest there is an enormous potential to raise productivity and increase production. Yields have remained at 2 tonne per hectare, which is about half of the average achieved in Asia. In addition, as population increases, along with rural to urban migration, ensuring food security in key staples becomes critical. However, food security cannot be achieved by a system that depends almost entirely on human muscle power and other manual methods. Nigeria's mechanisation has remained low at 0.3 hp/ha, relative to 2.6hp/ha in India and 8 hp/ha in China. The number of agricultural tractors is estimated around 22,000, relative to 1 million and 2.5 million in China and India respectively. Low income, limited access to affordable financing and the lack of technical skills have limited the adoption of mechanisation across the rice value chain. Given the rise in food consumption (rice inclusive), some have argued that the production of rice in large quantities (that is, large-scale) should be considered as one of the major ways of ensuring food security for the teaming population in Nigeria (Herrmann, Jumbe, Bruentrup and Osabuohien, 2017; Osabohien, Osabuohien & Urhie, 2017). Others hold contrary view, stressing the need to empower small-holder farmers. Against that backdrop, Juliano (2016) stated the importance of rice over other crops, in terms of its total production in the developing countries and the numberof consumers that are dependent on it as a staple food. This has also been stressed by Gyimah - Brempong, Johnson and Takeshima (2016).

Adewumi, Olayanju and Adewuyi (2007) observed that rice production and processing are profitable ventures in Nigeria and what is required is to encourage investment in rice processing activities. Aside the nutritional value of rice and high inclination of people

towards its consumption, the by-product of rice could serve as a source of energy generation for domestic purposes. This could serve as a source of biofuel for cooking especially in rural settings where most of the rural dwellers could not readily afford the cost of kerosene or gas for cooking and heating purposes. Yan, Ngadi and Kok (2016) in their study stressed that rice generates large amount of by-products that could be used to produce energy and reduce the amount of firewood required to meet the daily cooking needs. This is crucial in Nigeria where rural dwellers use local means of cooking such as firewood and charcoal. The connotation of the above is that modern processing of rice at the milling centres could help in preserving the rice hub which serves as firewood to the locality thereby reducing the cost of buying kerosene for cooking.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Study Area.

The study was conducted in Niger State, Nigeria. Niger State, is bounded to the south by the Niger River. It is also bounded by the States of Kebbi and Zamfara to the north, Kaduna to the north and northeast, Kogi to the southeast, and Kwara to the south. The Federal Capital Territory, Abuja is on Niger state's eastern border, and the Republic of Benin is its western border. The landscape consists mostly of wooded savannas and includes the floodplains of the Kaduna River.

Niger State is populated mainly by the Nupe people in the south, the Gwari in the east, the Busa in the west, and Kamberi (Kambari), Hausa, Fulani, Kamuku, and Dakarki (Dakarawa) in the north. Islam is the predominant religion. Most of the inhabitants are engaged in farming. Cotton, shea nuts, yams, and peanuts (groundnuts) are cultivated both for export and for domestic consumption. Sorghum, millet, cowpeas, corn (maize), tobacco, palm oil and kernels, kola nuts, sugarcane, and fish are also important in local trade. Paddy rice is widely grown as a cash crop in the floodplains of the Niger and Kaduna rivers, especially in the area around Bida. Cattle, goats, sheep, chickens, and guinea fowl are raised for meat. Pigs are raised around Minna for sale to southern Nigeria.

Minna and Bida are the state's chief towns and also the main education centres, with teacher-training colleges, a polytechnic institute in Bida, and a federal university of technology in Minna. Near Bida there is a rice research institute and an agricultural research station. The main highway system runs north of the railway and serves the market towns of Mokwa, Kontagora, Tegina, Kagara, and Kusheriki. The State's other large towns are served by networks of local roads. Area 29,484 square miles (76,363 square km) Pop. (2006) 3,950,249.

Figure 1 showing the IFAD Value Chain Developement Programme Areas.

3.2 Nature and Sources of Data

The data collected for the study covered both primary and secondary data sources and are both quantitative and qualitative. The secondary data was obtained from IFAD-VCDP progress reports, journals, newsletters, baseline survey, published research works and books. Primary data was obtained through Focus Group Discussion, In Depth Interviews, questionnaire and observations.

3.3 Sampling Procedure and Data Collection

Qualitative and quantitative data were used for this study through Key Informant Interviews and Questionnaires, through the use of open data kit (ODK) with the aid of android phones. The population of the study were smallholder farmers in Katcha and Bida local government areas of Niger State. Selection of rice farmers was done by simple random sampling from beneficiaries and non beneficiaries rice farmers in the areas. In all, a total of 193 farmers

were administered questionnaire. A pretest study was done to enhance the data collection process.

3.4 Description of Analytical Techniques

Objective 1: descriptive statistical tools were used to analyze the socio economic characteristics and using descriptive statistics.

Objective 2: Crop Factor Productivity Formulae

To assess the level of productivity of smallholder rice farmers in the study area, the factor productivity formulae were used. The factor productivity index formulae used were adopted from Mohammad (2017) and modified as thus:

Farm size productivity $= \frac{Total\ crop\ output\ (kg)}{Total\ farm\ size\ cultivated\ (ha)}$ = kg/ha

Seed productivity $= \frac{Total\ crop\ output\ (kg)}{Quantity\ of\ seed\ planted\ (kg)}$ = kg/kg

Fertilizer productivity = $\frac{Total\ crop\ output\ (kg)}{Cost\ of\ fertilizerused\ (₦)}$ = kg/Naira

Agrochemical productivity $= \frac{Total\ crop\ output\ (kg)}{Quantity\ of\ agrochemical\ used\ (litre)}$ = kg/litre

Objective 3: Classification of food security status of farmers

To assess the level of food security of smallholder rice farmers in the study area, coping strategy index (CSI) was computed for the farmers. This is a tool that measure what people do when they cannot access enough food, a series of question where asked on how often (on 7 days a week basis) the respondents adopt a coping strategy and the severity (using a 3-point Likert type rating scale) of the food insecurity situation leading to the strategy. Following Mayanja *et al.* (2015), the CSI of the farmers was classified thus:

CSI from 0 to 5 = food secure;

CSI from 6 to 20 = mildly food insecure;

CSI from 21 to 42 = moderately food insecure;

CSI above 42 = extremely food insecure.

Objective 4: Factors Influencing Rice Productivity

To assess the factors influencing productivity of smallholder rice farmers in the study area, the traditional production function was used. The crop production model is stated thus;

Linear: $Y = c + B_1Q_1 + B_2Q_2 + B_3Q_3 + B_4Q_4 + B_5Q_5 + B_6Q_6 + B_7Q_7 + B_8Q_8 + e$

Double-log: $\ln Y = c + B_1\ln Q_1 + B_2\ln Q_2 + B_3\ln Q_3 + B_4\ln Q_4 + B_5\ln Q_5 + \ldots + B_8\ln Q_8 + e$

Exponential: $\ln Y = c + B_1Q_1 + B_2Q_2 + B_3Q_3 + B_4Q_4 + B_5Q_5 + B_6Q_6 + B_7Q_7 + B_8Q_8 + e$

Semi-log: $Y = c + B_1\ln Q_1 + B_2\ln Q_2 + B_3\ln Q_3 + B_4\ln Q_4 + B_5\ln Q_5 + \ldots + B_8\ln Q_8 + e$

Where:

Y = quantity of rice produced by household per hectare

Q_1 = Farm size in hectare

Q_2 = Quantity of rice seed

Q_3 = Cost of fertilizer used (₦)

Q_4 = Quantity of agrochemical

Q_5 = Age in years

Q_6 = Household size in number of persons

Q_7 = Years in farming

Q_8 = Number of extension contacts

C = Constant

$B_1 – B_8$ = Coefficients of regression model

e = error term

ln = Natural log

Objective 5: Factors influencing Food Security

Food security linear regression model was used to assess the factors influencing food security of smallholder rice farmers in the study area. a. The model is specified below;

$Y = c + B_1Q_1 + B_2Q_2 + B_3Q_3 + B_4Q_4 + B_5Q_5 + B_6Q_6 + B_7Q_7 + B_8Q_8 + B_9Q_9 + B_{10}Q_{10} + e$

Where: Y = value of rice produced by household;

Q_1 = Age (years)

Q_2 = Sex of household head (male =1, female = 0)

Q_3 = Marital status (married = 1, otherwise = 0)

Q_4 = Household size (number)

Q_5 = Farm size in hectare

Q_6 = Years in farming

Q_7 = Primary source of income (farming =1, otherwise = 0)

Q_8 = Land ownership (owned =1, otherwise = 0)

Q_9 = Number of extension contact

Q_{10} = Crop output (kg)

C = constant

$B_1 – B_{10}$ = coefficients of the regression model

e = error term

3.5 Analytical Methods/Technique

The information collected was coded in excel sheet (MS Excel spreadsheet) and analyzed using Statistical Package for Social Sciences (SPSS). The data collected was cleaned and merged in data sheet. Both qualitative and quantitative data were generated for the study and presented through combination of cross tabulation, graphical and pictorial representations. Descriptive (frequencies, percentage, ratio, means, standard deviation) and regression analysis were used to ascertain the distribution of variables in the study to determine the general effectiveness of the VCDP training programmes in the study areas.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Socio-Economic Characteristics of Rice Producers in the Study Areas

Descriptive statistics have been widely used to identify the demographic characteristics of the farmers. The use of descriptive statistics enables one to describe and compare different characteristics of the sampled arable crop farmers; it also gives a comprehensible picture of the characteristics of rice producers. The tools used for this study include mean, standard error, percentage, and the frequency distribution. The socio economic characteristics considered are age, sex, marital status, level of education, household size, farm size, farming experience, primary occupation, secondary occupation, method of acquiring land, farming season, access to extension services, membership. These variables were considered because of their relationship with productivity and food security.

The results in Table 1 show that majority (95%) of rice producers in the study area were male. This indicates that women's involvement in farming in the study area was very low. Farming activities are best handled by men because of the tedious nature of farm operations, cultural and religious background of most farming communities. This result agrees with Adewunmi (2008) who reported male dominance in food crop production. Most of the respondents were between 31- 40 years. This finding implies that farmers were still within the active and economically viable age, which could increase the chance of active involvement in agricultural production and likely to adopt agricultural innovations more than those in higher age brackets. Older farmers view farming as just a way of life, inherited from their forefathers whereas young farmers may be more inclined to look at farming as a business opportunity in order to financially support their families (FAO, 2012).

Table4.1 Socio economic characteristics of rice producer in the study area

Variable	Frequency	Percentage
Gender		
Female	9	4.66
Male	184	95.34
Age		
>21	3	1.55
21-30	52	26.94
31-40	70	36.27
41-50	42	21.76
< 50	26	13.47
Mean	37.98±	
Standard deviation	10.57	
Marital status		
Married	188	97.41
Single	5	2.59
Educational Level		
Primary	3	43.01
Secondary	68	35.23
Tertiary education	37	19.17
Adult literacy	2	1.04
No formal education	83	1.55
Primary source of income		
Civil _servant	13	6.74
Farming	180	93.26
Secondary source of income		
Business	128	66.32
Transportation	23	11.92
No source of income	34	17.62
Other	8	4.15
Land ownership		
Borrowed	1	0.52
Inherited	101	52.33
Lease	20	10.36
Self-owned	71	36.79
Household size		
1 to 5	70	36.27
6 to 10	76	39.38
11 to 15	40	20.73
>15	7	3.63
Mean	7.81±	
Standard deviation	4.31	
Farm size		
0.1 - 2.0	169	87.56
2.1 - 4.0	21	10.88
>4.0	3	1.55
Mean	1.56±	
Standard deviation	1.37	
Farming experience		
1 – 10	72	37.31
11- 20	70	36.27
21 – 30	31	16.06
Mean	16.96±	
Standard deviation	10.26	

Source: Field survey, 2019

The study further reveals that majority (97%) of rice producers were married and few (3%) were single (unmarried). These shows that there was high percentage of married farmers in the study area, as a result could lead to increased availability of cheap family labour source as opposed to their unmarried counterparts who may depend solely on hired labour. The results of this study corroborated the findings of Okwu and Acheneje (2011) who found that majority of the respondent (74.5%) were married. Availability of family labour may increase crop productivity and food security of the rice producers in the study area .

The result further shows that majority had one form of formal education or the other while only few (2%) had no formal education. This shows that the literacy level of the respondents was high. Formal education of respondents may encourage the respondent to accept agricultural innovations, which in turn could increase crop production and food security. These finding is similar to the findings of Tsoho (2005) and Yisa (2013) who reported that, education enables the farmers cope with complexities associated with technology adoption.

Table 1 also shows the primary income of the rice producers, majority (93%) are into farming while just very few (7%) the table further shows that rice producer's secondary income is business (66%) and very few (12%) are into transportation and (17%) do nothing at all outside farming activities.

The study also shows the distribution of land acquisition of the respondents in the study area, as most (52%) of the respondents acquired their land through inheritance, and few (37%) are self-owned. Results in Table 1 reveal that majority (77%) of the respondents had household size of 1 to 10 persons in the study area. The result shows that the respondents had a large household size. In a farming community, large household at times leads to high family labour supply. This finding is in line with Wondimagmegn *et al.* (2011) who reported that larger household size allows labour supply during period of peak labour period in rice cultivation, increasing the farmer's productivity and food security.

Most farmers in the study area had farm size (88%) between 0.01 -2.00 hectares, this is an indication that the farmers were small farm holders. This finding is in line with Awoyemi (2009) who reported that most rural farmers in Nigeria cultivate on small scale basis. This implies that if the small scale farmers combined resources well, they can be technically efficient because they are able to manage their farms well, leading to increase in productivity, this in turn leads to food security.

About 74% of the respondents had between 1 to 20 years experience while 16% had experience between 21 and 30 years respectively. This indicates that rice producers were experienced in the rice production activities in the study area. The implication is that the experiences gathered over the year enables a farmer to be able to cope with inherent risk and uncertainty characterizing agricultural production. This experience is likely to be translated to increase in output and food security of the farmers in the study area. This is similar to Yisa (2013) who reported that experienced farmers are more efficient in crop production than inexperience farmers.

4.2 Level of productivity of smallholder rice farmers in the study areas

The result of the analysis of rice productivity in the State is presented in Table 2. The result revealed that the total farm size cultivated in the area was 3982.86kg/ha. This is an indication that the rice producers in the study area are small scale farmers which is in line with Awoyemi (2009) who reported that most rural farmers in Nigeria cultivate on small scale basis. The total seed usage was 179.79kg/kg, the farmers applied 570.89kg/Naira of fertilizer and 1.61kg/litres of agrochemicals respectively,

The results show that the productivity of smallholder rice farmers in the study areas is relatively low, productivity per kg of fertilizer applied was 41.60kg/Naira with the minimum and maximum productivity been 23.11kg/Naira and 61.30kg/Naira respectively and the productivity of agrochemicals per litre utilized was 570.89kg/litre.

The minimum and maximum farm size productivity recorded were 1750kg/ha and 6500kg/ha respectively. More so, seed productivity of the farmers per 1kg planted was estimated to be 179.79kg while the minimum and maximum productivity recorded were 83kg and 325kg respectively. This result shows that if the smallholder farmers combine their resources well, they can be technically efficient because they are able to manage their farms well, leading to increase in productivity, this in turn leads to food security.

Table 2 Productivity of smallholder rice farmers in Niger State

Variables	Productivity value		
	Average value	Minimum value	Maximum value
Farm size (kg/ha)	3982.86	1750.00	6500.00
Seed (kg/kg)	179.79	83.00	325.00
Fertilizer (kg/Naira)	41.60	23.11	61.30
Agrochemicals (kg/litre)	570.89	109.38	1366.67

Table 3 Summary of the level of rice farmers in the study areas

Variable	Mean	Standard Deviation	Minimum	Maximum
Farm size (kg/ha)	3982.86	1290.54	1750.00	6500.00
Seed (kg/kg)	179.79	62.30	83.00	325.00
Agrochemicals (kg/Naira)	570.89	0.25	1.13	3.61
Agrochemicals (kg/litre)	1.61	285.36	109.38	1366.67

4.3 The level of food security of smallholder rice farmers in the study area

The distribution of respondents according to the level of food security is shown in Table 3 Following Mayanja *et al.* (2015), the coping strategy index (CSI) was computed for the farmers and was used to classify them into different food security categories. The result shows that only 39.38% of the farmers were food secured. This implies that majority of the rice farmers representing 60.62% are still food insecure in the study area. The result categorically revealed that most of the rice farmers representing 49.74% were mildly food insecure, 9.33% were moderately food insecure while only 1.55% was extremely food insecure. The implication of this finding is that the level of food insecurity among the farmers is not very severe. This lends credence to the result presented in Table 4 which shows that average CSI of the smallholder rice farmers in the study area. The average CSI of 9.63 obtained implies that the farmers were only mildly food insecure in the area. However, the farmers need more support/enhancement from donor agencies such as IFAD-VCDP to attain food security.

Table 4 Level of food security of smallholder rice farmers in the study area

Food security status	Frequency	Percentage
Food secure	76	39.38
Extremely food insecure	3	1.55
Mildly food insecure	96	49.74
Moderately food insecure	18	9.33

In ascertaining the coping strategy adopted by farmers in the study area, a 4-point Likert type rating scale on the different strategies was employed. The result revealed a grand mean score of 9.63 indicating a high coping strategy.

Table 5 Coping strategy index of smallholder rice farmers in the study areas

Variable	Mean	Standard Deviation	Minimum	Maximum
Coping strategy index	9.63	8.83	0.00	40.00

Variable	Mean	Standard Deviation	Minimum	Maximum
0 – 10	4.10	3.41	0	10
11-20	14.5	2.55	11	20
21-30	24.06	2.41	21	28
31-40	36.00	4.06	31	40

4.4 Factors Influencing Productivity of Smallholder Rice Farmers in the Study Area

The ordinary least squares linear regression estimates of the factors influencing productivity of smallholder rice farmers in the study area is presented in Table 5 The double-log functional form was chosen as the lead equation based on the F-value, R-squared value and the number of significant variables. The result revealed that the F-value of 53.71 was statistically significant at 1% level of probability. This implies that the whole model was significant, that is, there was a significant relationship between the dependent variable and the independent variables included in the model. It also shows that the coefficient of multiple determination (R-squared) was 0.7076. This implies that 70.76% variation in the productivity of the farmers was explained by the explanatory variables included in the model, while the remaining 29.24% not explained is as a result of variables not included in the model as well as factors beyond the farmers' control. Since the double-log production function was the chosen equation, the estimated coefficients are the direct elasticities of the variables. The estimated positive elasticities of farm size, seed, cost of fertilizer, household size, and years of farming were 0.691, 0.086,0.063, 0.128 and 0.190 and each was at 1% level of probability. This implies that for 1% increase in the use of each of these variables, holding other variables constant, will lead to increase in the productivity of the farmers by 69.1%, 8.6%, 6.3%, 12.8%and 19.0% for farm size, seed, cost of fertilizer, household size, and years of farming respectively. Conversely, the elasticity of agrochemical was -0.128 and significant at 1% level of probability indicating that 1% increase in the use of agrochemical holding other variables constant will lead to decrease in the productivity of the rice farmers by 12.8%. This might be that the rice farmers are over using agrochemical in the area. Summarily, farm size, seed, cost of fertilizer, agrochemical, household size, and years of farming were the significant factors influencing the productivity of the smallholder rice farmers in the study area.

Table 4.4 OLS regression estimates of factors influencing the productivity of smallholder rice farmers in the study area

Variables	Linear function		Double-log function		Exponential function		Semi-log function	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Farm size (ha)	2004.915	10.75***	0.691	9.45***	0.362	8.54***	3816.658	10.95***
Seed (kg)	23.369	4.98***	0.086	3.62***	0.003	2.67***	737.761	2.90***
Cost of fertilizer (₦)	0.100	1.43	0.063	1.80*	2.33E-05	1.48	227.947	0.61
Agrochemicals (litre)	-50.392	-4.02***	-0.128	-3.03***	-0.008	-2.82***	-784.015	-3.89***
Age (years)	6.747	0.57	0.051	0.49	-3.56E-04	-0.13	651.166	1.32
Household size (no)	79.096	3.48***	0.128	3.56***	0.020	3.84***	449.503	2.63***
Years in farming	46.913	3.42***	0.190	3.59***	0.009	2.89***	927.874	3.67***
Extension Contact (no)	43.245	0.98	0.009	0.23	-0.011	-1.09	71.025	0.38
Constant	2883.553	4.38***	8.950	10.76***	8.195	54.81***	4696.797	1.18
R-Squared	0.6831		0.7076		0.5340		0.6074	
F-value	49.58***		53.71***		26.36***		35.59***	

*** = significant at 1% probability level; * = significant at 10% probability level

4.5 Factors Influencing Food Security of Smallholder Rice Farmers in the Study Area

The result of the ordinary least squares linear regression estimates of the factors influencing food security of smallholder rice farmers in the study area is presented in Table 6. The result revealed that all the estimated F-value of 16.27 was statistically significant at 1% level of probability. This implies that there is a significant relationship between the dependent variables and the independent variables included in the model. The result also shows that the coefficient of multiple determination (R-squared) was 0.4721. This implies that 47.21% variation in the farmers' food security coping strategy index was explained by the explanatory variables included in the model, while the remaining 52.79% not explained was as a result of variables not included in the model as well as factors beyond the farmers' control. The estimated coefficients of age, farm size, years of farming and crop output were negative and significant at 5%, 10%, 10% and 10% level of significance respectively. The implication is that a unit increase in these variables holding others constant will lead to decrease in food insecurity of the farmers. Similarly, the coefficients of sex of household head and land ownership were negative and significant at 1% and 5% respectively. This implies that male headed households and those who own land are likely to be less food insecure than their female headed household counterparts and those who do not own land, this is in line with Ashagidigbi et. al (2013) which revealed that the impact of family size is such that it reduces the per-capita food expenditure of the family thereby aggravating food insecurity in the household. Conversely, the coefficient of household size was positive and significant at 1% level of probability. This implies that increase in the farmers' household size holding other variables constant will make them more food insecure. In essence, age, farm size, years of farming, crop output, sex of household head, land ownership and household size were the significant factors influencing food security of smallholder rice farmers in the study area.

Table 6 OLS regression estimates of factors influencing food security of smallholder rice farmers in the study area

Variables	Coefficients	t-values
Age (years)	-0.1446	-2.14**
Sex of household head (male=1, female=0)	-10.9711	-6.23***
Marital status (married=1, otherwise=0)	-4.1573	-1.28
Household size (no)	0.7643	5.94***
Farm size (ha)	-0.6511	-1.73*
Years in farming	-0.0515	-1.84*
Primary source of income (farming =1, otherwise = 0)	-0.6581	-0.34
Land ownership (owned =1, otherwise = 0)	-3.5328	-2.17**
Number of extension contact	-0.3023	-1.08
Crop output (kg)	-0.0002	-1.77*
Constant	19.5142	4.32***
R-Squared	0.4721	
F-value	16.27***	

*** = significant at 1% probability level;
** = significant at 5% probability level;
* = significant at 10% probability level

CHAPTER FIVE

CONCLUSION AND RECCOMENDATIONS

5.1 Summary of major findings

This study assessed rice productivity and food security among smallholder farmers in Katcha and Bida local government areas of Niger State, Nigeria. A total of 193 questionnaires were administered. Majority of the respondents fall between 31years and 40 years age bracket and about 95% of the respondents are males.

The findings further revealed that majority of the respondents were married and had one form of formal education which showed that the literacy level of the respondent was high. 12% of the respondents are into transportation as a primary income while 66% of the respondents are into business as their secondary business. Majority of the rice farmers acquired their land through inheritance and about 77% of the respondents had a large household size. The result also showed that rice farmers were experienced in the rice production activities in the study area.

The coping strategy index was computed for the farmers and was used to classify them into different food security categories and the results showed that majority of the farmers are still food insecure. The estimate positive elasticities of farm size, seed, cost of fertilizer, household size, and years of farming using the ordinary least squares linear regression were 0.691, 0.086, 0.063, 0.128 and 0.190 and each was significant at 1% level of probability. The elasticity of agrochemical was -0.128 and significant at 1% level of probability indicating that 1% increase in the use of agrochemical holding other variables constant will lead to decrease in the productivity of the rice farmers by 12.8%.

The result of the ordinary least squares linear regression estimates of the factors influencing food security of smallholder rice farmers showed F-value of 16.27 was statistically significant at 1% level of probability and the coefficient of multiple determination (R-squared) was 0.4721. The research further showed that estimated coefficients of age, farm size, years of farming and crop output were negative and significant at 5%, 10%, 10% and 10% level of significance respectively, while the coefficients of sex of household head and land ownership were negative and significant at 1% and 5% respectively. The coefficient of household size was positive and

significant at 1% level of probability and this reveals that increase in the farmers' household size holding other variables constant will make them more food insecure. In summary, age, farm size, years of farming, crop output, sex of household head, land ownership and household size were the significant factors influencing food security of smallholder rice farmers in the study area.

5.2 Conclusion

Food security is a major concern in global agriculture that needs a significant increase in order to be able to feed the expected growing world population. The level of productivity of the smallholder farmers in the study area is low and improvement in agricultural research and technology transfer, extension and infrastructural development, policy reform, political stability, human capital development and sustainable natural resources management are strategies to enhance agricultural productivity of the rice farmers in the study areas.

An increase in agricultural productivity growth in the study areas can be achieved through improvement in the availability of food, accessibility and utilization which will contribute to overall economic growth of rice farmers in Katcha and Bida local government areas.

5.3 Recommendations

Government agricultural policies on rice production should focus more on methods of replacing the traditional method of rice processing with modern equipment to enhance the productivity of rice farmers. Processing centres in the local government areas should be considered as this will boost rice production and making it more affordable to majority of the citizens.

The provision of modern threshing machine at the farmers' disposal will boost rice production and processing and also reduce time involved in the production process. The availability of modern processing machines to the farmers will speed up rice production process and other losses arising from grain breakages could be controlled when the threshing duration is reduced and this further improves the quality and competitive nature of the rice in the international market.

To enhance the production of rice, training aimed at cropping system, fertilizer application, sensitization on engagement of youth in rice production, additional support for development of efficient rice seed varieties and right usage of family workforce on the farm by small scale

farmers should be frequently organized in the study area. It is also essential that the distribution of rice varieties that are resilient to climate changes be encouraged.

Agricultural extension agents should also encourage farmers to participate more in trainings that will help build their capacities and increase their productivity, constant practice of the skills acquired during the trainings should be done consistently and monitored by extension agents.

Rice producers organization should be strengthened with a view to building their capacities through training on value addition, consumers' preference, packaging and other useful skills that enhance their efficiency of operation. Donor organizations, financial institutions and governments should provide loan and credit facilities to these rice farmers.

REFERENCES

Adato, MAB(2009), Social Protection to Support Vulnerable Children and Families:the potential of Cash transfers to Protect,Health and Nutrition', AIDS Care report 21 (S1):60-75.

Adewumi J.K, Olayanju M.A & Adewuyi S.A (2007). Support for Small Rice Threshers in Nigeria. ProCom Monograph Series, No. 23, 1-60, London: DFID

B. Srilakshmi, Food Science, New Age International Publisher, 3rd edition, 2003.

Bdliya, P. M., (2013) increasing agricultural Productivity through Biotechnology Application: + The Agronomist perspective. Open Forum on Agricultural Biotechnology (OFAM) AFRICA: OFAB Edition, April, 213, pp. 12-22.

Byerlee, D., X. Diao, and C. Jackson. 2009. Agriculture, Rural Development, and Pro-Poor Growth: Country Experiences in the Post-Reform *Era*. Agriculture and Rural Development Discussion Paper 21. Washington, DC: World Bank.

Chirwa, E. W.; Zakeyo, C. 2003. Impact of Economic and Trade Policy Reforms on Food Security in Malawi. Report submitted to the Food and Agriculture Organization of the United Nations (FAO) and the African Economic Research Consortium (AERC).

Chirwa, E. W. (2007). Sources of Technical Efficiency among Smallholder Maize Farmers in

Southern Malawi. The African Economic Research Consortium. ISBN: 9966-778-17-9

Chirwa, E. W., Kumwenda, I., Jumbe, C., Chilonda, P., & Minde, I. (2008). Agricultural growth and poverty reduction in Malawi: Past performance and recent trends. ReSAKSS-SA Working Paper, 8.

Dercon, Stefan and Luc J. Christiaensen. (2005). ―The Impact on Poverty of Policies to Stimulate Modern Input Adoption: The Case of Fertilizer in Ethiopia.‖ Mimeo, The World Bank, Washington D.C.

(PDF) Agriculture and Development: A Brief Review of the Literature. Available from: https://www.researchgate.net/publication/228273038_Agriculture_and_Development_A_Brief_Review_of_the_Literature [accessed Dec 03 2018].

Denning, G., Kabambe, P., Sanchez, P., Malik, A., Flor, R., Harawa, R., & ... Sachs, J. (2009).

Input Subsidies to Improve Smallholder Maize Productivity in Malawi: Toward an African Green Revolution. Plos Biology, 7(1), e23. doi:10.1371/journal.pbio.1000023.

Economic commission for Africa (ECA) (2005), ECA Annual Report at the thirty-eighth session on 15 May 2005, Addis Ababa

FAO. (2014a). Building a common vision for sustainable food and agriculture, principles and approaches. Rome.

Food and Agriculture Organization of the United Nations (FAO). (2014). The state of food and

agriculture - Innovation in family farming (ISSN 0081-). Rome: Author.

FAO. (2015). ACQUASTAT website, Food and Agriculture Organisation of the United Nations (FAO).

Fasoyiro, S. B., & Taiwo, K. A. (2012). Strategies for Increasing Food Production and Food Security in Nigeria. Journal of Agricultural & Food Information, 13(4), 338-355.

Food and Agricultural Organization-FAO (2016). Rice Market Monitor, Volume XIX Issue N0.1

Grafton, R.Q., Daugbjerg, C. & Qureshi, M.E. 2015. Towards food security by 2050. Food Security, 7: 179–183.

GoM, Ministry of Agriculture and Food Security. 2006. Cotton production in Malawi

GOM. 2006. 2006/07 Budget Statement, Lilongwe: Ministry of Finance.

Gyimah-Brempong, K., Johnson, M. & Takeshima, H (2016) [Eds]. The Nigerian Rice Economy: Policy Options for Transforming Production, Marketing, and Trade. Pennsylvania: University of Pennsylvania Press.

Herwig H., (2000). Nutrition and Food Security; ConceptualFramework of Food and Nutrition Security. GTZ (DeutcheGesellschaft fur Technische Zusammenarbeit (GTZ) GmbHi).

IBRD/World Bank (The International Bank for Reconstruction and Development/World Bank). (2007). World Development Report 2008, Agriculture for Development (available at http://siteresources.worldbank.org/INTWDR2008/Resources/WDR_00_book.pdf)

IFAD. (2012). Youth in Agriculture, Special session of the Farmers' Forum Global Meeting, Synthesis of Deliberations, 18 February, Italy.

Jayne, T. S.; Mather, D.; Mghenyi, E.; Zulu, B.; Chirwa, E.; Tschirley, D. 2006. Maize Marketing and Trade Policy in a Pro-Poor Agricultural Growth Strategy: Insights from Household Surveys in Eastern and Southern Africa, International Development Working Paper (draft),.Department of Agricultural Economics, Michigan State University.

Johnson, M., Takeshima, H. & K. Gyimah-Brempong (2013).Assessing the Potential and Policy Alternatives for Achieving Rice Competitiveness and Growth in Nigeria. The International Food Policy Research Institute (IFPRI). IFPRI Discussion Paper, 01301.

Kibaara, B., Ariga, J., Olwande, J and Jayne, T. (2008). Trends in Kenyan Agricultural Productivity: 1997-2007. Egerton University, Tegemeo Institute of agricultural Policy and Development, September 2008.

Jerven, M., (2014). 'The Political Economy of Agricultural Statistics and Input Subsidies: Evidence from India, Nigeria and Malawi': The Journal of Agrarian Change, Vol. 14 No. 1, January 2014, pp. 129–145.

Livingstone, G., Schonberger, S., & Delaney, S. (2011, January 24–25). Sub Saharan Africa: The state of smallholders in agriculture. Paper presented at the Conference on New

Directions for Smallholder Agriculture. International Fund for Agricultural Development (IFAD): Rome

Malawi Government, 2011. Malawi Agricultural Sector Wide Approach: Malawi's prioritised and harmonised agricultural development agenda: 2011-2015. Lilongwe: Ministry of Agriculture and Food Security. www.moafsmw.org

Masson, B. (2005). Worsening food insecurity in Africa. International Committee of the Fourth International (ICFI).

Mthakati Alexander R. Phiri1, Pius Chilonda,Christopher Manyamba. (2012). Challenges and Opportunities for Raising Agricultural Productivity in Malawi.

Mwaniki, A. (2012)'Food security in Africa: Challenges and issues', United Nations, 22 October 2012

NSO. 2005. Integrated Household Survey 2004–2005. Zomba: National Statistical Office

NSO. 2010. National Census of Agriculture and Livestock 2006/07: Main Report.

National Agricultural Policy. (2016). Ministry of Agriculture, Irrigation and water development.

Njuki, J., Kaaria, S., Chamunorwa, A., & Chiuri, W. (2011). Linking Smallholder Farmers to Markets, Gender and Intra-Household Dynamics: Does the Choice of Commodity Matter? *European Journal of Development Research*, *23*(3), 426-443.

Nwanze, K. F., Mohapatra, S., Kormawa, P., Keya, S., & Bruce-Oliver, S. (2006). Rice Development in Sub-Saharan Africa. Journal of the Science of Food and Agriculture, 86 (5), 675–677.

Obayelu, E., A (2015). Transformation from Subsistence to Commercial Agriculture in Nigeria: The Effects of Large-Scale Land Acquisition on Smallholder Farmers. In E. Osabuohien (Ed.), Handbook of Research on In-Country Determinants and Implications of Foreign Land Acquisitions (pp. 409-431). Hershey, PA: Business Science Reference.

Ogunsumi, L.O, Ajayi A., Amire C.M & Williams S. (2013). Sustainability of Agricultural Transformation Agenda. The place of Rice Farmers in Ogun State Nigeria. Research on Humanities and Social Sciences, 3(13), 66-78.

Okodua, H. (2017). Assessing the Impact of Rice Sector Policy Reforms on Income Mobility of Rural Households in Nigeria. AGRODEP Working Paper 0039, February.

Osabuohien, E., & Efobi, U. R. (2013). Africa's Money in Africa. South African Journal of Economics, 81(2), 292-306.

Osabuohien, E., & Efobi, U. R. (2013). Africa's Money in Africa. South African Journal of Economics, 81(2), 292- 306.

Osabuohien, E. (2014). Large-scale Agricultural Land Investments and Local Institutions in Africa: The Nigerian Case. Land Use Policy, 39, 155-165.

Osabuohien, E., Efobi, U. R., Gitau, C. M., & Bruentrup, M. (2015). Agents and Implications of Foreign Land Deals in East African Community: The Case of Uganda. In E. Osabuohien (Ed.), Handbook of Research on In-Country Determinants and Implications of Foreign Land Acquisitions (pp. 263-286). Hershey, PA: Business Science Reference.

Osabuohien, E. (Monday June 20, 2016). Economy without Buffer must Experience Shocks. Daily Times, p. B8.

Pinstrup-Andersen, P. & D. D. Watson II. 2011. Food Policy for Developing Countries. The Role of Government in Global, National, and Local Food Systems. Cornell University Press, Ithaca.

Pro-poor Opportunities in Commodity and Service Markets Project (Propcom, 2012), http://www.propcom.org/.

Riely, F. and Mock N., (1995). Inventory of Food Security ImpactIndicators. In: Food Security Indicators and Framework: AHandbook for Monitoring and Evaluation of Food Aid Programs.USAID, Food Security and Nutrition Monitoring Project (IMPACT) Publication. Virginia: Arlington.

Shiferaw,F 2003, Determinants of Food Security in Southern Ethiopia, American Agricultural Economics Association, Montreal,Canada

Singh, J., & Dhillion, S. S. (2000). Agricultural Geography (2nd ed.) New Delhi : Tata McGraw Hill.

Tchale, H. (2009). The efficiency of smallholder agriculture in Malawi. African Journal of

Agriculture and Resource Economics, 3(2), 101-121.

Thirtle, C., Lin, & Piesse, J. 2003. The impact of research led agricultural productivity growth on poverty reduction in Africa, Asia and Latin America (Conference Paper). *25th conference of the International Association of Agricultural Economists.*Retrieved from http://www.odi.org.uk/events/2001/05/16/2334-background-paper-colin-thirtle- relationship-between -hanges-agricultural-productivity-incidence-poverty.pdf

Uduma B.U, Samson O.A & Mure U.A (2016), Irrigation Potentials and rice self-sufficiency in

Nigeria: A review. African Journal of Agricultural Research, 11(5), 298-309.

United States Agency for International Development (USAID),(1992). Definition of food security. USAID Policy Determination19. Washington, DC.

USDA (2003), Food Security Assessment, Agriculture and Trade Reports, Washington DC,USA.

Wiggins, S & Keats, S. (2013). Smallholder agriculture's contribution to better nutrition/ Report Commissioned by the Hunger Alliance. Overseas Development Institute (ODI) 20 March 2013. Overseas Development Institute, London.

World Bank. 2003. Malawi Country Economic Memorandum: Policies for Accelerating Growth. Washington: World Bank.

World Bankb. 2009. Constrains to Growth in Malawi. Policy research Working Paper 5097. Washington DC.

World Bank. (2014). Agribusiness Indicators: Tanzania. Retrieved 01 03, 2015, from The World Bank: http://reliefweb.int/sites/reliefweb.int/files/resources/NonAsciiFileName0.pdf.

World Bank. (2016). World Bank Open Data. Retrieved from: http://data.worldbank.org/

National Agricultural Policy. (2016). Ministry of Agriculture, Irrigation and water development.

World Trade Organization. 2010. Trade Policy Review: Malawi. WT/TPR/G/231.Geneva.

Yan, A.,Ngadi. M, & Kok, R. (2016).Physical properties of rice husk and bran briquettes under low pressure densification for rural applications. Biomass and Bioenergy, 84(January), 22–30.

APPENDIX

QUESTIONNAIRE

RICE PRODUCTIVITY AND FOOD SECURITY OF SMALLHOLDER FARMERS IN KATCHA AND BIDA LOCAL GOVERNMENT AREAS OF NIGER STATE.

INTRODUCTION

This survey is aimed at assessing rice productivity and food security of smallholder farmers in Kwacha and Bida Local government areas of Niger state, Nigeria. Information obtained will be treated with strict confidentiality. Thank you for your cooperation.

District: _____ County _____

Questionnaire ID: _____

SECTION A: BASIC INFORMATION

1. Age:_____ (Year)
2. Gender: Male ( ) Female ( )
3. Longitude: _____
4. Latitude:_____
5. Elevation:_____
6. Marital Status: Single ( ) Married ( ) Divorced ( ) Separated ( ) Widowed ( )
7. Highest Educational Attainment: No formal education ( ) Adult Literacy ( ) Secondary Education ( ) Tertiary Education ( )
8. Household Head: Female ( ) Male ( )
9. Main Source of Income for household: Farming ( ) Business ( ) Civil Servant ( )

   Please specify _____
10. Other source of Income for household: Farming ( ) Business ( ) Civil Servant ( )

    Please Specify_____
11. Do you belong to any social, farmer or community organization? Yes ( ) No ( )
12. Land ownership: Self Owned ( ), Borrowed ( ), Inherited ( )
13. Household Size:_____ (number of persons)
14. Household farm size (hectares):_____
15. Farming experience:_____ (in years)

16. Would you say you have benefitted from the Value Chain Development Programme: Yes ( ) No ( )

17. To whom do you sell your products? Directly to consumers ( ) Retailers ( ) Wholesalers ( ) Exporters ( ) Processors ( ) Governmental corporation for storage and marketing of agricultural products ( ) Other (specify)_____

SECTION B

QUESTIONS ON AGRICULTURTAL PRODUCTIVITY

1. Where do you get your rice seed from? _____

2. Have you always grown rice? Yes ( ) No ( )

3. Do you use fertilizer? Yes ( ) No ( )

4 If yes: What is the cost? _____ (per 25 kg bag)

5. If not: Why?_____

6. Do you use irrigation? Yes ( ) No ( )

7. If yes, where do you get the water from?

8. How much of your rice crop is lost annually to pests?_____

9. What kind of pests are the biggest problems for your maize crop?_____

10. What is the quantity of rice produced per year?_____(kg)

11. How do you process grains after harvesting? Threshing( ) traditional methods ( ).

12. Do you lose much of your crop using traditional methods? Yes ( ) No ( )

13. Do you use pest control on your farm? Yes ( ) No ( )

14. How much of your crop each year is sent to market? _____ (kg)

15. What is the typical price at market for your rice per kg?_____ (local currency)

16. How far is the market from your farm? 1-2 km ( ) 3-4 km ( ) 5 km and above ( )

17. How do you transport your farm produce? Truck ( ) motorcycle/tricycle ( ) wheel barrow ( ) bicycle ( ) others_____

SECTION C

FOOD SECURITY

/S/N	QUESTIONS	How severe	How many times in 7 days will you

			consider that
1	Worried that our food would finish before we got more or food to buy more.	Very severe() Moderately severe ( ) Not severe ( )	
2	Couldn't afford to eat balanced diet.	Very severe( ) Moderately severe ( ) Not severe ( )	
3	Did you or other adults in the household ever cut the size of your meals or skip meals because there wasn't enough food?"	Very severe( ) Moderately severe ( ) Not severe ( )	
4	Did anyone in your household ever eat less than they should because there wasn't enough food or money for food?	Very severe( ) Moderately severe ( ) Not severe ( )	
5	Was anyone from your household ever hungry, but didn't eat because you couldn't afford enough food.	Very severe( ) Moderately severe ( ) Not severe ( )	
6	Did you or anyone from your household lose weight because you didn't have enough food or money for food?	Very severe( ) Moderately severe ( ) Not severe ( )	
7	Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?	Very severe( ) Moderately severe ( ) Not severe ( )	
8	Purchase food on credit	Very severe( ) Moderately severe ( ) Not severe ( )	
9	Relied on only a few kinds of low cost food or feed our children because we were running out of food or money to buy food.	Very severe( ) Moderately severe ( ) Not severe ( )	
10	Couldn't feed our children a balanced meal because we couldn't afford that.	Very severe( ) Moderately severe ( ) Not severe ( )	
11	The children were not eating enough because we just couldn't afford enough food.	Very severe( ) Moderately severe ( ) Not severe ( )	
12	Did you ever cut the size of any of the	Very severe( )	

	children's meals because there wasn't enough money for food?	Moderately severe ( ) Not severe ( )
13	Were the children ever hungry but you couldn't afford more food?	Very severe( ) Moderately severe ( ) Not severe ( )
14	Did any of the children ever skip a meal because there wasn't enough money for food?	Very severe( ) Moderately severe ( ) Not severe ( )
15	Did any of the children ever not eat for a whole day because there wasn't enough money for food?	Very severe( ) Moderately severe ( ) Not severe ( )

Work Plan

Activities	September		October				November	
	WEEK							
	1	2	3	4	5	6	7	8
Preparation and travel plan to field trip	11th							
Familiarity with the project team members	15th	26th						
Work with the project design plan and visit to some field site	17th				21st			
Data Collection				6th		20th		
Monthly Report		27th				27th		
Computation and analysis of data and compilation of reports					17th		1st	
Submission of report								2nd
Predation and travel plan from the project site								4th


FGN/IFAD - VALUE CHAIN
DEVELOPMENT PROGRAMME (VCDP)
RICE PRODUCTION (FARO 44)
CLUSTER: BATAVOVOGI
LGA: BIDA
DATE: JANUARY, 2016.
NIGER STATE

OBJECTIVES	DATA REQUIREMENT	SOURCE OF DATA	ANALYTICAL METHOD
to describe the socio-economic characteristics of smallholder rice farmers in the study area	Age, Gender, Family Size, number in the household, level of education, involvement in other economic activity than farming.	Primary data obtained from structured questionnaire Secondary data through literature review.	Descriptive statistics (measures of tendencies i.e. mean, median, mode, frequency distribution and cross-tabulation).
to assess the level of productivity of smallholder rice farmers in the study area;	Farm size (ha), Seed (kg), Cost of fertilizer (₦), Agrochemicals (litre)	Primary data (questionnaires and focused group discussion) Secondary data through literature review	Descriptive statistics (Frequency distribution, mean, percentages), Crop Factor Productivity Formulae.
to assess the level of food security of	Nutrition,household	Primary data obtained from the	Descriptive statistics (measures of tendencies i.e.

smallholder rice farmers in the study area;	income, expenditure	use of questionnaire	mean, median and mode, frequency distribution, and percentage). coping strategy index (CSI)
to assess the factors influencing productivity of smallholder farmers in the study area.	Farm size (ha), Seed (kg), Cost of fertilizer (₦), Agrochemicals (litre), Age (years), Household size (no), Years in farming, Extension Contact (no)	Primary data obtained from the use of questionnaire.	Ordinary least square linear regression
to assess the factors influencing food security of smallholder rice farmers in the study area	Nutrition, income, expenditure, dietary intake	Primary data obtained from the use of questionnaire and secondary data from previous work on food security	linear regression model.