THE EFFECTS OF OFF-FARM INCOME ON SMALLHOLDERS' RICE PRODUCTION IN EBONYI STATE, NIGERIA.

BY

UCHA, SAMUEL OBINNA

PG/M.Sc./15/77918

DEPARTMENT OF AGRICULTURAL ECONOMICS

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TITLE PAGE

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AN MSC. PROJECT SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF NIGERIA, NSUKKA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS

BY

UCHA, SAMUEL OBINNA

PG/M.Sc./15/77918

AUGUST, 2018.

CERTIFICATION

This is to certify that Ucha, Samuel Obinna, a postgraduate student in the Department of Agricultural Economics, with registration number PG/M.Sc/15/77918 has satisfactorily completed the requirements of course and research work for the award of Master of Science (M.Sc) Degree in Agricultural Economics. The work embodied in this thesis, except where duly acknowledged is original and has not been previously published in part or full for any other diploma or degree for this or any other university.

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DEDICATION

This work is dedicated to Almighty God.

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ABSTRACT

The basis of this study was to investigate the effects of off-farm income on smallholders' rice production in Ebonyi State, Nigeria. To achieve this, the study specifically described the socio-economic characteristics of the smallholder rice farmers, described the off-farm activities of rice farmers, estimated the factors determining participation in off-farm activities among the smallholder rice farmers, determined the effects of off-farm income on the output of rice farmers and identified factors limiting farmers' participation in off-farm activities in the study area. *The study was carried out in Ebonyi State, Nigeria. The research employed a multistage sampling technique in the selection of respondents for the study. One hundred and twenty (120) farmers were selected using random sampling procedure. Data were collected using well-structured questionnaires as an interview guide. Descriptive statistics like frequency, percentage, mean and inferential statistics like regression model were used in data analysis. Results of the study showed that half (50%) of the respondents were males among whom 42.50% were married. The highest age bracket is between the ages of 21 to 30 years representing 55.83% of the entire respondents. The average household size was approximately five persons. Four of the respondent interviewed constituting 3.3% of them had no formal education, 24 of them constituting 20% had primary education. Forty-three respondents constituting 35.83% had post-primary education while 33 of the respondents constituting 27.50% acquired tertiary education. Majority of the respondents (74.17%) participated in off farm activities. The average farming experience was above 12 years, and half of the respondents had access to extension services delivery. Results of the findings showed that Gender, Farm size and Access to credit by the farmers were the major determinants of off farm activities' participation among other factors that could influence it. More so, off-farm income significantly influenced the output of rice produced by the farmers. The identified constraints/factor limiting farmers participation in off farm income in the study area include: lack of education, Farm size, Age of the farmer, Health status, limited time, poor access to credit, poor assess to extension services, among others. The hypothesis tested confirmed that off-farm income of the rice farmers had significant effects on their output. The second hypothesis tested confirmed that socio-economics characteristics of the rice farmers influenced their participation in off-farm activities in the study area. Recommendations were made based on the findings to encourage the farmers' participation in off farm income in order to diversify their economics aiming at improving their overall standard of living.*

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CHAPTER ONE
INTRODUCTION

1.1Background of the Study

Agriculture is a major base of the world's economy. The sector plays important roles in the development process of any nation by supplying food items, industrial inputs, generating foreign exchange, creating employment opportunities, contributing to gross domestic product (GDP) and expanding markets for industrial outputs(Abebe,2014). World Bank (2007) revealed that agriculture is the major source of income and employment for about 70 percent of the world's rural poor societies and 32 percent in the growth of GDP in these countries. The struggle for food is desperate for the 240 million people of West Africa: one of every three of who is a Nigerian (West Africa Rice Development Association (WARDA), (2002).

Rice (Oryza sativa) is the staple food of approximately half of the world's population (International Rice Research Institute (IRRI), 1997). It has traditionally been an important basic food commodity for certain populations in sub-Saharan Africa (SSA), and West Africa. Recent important and major changes have led to a structural increase in rice consumption in the sub-region. Since 1973, regional demand has grown at an annual rate of 6%, driven by a combination of population growth and substitution away from traditional coarse grains (WARDA, 2001). The consumption of traditional cereals, mainly sorghum and millet, has fallen by 12 kg per capita, and their share in cereals used as food decreased from 61% in the early 1970s to 49% in the early 1990s. In contrast, the share of rice in cereals consumed has grown from 15% to 26% over the same period (Akpokodje, Lancon and Erenstein, 2001). Also, it was observed that between 1961and 2005, the annual increase in rice consumption was 4.52% in SSA (WARDA, 2007). Growth in regional rice consumption remains high. The demand for rice has been increasing at a much faster rate in Nigeria than in

other West African countries since the mid 1970s (WARDA, 2001). For example, during the 1960's Nigeria had the lowest per capita annual consumption of rice in the sub-region (average of 3 kg). Since then, Nigeria's per capita consumption levels have grown significantly at 7.3% per annum (Ogundele and Okoruwa, 2006). Consequently, per-capita consumption during the 1980s averaged 18 kg and reached 22 kg in 1995-1999. In an apparent move to respond to the increased per capita consumption of rice in Nigeria, local production boomed, averaging 9.3% per annum (Ogundele and Okoruwa, 2006). These increase in local production have been traced to vast expansion of rice area at an annual average of 7.9% and to a lesser extent to increase in rice yield of 1.4% per annum.

The reality is that Nigeria has not been able to attain self-sufficiency in rice production despite increasing hectares put into production annually (CBN, 2000). Consequently, Nigeria has depended heavily on imported rice to meet her consumption needs and has become the World's largest importer of rice (WARDA, 2003). According to Okorji and Onwuka (1994) the rice import bill for Nigeria was N123.61 million in 1980 and has since continued to rise. Meanwhile, CBN (2017), confirmed that Nigeria spent about $3.5 billion on rice importation between 2014 and 2016. This is indicative of the declining self-sufficiency in rice production which constitutes a huge drain on Nigeria's foreign reserve and a major bottleneck in the balance of payments (Egbuna, 2003).

In a bid to address the demand-supply gap for rice, governments have at various times come up with policies and programmes. However, these policies according to WARDA (2001) have not been consistent due mostly to oscillating import tariffs and import restrictions. For instance, from 1986 to the mid-1990s imports were illegal. In 1995 imports were allowed at a 100% tariff. In 1996 the tariff was reduced to 50% but increased to 85% in 2001. Presently, there is a total ban on rice importation in the country. The erratic rice import policy reflects the dilemma of securing cheap rice for consumers and a fair price for

producers. Notwithstanding the various policy measures, domestic rice production has not increased sufficiently to meet the increased demand. Even during the rice import ban period, Nigeria was still importing several hundred thousand tons of rice per year through illegal trade. With the removal of the rice import ban, consumption resumed its rapid growth taking advantage of the downward trends of rice price on the world market.

This fluctuation and limited capacity of the Nigerian rice economy to match the domestic demand has raised a number of pertinent questions both in the policy circle and amongst researchers. Such questions include: what are the factors explaining the lag in domestic rice production vis-a-vis demand for the commodity in Nigeria? Which strategy could lead to a sustainable contribution of the Nigerian rice economy to the national food security within a competitive and open economy? Central to this explanation is the issue of off- farm income and efficiency of the rice farmers in the use of resources.

West African Rice Development Association (WARDA) in collaboration with the Nigerian Institute for Social and Economic Research (NISER) suggested the strategy of increasing off-farm income and efficiency at producer level as one of the key components to revitalize the rice sector in Nigeria (WARDA, 2003).

In spite of its great importance to the country's economy, agricultural productions are however, subsistence-based and dominated by smallholder farm households that operate on farms of less than one hectare (Ume, Ezeano, Onunka, &Nwaneri, 2015). Even though the immediate past and the present governments have given higher priority to the agricultural sector through their programmes; Agricultural Transformation Agenda (ATA) and Green Alternatives (GA) respectively. Its productivity is however at its lowest level. This may be because of different interrelated socio-economic and climatic problems such as inappropriate use of farmland, over grazing, over cultivation, population growth, tenure insecurity, weak extension services, inadequacy of infrastructure, low access to agricultural inputs such as

fertilizer, herbicides, pesticides, seeds and seedlings among others (Oseni and Winter, 2009). According to Rahman (2007), smallholder production is generally characterized by low access to improved technologies, financial services, modern inputs, agricultural markets and irrigation services that attributed to variability of earnings from the farming sector. This engrossed the rural areas, where majority rely on agriculture for their livelihood.

In order to improve the rural livelihoods, Haagablade (2010) noted that households' diversification into portfolio of income activities of which off-farm income stand tall becomes a measure. However, farmers are forced to participate in off-farm activities to overcome these obstacles. Philip, Nkonya, Pender and Oni (2009) explained off- farm income to include all income generated outside own farm and are diverse, partly seasonal and often performed around the family compound in most developing countries.

However, Studies suggested that participation in off-farm activities are initiated by two conventional factors, viz; pull and push factors. The "push" factors as explained by Reardon, Stamoulis, Balisacan, Cruz, Berdegue and Banks *(*1998) are mandatory factors that force farmers to participate in off-farm activities to manage income risk and in this case, off-farm income is used as a coping strategy. These factors include shortfalls of agricultural production resulting from temporary failures due to unexpected drought or long-term factors such as shortages of farm land, absence of crop insurance, failures in input and credit markets and others. On the other hand Barrett, Reardon, & Webb (2001) explained the "pull" factors as the incentives that attract households to non-farming sectors when non- farm activities offer higher return than the farm activities.

Chavas, Chambers and Pope (2010) on their own study recognized the influence of the nonfarm sector as a primary force in shaping farm structure. In addition, Schmitz, Moss, and Schmitz (2010) reported that it is widely acknowledged that general economic growth and off

farm work opportunities have played a central role in resolving the equity issues that motivated farm policies in their inception. Likewise, Woldehanna (2000) in his study in northern part of Ethiopia indicated that off-farm income constitutes about 35 percent in the total income of households in the area. Similarly, Bedemo, Getnet, Kassa, &Chaurasia (2013) reported that about 73.5 percent of households participate in off-farm activities in their studies in three districts of Ethiopia; GutoGida, GidaAyana and Jima Arjo. Woldehanna, (2002) listed off-farm activities in the country to include Unskilled wage works in others' farm, unskilled non-farm works, skilled and professional works as teaching, clerical works, government and health works, trading, driving, weaving, tailoring and paid developmental works (for instance, food-for-work).

In Nigeria, off-farm activities are more common among Southern Nigeria households than in Northern part of the country (Babatunde, 2013). These non-farm economic activities which are common in rural Nigeria as observed by Alimba (1995), are petty trading (food stuff sales, fruit sales, provision sales), dress making, palm wine tapping, craft making (wood and calabash carving, carpentry, pot making, leather work and weaving). In general, farm households participate in one or more types of these activities to diversify their sources of income. According to Eboh (2009), these non-farm activities provide employment options outside the farm reduce rural-urban migration, promote income distribution and diversification and intersectional linkages, which are capable of leading to a vibrant rural economy.

Yue & Sonoda (2012) reported that even though households' participation in off-farm activities have considerable effects on the productivity of the farming sector, the possible link is not clear. These effects can be positive or negative or nil depending on where income from off-farm activities are invested. Babatunde, (2013) stated that if incomes generated from off-farm activities are spent as investment in the farming sector in the form of

purchase of modern inputs and adoption of new technology, then the sector's production will be enhanced. On the other hand, the absence of labor in the agricultural sector negatively affect the productivity of the sector if incomes generated in the off-farm activities are spent for consumption or used to leave the agricultural sector.

1.2 Statement of the Problem

Rice is an important food crop in Nigeria dominated by smallholder farmers and its consumption is growing particularly among urban dwellers. Domestic production of this commodity has been inadequate and unable to bridge the increasing demand-supply gap. These farmers have limited access to modern improved technologies and their general circumstance does not always merit tangible investments in capital, inputs and labour (Mgbenka and Mbah,2016). Certain factors are responsible for these inefficiencies in smallholder farming in Nigeria. These farmers lack agriculture information and this is a factor that promotes ignorance of modern farm technologies and income diversification. These farmers also operate under high costs of production that affects both the commercial and smallholder farmers. Smallholder farmers in Nigeria have limited access to credit facilities, which reduces their productivity largely. Great percentage of Nigerian cultivable lands is being converted to other uses than agriculture. Other factors that hinder productivity in smallholder farming are lack of market, high cost of input and lack of extension services that impoverishes and discourages them from production. In addition to these challenges, Obiechina (2012) points out that the main reason for poor performances of smallholder farmers is due to lack of commitment by all tiers of governments to implement the right policies, hence the constraints require more attention than it now gets.

In Ebonyi State, the past and present administrations have been working assiduously by ensuring that more land are put into rice production by making policy of "one man one hectare of land" and establishing ultra-modern rice milling industries in each of the three

Agricultural Zones of the state . The government also gives incentives to farmers such as soft loan, grants and subsidized agricultural inputs (improved rice seed varieties and agrochemicals). These concerted efforts of the state government have helped the farmers to improve their standard of living because of their engagement in off- farm activities

Besides, in Nigeria due to the smaller farm size and low return from farming activities, majority of rural households are exposed to food insecurity and chronic poverty (Food and Agriculture Organization, FAO, 1996). Farm households usually participate in off-farm activities to supplement their agricultural income (Beyene, 2008). Participation in off-farm activities could attract extra income to a farmer which if invested in rice farming would increase production. It is expected that off-farm income generated would be used to enhance productivity in farming.

Several related studies have been carried out on effect of off-farm income on the agricultural productivity of smallholder farmers in Nigeria and worldwide. Babatunde (2013), examined the effects of off-farm diversification on agricultural production in Kwara State, he used cross sectional survey data to analyze effect of off-farm income on purchased input and technical efficiency. Babatunde (2015) also worked on on-farm and off-farm works: complement or substitute in Nigeria? Mezid &Bekele (2014) researched on the Effect of off Farm Employment on Agricultural Production and Productivity in Southern Ethiopia. Abebe (2014) equally researched on off-farm income and technical efficiency of smallholder farmers in Ethiopia. Barrett, Reardon and Webb (2001) studied non-farm income diversification and household livelihood strategies in rural Africa. Based on these aforementioned topics, to my best knowledge, little or no study has been done on the effects of off-farm income on the rice production of smallholder farmers in Ebonyi state, hence the need for this study.

Based on all this pending research gaps, this research calls for the need to investigate the following research questions.

i. what were the off-farm activities involved by the rice farmers?
ii. what were the effects of the off-farm income on their production output?
iii. what were the determinants of farmers' participation in off-farm activities?
iv. What were the factors limiting farmers' participation in off-farm activities in the study area?

1.3 Objectives of the Study

The broad objective of the study was to evaluate the effects of off-farm income on smallholders' rice production in Ebonyi State, Nigeria. Specifically, the objectives were to:

i. describe the socio-economic characteristics of the smallholder rice farmers;
ii. describe the off-farm activities of rice farmers in the study area;
iii. estimate the factors determining participation in off-farm activities among the smallholder rice farmers;
iv. determine the effects of off-farm income on the output of rice farmers
v. identify factors limiting farmers' participation in off-farm activities in the study area.

1.4 Hypotheses of the Study

HO_1: Off-farm income has no significant relationship with rice output in the study area.

HO_2: Socio-economics characteristics of the rice farmers have no significant influence on their participation in off-farm activities.

1.5. Justification for the Study

It is now widely accepted that we should address the challenges of future agricultural policy design, we should understand farm household behaviour in a more complex policy context that recognizes the diverse nature of farms with respect to farm size, farm production and business organization. We must also recognize the increasing interconnection between decisions made by farm businesses and farm households, and their effects on the well-being of farm families (Kuhn and Offutt 1999; Offutt, 2002). Recommendations suggested from such would boost the effectiveness and success of policies and programmes targeted at increasing production. Given the increasing number of farm families taking up off-farm work, the increasing rice demand-supply gap and the risk associated with rice production, the need for this study is justified.

The recommendations from this study are expected to give direction to policy makers in designing appropriate policies to increase rice production in Ebonyi State and Nigeria. This is because more knowledge about whether farm production is affected by off-farm income could help policy makers introduce better rural development policies.

In addition, farmers will find this work very useful as it will help increase their production as they gain understanding of the interconnection between off-farm income and rice production. Thus, results from this study will provide information for stakeholders in government and extension services on how to increase the production of the farming and non-farming sector. Besides, it will add to the existing literature in rice production and off-farm income.

Furthermore, through identification of problems limiting farmers' participation in off – farm activities, policy options could be instituted by government and researchers on how best to overcome the constraints to boost food security especially now that credit access from lending agencies are becoming difficult as result of the conditionality attached, which in

many a times beyond the affordability of smallholder farmers is he area. The study could serve as teaching tool for students and reference for further research work.

CHAPTER TWO

LITERATURE REVIEW

This chapter provides a review of related literature in line with the specific objectives for the understanding of this research and to help in analysing pertinent specific objectives.

2.1 Conceptual framework

There has been increasing evidence revealing that small-holder farm households in developing countries rarely depend on farming alone, but often maintain a portfolio of income activities in which off-farm activities are an important component (Barrett *et al*., 2001; Nasir and Hundie, 2014; Seng, 2015). Haggblade, Hazell and Reardon (2010) indicated that non-farm income accounts for between 35% and 50% of total income of rural households in developing countries. Davis, Winters, Carletto, Covarrubias,Quinones, Zezza, Stamoulis, Bonomi and Digiuseppe (2007) put the global figure at approximately 58%, with some countries having a share as high as 75% of total income on average. Amidst all these facts, the level of participation and its use on purchased inputs have not yet been covered. The share of off-farm income is expected to increase substantially in the coming years, especially in Sub-Saharan Africa where increasing population growth and limited agricultural resources are threatening the growth of the agricultural sector (Haggblade, Hazell and Reardon, 2007; Shittu, 2014). Figure 2.1 gives the conceptual framework of the study as it relates the nexus between pull and push factors as determinant of off-farm participation and how it leads to increase welfare and general income.

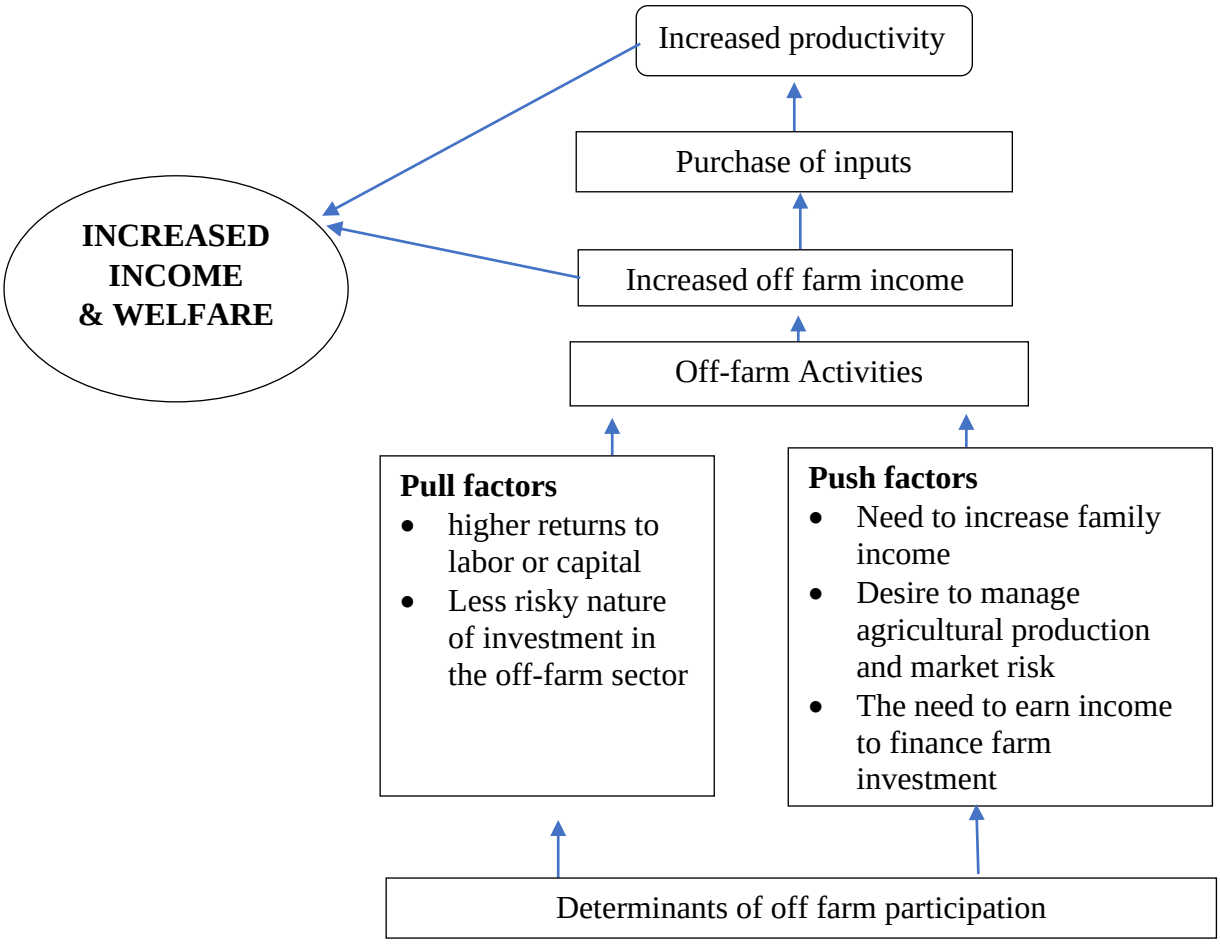

Figure 2.1: Conceptual framework of the study

Source: Author's conceptualization

In terms of participation, the level is even higher. For instance, Jolliffe (2004) found that in rural Ghana in 2004, 74% of farm households were engaged in off-farm activities. Fernandez-Cornejo (2007) reported 65% and 75% participation rate among United States and Taiwan farm households respectively. Literature has identified two main factors that drive diversification into off-farm activities among farm households in developing countries. These factors are broadly classified into "pull factors" and "push factors". Reasons why a farm household can be pulled into the off-farm sector include higher returns to labour and or capital and the less risky nature of investment in the off-farm sector (Kilic, 2009). The push factors that may drive off-farm income diversification include: first, the need to increase

family income when farm income alone cannot provide sufficient livelihood (Minot *et al.,* 2006); second, the desire to manage agricultural production and market risks in the face of a missing insurance market (Reardon, 1997; Barrett *et al*., 2001); and third, the need to earn income to finance farm investment in the absence of a functioning credit market.

This will lead to increased income to purchase farm inputs that will consequently lead to increased productivity. Increased productivity will lead to increased income of the farmer and general improvement in welfare.

2.1.1. Off-Farm Activities among Farmers

According to Kijima, Matsumoto and Yamano (2006), off-farm activities is an important component of livelihood strategies among rural households in most developing countries because when farming becomes less profitable and more risky as a result of population growth and crop and market failures, households are pushed into off-farm activities leading to "distress-push" diversification. Ibekwe, Eze, Onyemauwa, Henri-Ukoha, Korie and Nwaiwu (2010) reported that activities in the off-farm sector have witnessed a boom in the manufacturing, agro based and service sectors. In Africa, various studies have shown that most rural households are involved in agricultural activities as their main source of livelihood, however, they also engage in other income generating activities to augment the main source of income (Adepoju and Obayelu, 2013).

Ovwigho, (2014) was of the opinion that off farming income generating activities ostensibly avert the seasonality of primary agricultural production and create a continuous stream of income to cater for exigencies of life. The type of off-farm income generating activities varies across geo-political locations and countries. Off-farm arrangement is generally disaggregated into three components. These include agricultural wage employment (AWE) comprising labour source to other farms; non-agricultural wage employment (NAWE) comprising both formal and informal non-farm activities; and self-employment

(SE) such as own trades (Babatunde, Olagunju, Fakayode and Adejobi, 2010) and (Ibekwe *et al.*, 2010). Babatunde (2013) stated that in Nigeria, off-farm activities are more common among Southern Nigeria households than in Northern part of the country. Alimba (1995) identified these non-farm economic activities which are common in rural Nigeria to include petty trading (food stuff sales, fruit sales, provision sales), dress making, palm wine tapping, craft making (wood and calabash carving, carpentry, pot making, leather work and weaving).

According to Davis (2003), off-farm work is important to rural economics because of its production linkages and employment efforts while the income it provides to rural households could represent a substantial and most times greater share of farm capital. Ibekwe *et al.*, (2010) suggested that the off farm activities should no longer be considered as "marginal" as they have so often been by policy makers because more than 40% of the income from farm households came from off farm activities. Consequently, emerging research in agricultural finance has focused on off-farm activities embarked upon by farmers as an alternative and sustainable source of farm capital (Ahituv&Kimhi, 2002).

2.2. Theoretical Review

In this section, underlying theories relevant to the work will be examined. The theories are those of welfare maximization theory, utility maximization theory, and production and demand theory

2.2.1 Welfare Maximization Theory

It is reasonable to say that Adam Smith (1986) has played an important role in the development of welfare theory. The theory is built on the notion that an invisible hand idea, that is, one of the most fundamental equilibrating relations in Economic Theory; the equalization of rates of returns as enforced by a tendency of factors to move from low to high returns through the allocation of capital to individual industries by self-interested investors.

The self-interest will result in an optimal allocation of capital for society. Adam Smit writes: "Every individual is continually exerting himself to find out the most advantageous employment for whatever capital he can command. It is his own advantage, indeed, and not that of society, which he has in view. But the study of his own advantage naturally, or rather necessarily leads him to prefer that employment which is most advantageous to society"

Sen (1970) introduced the concept of development and wellbeing. In the modern welfare theory, and based on Alfred Marshall in Wealth and Welfare (1912) and Economics of Welfare (1920) discussed how individual will tend to maximize utility until they attain Pareto efficiency. Coming to the tendency to take up off farm activities in rice production, the farmers as long as there is always the need to increase income, there will always be the tendency to diversify.

In microeconomics, welfare and utility among individuals cannot be differenced or isolated. Bringing it down to the level of the farm households, increasing welfare will be increasing means of production or better farm inputs. This will ultimately lead to increase satisfaction. Off-farm activities have proved to be a veritable way of accomplishing this utility and welfare and attain an equilibrium where individual satisfaction is achieved by taking up addition source of income.

2.2.2 Utility Maximization theory

Nicholson (1978) describe utility satisfaction experienced by the consumer from a good or service. The concept is an important underpinning of rational choice theory in economics and game theory as such; utility theory is concerned with the choices and choice of people. This encompasses preference and judgment on choice, value, goodness or any of a number of similar concepts (Fishburn, 1982). The utility theory offers a procedural framework for the evaluation of alternative choices made by individuals, firms and organizations, and the satisfaction derivable from each of those choices. It is premised on the

assumption of utility maximization, i.e. the decision maker's choice and decision is such that offers the highest fulfilment or satisfaction and utility subject to the budget limitation. The traditional utility assumption has been extended over the past three decades to multi-attribute case, in which conclusion are taken by multi-criteria. Its application has extend away from typical individual consumer behaviour studies, and as such, has been extensively functional to explain the behaviour and validation for the decisions and choices of several other economic agents and units in the society (Otitoju, 2013; Offie, 2015; Okwo, 2015).

Given the nature of utility maximization, human social interaction is reduced to exchange between individuals. Clearly, the utility assumption generates a distinct depiction of human beings, human needs, and human society. The utility maximizing assumption also generates a specific conception of what is an economically "just" society. In other words, orthodox economics has a specific view of what it believes is the best way for society to be organized economically.

The orthodox worldview can be neatly summarized. If people desire utility, then people can acquire utility by exchanging with others. Once people exchange with others, the act of exchanging makes them better off. Once all exchanges are complete, all people are as well off as they can become economically. If everyone is as well off as he can become, then no one, or many, can be made better off without someone, or many, being made worse off. As far as orthodox economics is concerned, society has reached its ideal, Pareto optimal, outcome because people were free to make choices within an economy that facilitates exchanges, and namely a market based economy.

The utility hypothesis is used to explain the behaviour and choice of rice farmers in engaging in off-farm activities other than other methods in their production activities. The choices of engaging in off-farm by the rice farmers determine their level of profit such that

their utilities are maximized. In this case, the rural farmers play the function of decision makes who must decide how many of off-farm activities will be involved to obtain the highest possible utility level subject to numerous challenges on production activities. The rice farmers' decision of whether or not use off-farm income to purchase inputs which are reliant on profit is considered under the framework of utility or profit maximization (Deressa *et a*l., 2009). The utility derived by the rural farm households from their decisions on the choice purchasing farm inputs is measured by a utility function, U, which is a mathematical representation of the farmers choice of purchasing farm input such that:

$$U(X_1) > U(X_2) \quad \ldots\ldots\ldots \quad 2.1$$

Where choice of buying farm inputs X_1 is preferred over choice X_2, or

$$U(X_1) = U(X_2) \quad \ldots\ldots\ldots \quad 2.2$$

Where choice $X_1$is indifferent from X_2 (both choices are equally preferred).

2.2.3 Production and Demand Theory

In the framework of this study, demand deals with the quantity of farming inputs the rice farmer is willingly and able to buy at any given price and at a particular time. The concept "demand" according to Lipsey (1992) is described as the quantity of goods or services a consumer is willingly and able to purchase at various prices during a given period. The factors acknowledged to affect demand are price of the commodity, price of related commodity, level of income, taste and preference of the consumer, income of the consumer, and expectation in change of price, taxation, weather and climate.

Production theory is the study of production, or the economic process of changing inputs into outputs. Production uses resources to create good or service that is appropriate for use or exchange in a market economy. This can include manufacturing, construction, storing, shipping and packaging (Antunes, Ricardo, Gonzalez, Vicente, 2015)

The theory of demand has a law, which states that the higher the price, the lower the quantity demanded and the lower the price, the higher the quantity demanded *cetris paribus*. This theory is engaged in this work to explain the behaviour of rice farmers in response to prices of farm inputs purchased in the market .The law stated above will hold under the following assumptions: That there will be no change in taste and preference of the consumer

- That the consumers income remains constant
- That no close substitutes of the commodity exists
- That the habits of consumer remain unchanged
- That there is no change in the quality of product

Demand function can be expressed thus;

Qd=f (Pr, Po, Li, Tp, Ic, Fe, Wc) ……. 2.3

Where;

Pr=price of the farm inputs

Po=price of other commodity.

Li=level of income

Tp=Taste and preference

Ic=income of the farmer

Fc=Expectation in [price]

Wc=weather and Climate**.**

In economics, a production function narrates physical output of a production process to physical inputs or factors of production. The production function is one of the key theory of mainstream neoclassical theories, used to define marginal product and to distinguish efficiency, the defining focus of economics. The most important purpose of the production function is to address allocative efficiency in the use of factor inputs in production and the resulting distribution of income to those factors, while abstracting away from the

technological problems of achieving technical effectiveness, as an engineer or professional manager might understand it (Cohen & Harcourt, 2003).

In macroeconomics, total production functions are estimated to create a scaffold in which to distinguish how much of economic growth to attribute to changes in factor distribution (e.g. the accumulation of capital) and how much to attribute to advancing technology. Some non-mainstream economists, however, reject the very concept of an aggregate production function (Daly, 1997).

In summary, relating to the question of rice farmers and willingness to adopt off farm activities, the demand for the farm produce will push production positively and this creates the need to acquire more inputs, which can be achieved through the purchase of off farm jobs.

2.3. Empirical Literatures

Rice production in the country increased appreciably in the periods 1980 to 1998 due to increase in land area put into rice production. FAO (2017) reported that average rice production and average land area in hectare in Nigeria between 2001 and 2010 were 3,512,271 metric tonnes and 2,318,151 hectares and increased to 5,400,719 metric tonnes and 2,790,106 hectares between 2011 and 2014. These figures are likely to continue to push upwards. The question remains, is rice production in Ebonyi State, which is the largest producer of rice in Nigeria viable. on the other hand, Food and Agriculture Organization, FAO, (2008); Ugwugwu, (2008) studied the problems of rice production and identified as relatively high production costs, relatively poor producer prices and marketing systems, this results to low returns and subsequently decline in rice production. Odozi, (2014) also reported that most of the farmers have small farm sizes of about 1 to 5 hectares.

Nigeria is the largest producer of rice in West Africa producing over 40% of the regions total production (Singh *et al.,* 1997 and FAOSTAT, 2007). In the past 30 years, production has increased six fold with Nigeria producing 3.3 and 3.6 million tons of paddy

rice in 2000 and 2005 respectively (FAOSTAT, 2004 and 2007). Africa accounts for only about 2% of the world's output of rice.

Current production stands at 2.8 million tons with a deficit of 1.6million tons excluding the quantity smuggled through the porous borders (USAID, 2008).The successive programmes launched to increase rice production have not been able to reduce the resulting rice shortage. The imposition of a ban on rice import from 1985 to 1995 and ensuring increase in the relative price against other major staples boosted rice production mainly through area increase. Past policies did not help local rice producers to secure significant market share and imports have increased since the lifting of the ban and successive increase in the import tariff from 50% to 100%. Imported rice represents more than 20% of agricultural imports and half of total rice consumption (WARDA, 2003). In spite of the relative increase in the price of rice per capita, consumption has maintained the upward trend showing that rice has become a structural component of Nigeria diet with a low price elasticity of demand (WARDA, 2003)

However, to support Federal Government efforts in improving rice production, off-farm income may have a positive effects on the farmers production output. On this, Babatunde (2013), studied the link between on-farm works and off-farm income on farm level output, purchased inputs and technical efficiency of farmers. The findings of his research confirmed positive associations between off-farm income and output, purchased inputs and technical efficiency. Using instrumental variable estimation Woldehanna (2002) examined the linkages between farm and non-farm activities in Northern Ethiopia. His result indicates that non-farm income plays a vital role in reducing credit constraints of poor farmers.

However, Babatunde, Olagunju, Fakayode and Adejobi (2010) in their study reported that the impact of non-farm income on farm inputs was negative due to unfavorable

conditions in the study areas. They also found that poor households and large families are more likely to participate in off-farm activities than rich households and small sized families. In general, the findings of their study indicate that non-farm income has a positive and significant effect on investments in equipment livestock and buildings whereas negative effects on improved seeds and fertilizer.

Coelli *et al.,* (1998) investigated productivity and efficiency differences in agricultural production between households with and without off-farm income. A negative estimate on the variable corresponds with a positive effect on technical efficiency and vice-versa. The results showed that off-farm income is positively related to technical efficiency, but the effect is not statistically significant. This indicates that, though off-farm income enables farmers to buy more inputs and produce more output, it cannot be said to enhance farmers' efficiency. This might not be unconnected with the fact that farmers with off-farm income have less time to monitor and ensure an efficient utilization of the purchased inputs they deployed in agricultural production.

Using the same model, Babatunde (2015), who studied On-Farm and Off-Farm Works: Complement or Substitute?; Evidence from Nigeria examined the effect of off-farm income diversification on agricultural production in rural Nigeria. Both descriptive and empirical approaches such as stochastic frontier production function using the maximum likelihood method were employed to analyze the effect of off-farm income on farm output and technical efficiency in Kwara State, Nigeria. It was found that off-farm income is important for the vast majority of the households: almost 90% of the sampled households have at least some off-farm income and on average, it accounts for about 50% of total household income. The results of the estimation suggest that off-farm income contributes to higher farm production while it decreases the use of family labour.

In summary, the agricultural investment effect of off-farm income diversification is particularly important for poor farm households. This is because lack of liquidity and poor access to credit are the most pressing constraints to improved agricultural productivity among farm households in developing countries (Haggblade *et al*., 2007). Apart from providing flows of cash income that can be used to purchase farm inputs and hire labour for agricultural production, evidence of a steady off-farm income has been used as collateral for agricultural loans, given the inadequacy of land, in certain settings (Hertz, 2009; Collier and Lal, 1986; Hoffman and Heidhues, 1993)

The empirical literature are further detailed under the subheadings below

2.3.1. Off-farm Income and Rice Production

Off-farm activities by farm households is a continual phenomenon in most countries, and the reliance of farm families on the income from off-farm work has increased steadily over years. To improve the wellbeing of farm households, it is necessary to have a better understanding of the non-farm business of farm household. The importance of off-farm work has been widely acknowledged and the empirical proof has been revealed in many countries especially among rice producers as it provides great opportunity to increase inputs in rice production. For example, according to the review of historical data reported by the United States Department of Agriculture (USDA), the rate of U.S farm households that work off-farm is approximately 65% on average (Fernandez-Cornejo, 2007). Similarly, Ugwugwu (2008), rice production requires intensive input engagement of which most farmers require additional, income to support production.

Income from off-farm activities has been shown as a primary basis of total farm household income. Similar evidence has also been found in Taiwan as summarized from the Agricultural Census data in 2001, that approximately 75% of the farm households have

reported wages or income from an off-farm job were engaged in rice production. In light of the increasing prominence of off-farm labour as a crucial determinant of farm income, attention has been paid to the interaction between the farm practice and off-farm work. It is expected that the increased reliance on off-farm employment may affect the allocation of family labour, thus have influences on rice farm production. On the other hand, off-farm activities provide an opportunity for farm households to stabilize household income and reduce uncertainty associated with agricultural production. of which rice farming is not an exceptional

It is a generally held belief that engaging in the off-farm labour market provides a risk management tool to reduce the income variability for the farm household. Some of the previous studies have investigated the impacts of off-farm work on farm productivity. For instance, by estimating a stochastic production frontier model, Kumbhakar *et al*.,(1989) examined the effects of off-farm income on farm-level efficiency of dairy farms in the United States. Their results show that off-farm work is negatively associated with the technical efficiency. Using a similar approach to the vegetable farm survey in Florida, Fernandez-Cornejo (1992) found similar results. In addition, Goodwin and Mishra (2004) used the gross cash income over the total variable costs as a simple proxy for the farm efficiency and analysed the relationship between the off-farm labour supply and farm production. Their results also show that those farm households who work off the farm are less efficient.

On the other hand, past studies have pointed out that farm households may treat off-farm activity as a vehicle to stabilize their income (i.e. Mishra and Goodwin,1997). This is because farm commodity prices are more variable than off-farm wages. As predicted by the economic theory, a risk averse farmer will allocate labour and other resources to the less risky income sources (i.e. the off-farm activities) until the expected marginal returns are equal

between available activities. As a result, the reduction of the income risk of farm production may drive farmers to engage in the off-farm labor market.

2.3.2. Purchased Input Expenses and Rice Production

Growth in farm asset, or gradual depreciation of farm assets, or greater ease of asset spare, had the tendency to maintain farmers' interest in farming (Ogbanje, Chidebelu&Nweze, 2014). Meanwhile, Babatunde, Olagunju, Fakayode&Adejobi, (2010) reported that in adding to providing the much needed capital asset for the farm, off-farm occupation has been seen by some researchers as a risk decreasing strategy which is important, especially, to the small-scale farmers. This is, indeed, a sound precaution against crop failure and market failure. Osaka (2006) and Ogbanje (2010) distinguished that capital, including cash and other manmade farm assets that are required to carry out production, is commonly accrued through savings and investment. Myyra, Pietola&Heikkila (2011) asserted that besides making annual income, a farm family might have aim to accumulate wealth through capital achievements from off-farm activities. This could increase the production of the farmer and enhance the overall production of the enterprise.

Off-farm activities can affect rice production through both labor and capital markets. The removal of labor out of agriculture into non-farm activities may or may not negatively affect agricultural output, subject to the presence of surplus labor and the extent of rural labor market perfection (Bardhan and Udry 1999). In the absence of surplus labor, and if the labor market is thin, the labor withdrawal can reduce on-farm labor and agricultural output (Leones and Feldman 1998). If the labor market is running well, hired labor can substitute for lost family labour without conceding.

2.3.3 Determinants of Participation on Off-farm Activities

In the past, the opinion was that rice farmers were just dependent on their farms, and did not need any off-farm activities. Therefore, the policy makers just focused on farming

sector. However, during the last several years, there have been collective indications, which show that rice farming households do not rely on agriculture only. Historically farmers have tried to maintain their range of income activities in which off-farm activities have played a vital role (Barrett, Reardon, and Webb, 2001). Though Haggblade, Hazell, and Reardon (2010) pointed out that income from other than agriculture sources has a share of about 35 to 50 per cent of the total income of rural households in developing countries. There is an anticipation that the portion of off-farm income will increase in the upcoming years, mainly in the countries where there is rapid increase in population and have; inadequate agricultural sources are a big threaten for agriculture sector (Haggblade, Hazell, and Reardon, 2007). Almost the trend of receiving income from non-agriculture sources is increasing in almost all countries. Jolliffe(2004) indicated that in rural Ghana nearly about 74% of farming households were involved in off-farm sector, while another study in Ghana by (Fernandez-Cornejo, 2007) narrated that 65% farm household were attached with off-farm income sources and in Taiwan this rate has increased up to 75% respectively.

The main reasons of farmers' involvement in off-farm sector are greater returns and low risk of investment in non-agriculture sector (Kilic, Carletto, Miluka, and Savastano 2009). As De Janvry, Sadoulet, and Zhu (2005) reveal that non-farm employment has a favorable effect on agricultural production, because the income obtained through this sector can be used for investing on farm and will benefit the farmer to practice farming on time. Furthermore, Stampini & Davis, (2009) observed that non-farm employment has influenced the use of variable inputs in rural Vietnam, where farmers having off-farm employment sources invested more on seeds, fertilizer, agricultural services and hired labour. Still off-farm activities have become a key fragment of farmer's overall income in the developing countries. As agriculture sector is quite risky, because farm production dependent on many factors which are un-controllable by the farmer. In spite of this, there is no guarantee of

beneficial returns from farming. Many farmers have tried to adapt different sources of earnings to ensure their farm income (De Janvry & Sadoulet, 2001; Ruben & Van den Berg, 2001; Haggblade *et al*., 2007). There are many reasons for this observed changing phenomenon, which may be reduction in farm income and willingness to protect farm productivity against different risks (Reardon, 1997; Ellis, 1998).

Doing off-farm work for generating income is a way of self-insuring strategy of the farmers to strengthen the households overall income (Alasia, Weersink, Bollman, and Cranfield, 2009). It is very helpful for the farmer in a condition when he has to face loss in agriculture due to any factor, which may be natural, or artificial (Muhammad, Qing & Umar, 2015).

Most studies in the area of off-farm business indicated that, demographic characteristic and financial and resource bases of the household are considered as main factors determining the decision of participation in off-farm activities. For example, using data on 200 households selected from 40 villages of Southeast Nigeria, Ibekwe *et al.,* (2010) examined factors determining non-farm income. Their findings shows that age of the household, education level, farm size and hours spent on farm activities are the most significant variables determining both farm and off-farm income. Specially, the size of farmland is positively associated with farm income whereas negatively correlated with off-farm income. This indicates that increases in the size of farmland increases farmers' willingness to operate in farm activities than participating in off-farm activities. They also found positive association between household size and farm income and negative correlation between age of the household and off-farm income, implying less participation of older farmers in off-farm activities.

Bedemo *et al.,* (2013) studied factors determining the decisions to participate in off-farm work in western Ethiopia. The finding of their study shows that variables on household

characteristics, access for credit and size of farmland are major determinants of decisions to participate in off-farm activities. Zahonogo (2011) also examined factors determining participation in non-farm activities in Burkina Faso and results of his study indicate that participation in non-farm activities mainly related to farm income, technologies in farm production, age and education of the household head, the number of working individuals in the household and the amount of rainfall. Accordingly, income from farm activities was found to have a negative effect on participation in the non-farm activities; whereas, other variables were found to have positive effects on participation in non-farm activities.

On his analysis on factors determining decisions to participate in off-farm activities in Ethiopia, Beyene (2008) estimated separate models for male and female members of a given farm households. His result indicates that training on off-farm activities and health status of the participant has considerable impact on their participation in off-farm activities. Besides the human capital variables, access to credit and income transfers were also found to have positive impact on off-farm activity participation. Accordingly, trained farmers are more likely to participate in off-farm business. In addition, transfer income and credit have a positive effect on participation in off-farm activities. He also confirmed that female members of households are less likely to participate in off-farm activities because of cultural factors and influences of the household head. His study however does not indicate the impact of off-farm activity participation on farm activities

2.4 Analytical Reviews

In this section, the fundamental basis of major analytical tool for analysing the data for the study were examined. The models include ordinary least square regression model and binomial logistic model.

2.4.1. OLS multiple regression

Multiple regression analysis is an econometric method used to study relationships involving more than two variables. Awoke (2001) opined that the variation in the endogenous variable is explained by more than one exogenous variable. Gujarati and Porter (2009) also opined that most regression models are multiple regression models because few economic models can be explained by only one variable. The fundamental objective of regression analysis is to forecast the single dependent variable by a set of regressors. In order to lug out a multiple regression analysis, researchers use a variety of modern statistical methods, econometric models and analytical software's (Eboh, 2009).

The purpose of regression analysis is to arrive at a set of values called coefficient for independent variables (Barbara & Linda,2013).The regression result is a generalization of equations that signify the best predictions of dependent variables from several continuous independent variables.

Multiple regression analysis can be stated either in the implicit or explicit forms as follows:

$Y=f(X_1,X_2,X_3,X_4,X_5,X_6,\ldots\ldots...Xn,e)$(implicit form) …….. 2.4

$Y=b_o+b_1X_1+b_2X_2+b_3X_3+b_4X_4\ldots\ldots+bnXn+e$ (explicit form) ….. 2.5

Where:

Y=dependent variable

bo=intercept

b_1-bn=regression coefficients

X_1-Xn=independent variables.

In this study, regression analysis was used to determine the effects of off-farm income on the output of rice farmers. Several authors have used multiple regression analysis in their different studies. For instance, Ukwuaba (2016), Onyemauwa (2010); Isibor and Ugwumba

(2014) and Kainga (2013) used multiple regressions to guesstimate the factors that influence the marketing margins of watermelon marketers in various regions in Nigeria. In addition, Ebewore and Achoja (2012) used the tool in identifying the determinant of returns to management in snail marketing in Delta state, Nigeria.

2.4.2. Binomial Logistics Regression

Binomial logit model is usually used to model relationships between a two-response variable and a set of regressor variables (Ying so and Kuhfeld, 2005). As stated by Enete (2003) binomial logit regression is used when the dependent variable in question is ordinal and consists of two categories. Binomial logit model was employed in this study due to its suitability to estimate the influence of socio-economic characteristics of the farmers on dichotomous nature of either participating or not participating in off farm activities.

Binomial logit model is a choice between two responses. According to Ying and Kuhfeld (2005) an ordered model, the response *Y* of an individual unit is restricted to one of *two* values.

$$Pr \quad (Z = 1) \quad = \quad \frac{\ell^{x\beta(1)}}{\ell^{x\beta(1)} + \ell^{x\beta(2)} + 1} \quad \text{..... 2.6}$$

The relative probability of $Z = 1$ to the base category is;

$$\frac{Pr\,(Z = 1)}{Pr\,(Z = 2)} = \ell^{x\beta(1)} \qquad \text{…….. } 2.7$$

Enete (2003) reported that, the exponential value of a coefficient is the relative likelihood ratio for one-unit change in the corresponding variable. As pointed out, the dependent variable “participating on off farm activities” have two possible values; value 1 if a farmer is participating, value 0 otherwise. The willingness to participate by a farmer could be a function of some socio-economic variables of the farmer. The study included the following independent variables;

X_1 (Age) = Age of the farmer (in years)

X_2 (Sex) = Sex of the farmer (male 1; female 0)

X_3 (Fm Exp) = Years of farming experience (in years).

X_4 (YrofEdu) = Years of formal education (in years).

X_5 (Income) = Annual income of the farmer (in ₦)

X_6 (FmSize) = Total farm size (in hectares)

X_7 (Topo) = member of cooperatives

X_9 (ExtContact) = Number of extension contact per cropping season (in number)

X_{10} (HhldSize) = Household size (in number)

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Study Area

The study area is Ebonyi State. It is an inland South –East State of Nigeria that was created on October 1st, 1996 out of the former Abia and Enugu States. Its capital and largest city is Abakaliki. Geographically, the state, which lies approximately between latitudes 5˚40' and 6˚45' N of Equator and longitudes 7˚30' and 8˚28'E of Greenwich Meridien. The state is bounded to the southeast by Cross River State to the North east by Benue State to the west by Enugu State and to the south west by Abia State (Ebonyi State ministry of land and survey, 2005). Presently, the state has 13 local Government Areas. The State is divided into three Agricultural Zones, which includes the following: Ebonyi North Agricultural zone comprising Abakaliki, Ebonyi, Izzi and Ohaukwu LGAs; Ebonyi Central Agricultural Zone comprising Ezza North, Ezza south, Ikwo and Ishielu Local Government Areas and Ebonyi South Agricultural Zone Comprising Afikpo North, Afikpo South, Ivo, Ohaozara and Onicha Local Government Areas

The state has a population of 2, 175, 501 (NPC, 2006) and a land mass of about 5,535sqkm^2 most of which are fertile and arable (Egwu, 2002). The mean and annual temperature is about 80^{o}F and the mean annual rainfall varies between 1700mm to 2500mm (Eze&Idike, 1997). The state is blessed with an abundance of flood plains and a good number of perennial and seasonal rivers and other mineral resources such as salt deposit, zinc, limestone, lead, Gypsum, Quarrying reserves, lignite, uranium, crude oil, laterites and phosphate (Nwambe, 2004).

The farmers are engaged in growing different types of food and cash crops such as rice, yam, cassava, sorghum, coco yam, maize, vegetable, oil palm, groundnut, tomato, okra, cowpea, sesame as well as keeping some ruminant animals like; goat, sheep, cattle, etc.

Figure 3.1: Map of Ebonyi State.

Source: Google map (2016)

3.2 Sampling Procedure

Ebonyi State is divided into three agricultural zones (Ebonyi North, which comprised of four local government areas; Ebonyi Central, which comprises of four local government areas and Ebonyi south, which comprises of five local government areas). There is rice production in all the three zones. Therefore, this research employed multistage sampling technique in the selection of respondents for the study. A list of 321 rice farmers was obtained from Ebonyi State Agricultural development Programme (EBADEP) that formed the sample frame for the study.

The first stage was random selection of two (2) local government areas from each of the three (3) Agricultural zones of the state(Ohaukwu L.G.A and Izzi L.G.A from Ebonyi North Zone, Ezza North L.G.A and Ikwo L.G.A. from Ebonyi Central Zone Ivo L.G.A and Ohaozara L.G.A from Ebonyi South Zone), which gave six (6) local governments areas. In the second stage, five (5) Autonomous communities were randomly selected from each of the selected local government areas, making thirty (30) communities. Finally, four (4) rice farmers were randomly selected from each of the communities. This gave one hundred and twenty (120) farmers sampled for the study.

3.3 Data Collection

Data for this study were collected from primary sources. The data were collected using a set of well-structured and pre-tested questionnaire. The questionnaire was designed to capture information on socio-economic characteristics of the farmers, the off-farm activities of farmers, the effects of off-farm income on the rice output of the farmers.

3.4 Validity and Reliability of Instrument

Content validity were to determine the adequacy and relevance of the instruments. In the process, the instrument was thoroughly examined by two experts independently from

the Ebonyi state ministry of Agriculture and the Department of Agricultural Economics University of Nigeria, Nsukka. The experts gave their critical opinions on the adequacy and relevance of the instruments to the objectives of the study. The observations were harmonized and necessary corrections effected on the instruments before the field survey commenced. This was done in line with the recommendation of Kerlinger (1973) that reliability to check the consistency and the reaction of the respondents to the questions using the test-retest method were conducted.

3.5 Method of Data analysis

The nature and purpose of study determines the type of analysis to be employed (Chukwuone, 2009). However, any study that requires a detailed analysis of quantitative relations need a higher level of analysis other than descriptive statistical tools (Eboh, 2009). In this study, both descriptive and inferential statistics were employed in data analysis. The statistical tools that were used include descriptive statistics such as percentages, means, and relative frequencies, and inferential statistics such as Ordinary Least Square Multiple Regression. Therefore, Objectives (i), (ii),and (v) (description of the socio-economics characteristics of the small-holders' farmers, description of the off-farm activities of farmers in the study area, and identification of factors limiting farmers participation in off farm-activities) were realized using descriptive statistics such as mean, percentages and frequency distribution counts. Objective (iii) (estimation of the factors determining participation in off-farm activities among the smallholder farmers) was achieved using binomial logistic model. Objective (iv) (determination of the effects of off-farm income on the output of the farmers was achieved with Simple Regression Model. Finally, the null hypotheses of the study were tested using t- values and z-values produced by the regression analysis by comparing with t-critical values and z-critical values for each variable, to reject or accept the null hypothesis with respect to the variable.

3.6. Model Specification

3.6.1 OLS Simple Regression Model

The OLS simple regression model was used to determine the effects of off-farm income on the production output of the rice farmers in the study area. OLS simple Regression Model for the Effects of Off-Farm income of small holders' rice output is specified below;

Y = F (X, e) implicit form …… 3.1

The explicit forms are presented in four functional forms below;

Leaner form

$Y = b_0 + bX + e$ ……. 3.2

Semi-log form

Y = b0 + blogX + e …….. 3.3

Double –log form

LogY = b0 + blogX + e …….. 3.4

Exponential form

Y = b0 + bexpX + e …….. 3.5

Y = output of rice (kg)

b0 = constant term

b = parameter estimated

X = Off- Farm Income(Naira)

e = error term

3.6.2. Binomial Logistic Model

Binomial Logistic regression model was used to estimate the factors determining farmers' participation in off-farm activities and stated implicitly and explicitly below:

$Y = f (X_1, X_2, X_3, X_4, X_5, X_6, X_7 \ldots\ldots X_9)$……. 3.6

$Y = a_0 + a_1X_1 + a_2X_2 + \ldots + a_9X_9 + e$ …… 3.7

Where,

Y = participation in off-farm activities (dummy; 1 if participated in an off-farm activity, otherwise, 0)

X_1= Age of respondent (years)

X_2= Gender (dummy variable: Male=1, Female = 0)

X_3= Marital status (dummy; 1 if married, otherwise 0)

X_4= Household Size (number of persons)

X_5= Education level (years)

X_6= Farming Experience (years)

X_7= Farm size (hectares)

X_8= Membership of Cooperative Society (dummy; 1 if member, otherwise 0)

X_9 = Access to credit (dummy; 1 if access, otherwise 0)

e=Stochastic error term.

3.6.3. Test of Hypotheses

The null hypotheses were tested using t- test and z-test on the decision rule that if t-value or the z- value produced by the regression analysis were greater than the t-critical and z-critical, reject the null hypothesis and accept the alternatives.

CHAPTER FOUR
RESULTS AND DISCUSSION

The findings presented in this chapter were based on the specific objectives of the study, which were to: describe the socio-economic characteristics of the smallholder rice farmers, describe the off-farm activities of rice farmers in the study area, estimate the factors determining participation in off-farm activities among the smallholder rice farmers, determine the effects of off-farm income on the output of rice farmers and identify factors limiting farmers' participation in off-farm activities in the study area.

4.1 Socio Economic Characteristics of the Respondents

The socio economics characteristics of the rice farmers may affect the production output in the study area. The socio-economic characteristics studied include the age of the rice farmers, marital status of the farmers, household size of the farmer, educational level, gender, farming experience, access to extension services, farm size, membership of cooperative societies, and participation in off-farm activities, major occupation and access to credit facilities.

Age is an important factor in the socio-economic characteristics of the rural rice farmers. The average age of respondents (36 years) according to their age is presented in table 4.1. The highest age bracket is between the ages of 21 to 30 years representing 55.83% of the entire respondents. Conversely, the lowest age bracket was those below that age of 20, representing 3.33% of the entire respondents. This implies that majority of the respondents were mature but young individuals, who may be more familiar with so many off farm businesses.

Table 4.1: Distribution of Rice Farmers according to their Socio-Economic Characteristics

Parameters	Frequency	Percentage
Age (years)		
Less than 21	4	3.33
21- 30	67	55.83
31 - 40	29	24.17
41 – 50	17	14.17
Above 50	3	2.50
Mean age	= 36	
Marital status		
Single	37	30.83
Married	51	42.50
Divorced	20	16.67
Widowed	12	10.00
Household size		
Less than 3	60	50
3 – 6	29	24.17
7 – 10	30	25.00
11 and above	1	0.83
Mean	= 5	
Educational level (years)		
None	4	3.33
1 - 6	24	20.00
7 – 12	43	35.83
13 – 17	33	27.50
Above 17	16	13.33
Gender		
Male	60	50
Female	60	50
Farming experience		
Less than 5 years	4	3.33
6 – 10 years	58	48.33
11 – 15 years	16	13.33
16 – 20 years	42	35.00
Mean	= 12	
Access to extension service		
Access	60	50
No access	60	50
Farm Size		
Small (less than 2 plots)	8	6.67
Medium (2 – 4 plots)	73	60.83
Large (5 plots and above)	39	32.50
Cooperative society membership		
Member	41	34.17
Non-member	79	65.83

Parameters	Frequency	Percentage
Participation in Off-farm activities		
Yes	89	74.17
No	31	25.83
Major Occupation		
Yes	54	41.00
No	66	59.00
Access to Credit		
Yes	73	60.83
No	47	39.17

Source: Field Survey Data, 2018

The average age also implies that majority of the respondents have sufficient wealth of experience in terms of farming experience in years and that majority of the respondents fall in the independent class of the society and are thus able to carry out agriculture while engaging in off farm activities.

From the results in table, 4.1 it can be gleaned that 51 out of 120 respondents interviewed representing 42.50% of the sample were married, 37 respondents were single representing 30.83% and 12 of them were widowed representing 10%. This implies that most of the rice farmers in the study area were faced with many responsibilities, which may push them into off-farm activities to earn extra income for the family. This result is in line with the findings of Adepoju and Obayelu (2013) who reported that instability of income and its consequences were felt more by married farmers than single farmers in areas like provision of food, shelter, and clothing for his family etc. unlike the single farmer who has fewer responsibilities. This also implies that use of off farm income as a risk management strategy is of greater importance to the married farmers that rely on returns from sales of agricultural produce for upkeep of the household.

Household size is conceptualised as the number of people living together and eating from the same pot (Reardon, Berdegué, & Escobar 2000). It is an important area of consideration in the socio-economic characteristics of respondents. The Average household size of the respondent is seen in table 4.1. From the table, the average household size was approximately five persons. Household size may determine the extent of savings and influences decisions taken with respect to risk management and off farm activity to adopt. The results implies that majority of the respondents were burdened with responsibilities and may therefore be careful of what off farm activity to adopt.

Educational level of a farmer (through which he acquires knowledge), measured by the number of years spent in school may determines the ability of the farmer to make realistic and profitable decision on matters related to agricultural production and draw on approaches to better off farm activities that best reduce the occurrence of low productivity. Educational level according to the Respondents is presented in table 4.1. From the result obtained, 4 of the respondents interviewed constituting 3.3% of them had no formal education, 24 of them constituting 20% had 1 – 6 years level of education. Forty-three respondents constituting 35.83% had 7 – 12 years of education while 33 of the respondents constituting 27.50% had 13 – 17 years level of education. Only 13.33% of the respondents had above 17 years of level of education. It can be deduced from the result that majority of the farmers had primary education while 4 out of 120 respondents did not have any form of formal education. The result implies that the level of education influences the respondent's knowledge on risk management and ability to engage in multiple streams of income and thus influences their choices of engaging in off farm activities. Thus, result from the table above implies that majority of the respondents may be knowledgeable to engage in off farm activities. The result conform with the findings of Reardon, Berdegué, Barrett, & Stamoulis, (2006) that high level of illiteracy, poor access to credit, technology and market, weak institution and

structure, severe poverty and poor governance system and limited sources of employment and income from agriculture are among the constraints to adaptation in most cases.

Out of the 120 rice farmers (respondents) interviewed 60 were male constituting Half (50%) of the sample size. From the result, it can be deduced that equal number of female and male rice farmers were sampled. The relatively equal percentage of males and female involved in the rice farming may be explained by the system of rice production in the area where men and women have the equal access to the venture. Rice production in the area is opened to all and appears to be a common practice in the area and so can be entered by anybody. The ability of both male and female to engage in the rice production also depends on the regions (Davis, 2004). Study by Davis, (2004) shows that in areas where there is gender disparity in terms of access to land and production factors, it deters women's participation in the region. This explains why the males are allowed more access to assets due to inheritance than the females

Table 4.1 also shows the distribution of respondents according to their participation in off farm activities. From the table, majority of the respondents (74.17%) participate in off farm activities. This implies that the rice farmer in the area adapt to their responsibilities by participating in off- farm activities as a way of earning extra income. In addition, this may lead to an increase in production if the income is channelled into their rice production. This finding is against that of Barrette, Bezuneh, and Aboud (2001), who concluded that in areas of low agricultural productivity, increasing off farm employment results in labour transfer out of farming and leads to reduced farm incomes and production. However, it can be argued that income realised from off farm activities can be channelled to increase agricultural productivity.

A farmer who has been engaged in farming for so many years will be more familiar with risks and possible measures to reduce its occurrence than farmers who have lesser years

of experience. The average number of years spent by respondents in farming is presented in table 4.1. The average farming experience was 12years. This implies that majority of the respondents may have been familiar with risk management and thus engage in off farm activities.

Access to extension services increased farmers' knowledge about best practices hence increases their productivity. The table 4.1 shows that half of the respondents have access to extension service delivery. The result also shows that majority of the respondents (65.83%) do not belong to any cooperative society at all while 34.17% belong to one form cooperative society or the other. Cooperative membership create access to networks and opportunity to diversify and be engaged in other activities and increase income as well. In general, 59% of the respondents have rice production as their minor occupation. This means that 41% of the respondents have rice production as their major occupation. This is significant as it shows that sizeable number of the respondents have means of absorbing shock in case of crop failure. However, it can also be argued that having rice production as major occupation suggests that the farmer put in most of their time in the business which might likely translate to higher production.

The result on the table equally shows that majority of the rice farmers (60.83%) do not have access to credit while only 39.17% of them have access to credit. This implies that farmers who have means of credit has the higher tendency of diversifying the income in the state. Their poor access to credit may be as the result of the poor access to extension services and low membership cooperative societies.

4.2 Description of Off-Farm Activities of Rice Farmers

Study conducted by Ruben & Van den Berg (2001) showed that farmers engage in off farm activities for various reasons. The study showed that interviewed respondents embarked on other non-farming activities for cash, to keep themselves busy, and for the fun of it, for

averting risks and for controlling contingencies. The distribution of respondents based on the off-farm activities engaged is presented in table 4.2

Table 4.2: Distribution of Respondents based on the Off-Farm Activities engaged by the Rice Farmers.

Off – farm activities	Sub activities	Frequency	Percentage
Unskilled wage works		17	14.16
Civil service		43	35.83
Trading		13	10.83
Driving			
	Okada riding	3	2.31
	Tricycle riders	6	4.23
	Bus drivers	2	1.99
Weaving		10	8.33
Palm wine tapping		3	2.50
Craft making			
	Wood and calabash carving	0	0
	Carpentry	1	0.88
	Pot making	0	0
	Leather work and weaving	0	0
	Hair saloon	5	4.33
Mechanics			
	Bicycle repairers	0	0
	Volcanizes	0	0
	Tricycles repairers	1	0.88
	Motorcycle repairers	0	0
	Car repairers	3	3.33
	Electronic repairers	0	0

Source: field survey (2018) N.B multiple responses were recorded.

The result presented in table 4.2 include a multiple responses, as each respondent can be engaged in more than one off farm activity. The table shows that high proportion (35.83%) of the respondents engage in civil service. The interviewed respondents reported that engaging in civil service gives them the time they need to cultivate in their farms. This suggests that the farmers have the ample time to combine civil service and rice production. The result is in line with the findings of Ruben *et al.,* (2001), who reported that most civil servants always have additional stream of income.

Unskilled wage work contributed over 14% of the off-farm work engaged by the respondents. Unskilled work is the segment of workforce associated with a limited skill set or minimal economic value for the work performed (Ruben *et. al*. 2001). Unskilled labour is generally characterised by a lower educational attainment, unlike secondary school or university graduates. This suggests that most of the respondents with little or no informal education could engage in off-farm activity. This means that education might not necessarily be a deterrent to engaging in off farm activities as they can engage in unskilled off farm activities.

The result of table 4.2 shows that 10.83% of the rice farmers engage in trading. Trading simply involves the act of buying and selling (Ruben et. al. 2001). Trading actually forms a common activity for individuals in the study area. Therefore, it is common for some of the farmers to be engaged in trading as both secondary and even primary occupation. The table also shows driving and mechanic as one of the off farm activities engaged by the farmers. The bike drivers commonly known as 'Okada' and the tricycle drivers known as 'Keke' may be one of good off farm business for the farmers in the area. After further questioning, Most of the respondents reported that they earn a very large income from driving and from their mechanic works. Result in table 4.2 shows that over 14% of the respondents engage in driving as their off-farm activities while up to 4% are also mechanics as well as rice farmers.

4.3 Determinants of Off-Farm Activity Participation among Rice Farmers

Binomial Logistic regression model was used to identify the factors that determines farmer's participation in off-farm activities. The variables tested include Gender, Age of respondent, marital status, Household Size, Educational qualification, Farming Experience, Farm size, Membership of Cooperative Society and Access to credit.

Table 4.3: Determinants of Off Farm Participation

Variables tested	Coefficient	z-value	p-value
Constant	-6.4275	-2.77	0.006***
Age	0.0115	0.23	0.818
Gender	5.0208	4.28	0.000***
Marital status	0.4802	0.75	0.451
Household Size	-0.3645	-1.63	0.103
Education	0.0290	0.05	0.959
Farming Experience	0.2000	0.99	0.321
Farm size	0.4385	2.06	0.039**
Cooperatives	-0.5121	-0.47	0.638
Access to credit	1.4677	2.79	0.005***

Psudo R^2 = 0.6345 Prob > Chi = 0.0000 LR Chi (9) = 87.00
***, ** and * shows significant at 1%, 5% and 10% level of probability respectively.

Table 4.3 shows the results of binary logistic regression, explaining the determinants for farmers to participate in off-farm activities. The Prob > Chi = 0.0000 test results indicates that the model is good fit. The Psudo R^2 value of 0.6345 indicates that the model explains about 63 percent variations in farmers' participation in off farm activities. The model predictive ability is 63.45%.

The coefficients of the variables do not give the direct information about the effect of changes in explanatory variables on the probability of participation in off farm activities. For clear understanding, this odds ratio/Exp(β) is necessary to discern. This is the ratios of the probability of participating in off farm activities to the probability that the person will not take part. The variables, which are affecting significantly the probability of participation in off farm activities, are gender, farm size, and access to credit. The result shows that all the statistically significant variables were positively changing the probability. The results implies that by increasing the total farming area, the chances of farmer to go for business activities increases by the value of the associated odds ratio, which is 0.4385. There may be a reason that by increasing farming size, household may earn more income from his rice production and so there is a chance to invest higher income in off farm activities. This finding is in conformity with that of Rahman (2013) who reported similar finding.

Similarly, the probability of participating in off-farm activities increases with increased access to credit and with gender. It is understandable that as farmers access to credit increases the probability that the farmer will invest in off farm activities rises. Similarly, more male farmers have the probability of engaging in off farm activities. Men naturally have the strength to multi task especially in order to provide for the family. These results are expected but are contradictory with studies by Reardon (1997) who reported that the coefficient of farm size is unexpectedly negative as there may be reason of spending more time in farms.

4.4 Effects of Off-Farm Income on the Output of Rice Farmers

Simple regression was used to determine the effects of off-farm income on the output of rice farmers in Ebonyi State. The results were fitted in four functional forms; linear, semi-log, double-log and exponential forms. The result were presented in table 4.4.

Table 4.4: Regression Result on Effects off-farm income on the output of the rice farmers.

Variables	linear	semi-log	double log	+exponential
Constants	0.2393345 (5.81) ***	0.2424981 (6.11)***	0.485047 (6.64)***	17.40643 (0.59)
Annual off farm income	0.5306882 (9.09) ***	0.1877058 (8.58)***	0.5348506 (9.46)***	0.5424562 (11.12)***
R^2	0.4119	0.3843	0.4315	0.5118
F- ratio	82.64 ***	73.67***	89.58***	123.72***

***,** and * shows 1%, 5% and 10% level of significance respectively. Values in bracket shows t-values.

Source: field survey, 2018.

The exponential form was adopted as the equation of best fit among the models. The selection was done based on the equation with the economic criteria of highest R^2 value (0.5118). The value of R^2 implies that about 51% of the variation in the output of rice farmers

were as a result of the variation in the off- farm income of the farmers, while the rest were due to the other variables not included in the regression model. .

In line with the aprior expectation, independent variable (annual off-farm income of the rice farmers) had positive coefficient and statistically significant at 1% level of probability. The implication is that as the off- farm income of a rice farmer increased; there was a marginal increase in the quantity of rice produced. This could be that the farmer invested the off-farm income in the rice production, either in the procurement of the variable inputs or on improved technologies in the rice production. This finding is in line with the finding of Babatunde (2013), who reported that there was positive association between the off-farm income and output. Similarly, Stampini and Davis (2009) observed that non-farm income has influenced the use of variable inputs in rural Vietnam, where farmers having off-farm income sources invested more on seeds, fertilizer, agricultural services and hired labour.

4.5 Factors limiting farmers' participation in off-farm activities

Analysis of the constraint was done by means of mean score of a critical mean of 3.0. The factors hindering the rice farmers' participation in off farm activities in the study area are presented in Table 4.6. The identified constraints include: Lack of Education (3.1), Age of the farmer (3.08), Health status of the farmers (3.04), limited time (3.04), poor access to credit (3.36) and poor assess to extension services (3.04)

Table 4.5: Factors limiting farmers' participation in off-farm activities

Constraining factors	X	S. D	Decision
Lack of Education	3.158333	1.11518	A
Age of the farmer	3.083333	1.185227	A
Health status	3.041667	1.048375	A
Household size	2.766667	0.85733	R
Unavailability of the off-farm works	2.897196	1.072245	R
Insufficient capital	2.5	0.733359	R
limited time	3.041667	1.118191	A
poor access to credit	3.366667	1.249762	A
poor assess to extension services.	3.041667	1.21887	A
High yield	2.866667	1.011973	R
Unstable government policies	2.691667	0.959655	R
Inadequate power supply	2.637168	0.916729	R
Poor communication network	2.566667	0.867076	R

Note: X = Mean
SD = Standard Deviation
A = Accept; R = Reject

Lack of access to credit as a constraint took the first position in the ranking as shown by the study. Many rice farmers in the study area lack adequate capital to either operate their farms profitably, expand them or to start up another business. This might be due to unwillingness of financial institutions to grant loans to the farmers or high interest rate of the loans when given.

Lack of education is a second ranked challenge facing rice farmers in engaging in off farm activities. According to Barrett *et al.,* (2001), education exposes farmers to the awareness of diversifying and the skill to successful engagement in multiple businesses profitably. Most of the farmers in the area were in the agreement that lack of education proves to be a limiting factor in diversifying and engaging in off farm activities. The result of the regression also concurs to this fact as increase in educational attainment leads to increase in the output of rice produced by the farmers, which may be as the result of engaging in off farm activities, from which he could earn extra income for the procurement of production inputs.

Age of the farmers is in the third position of the major constraints to participating in off farm activities. This confirmed the findings of Barrett et al. (2001). According to Barrett et al. (2001), rice farmers who are advanced in age are not usually willing to take up additional off farm activities. Conversely, the younger farmers can easily multitask and work as many jobs as possible.

Poor access to extension services is another constraint being faced by the rice farmers in the study area. The inability of some farmers to get useful information from extension agents will make them ignorant of the need. Access to extension service is closely related to inadequate education. Extension service will not only lead to exposure but will also increase the farmers' skills and information on how to go about adapting to multiple activities.

Limited time is also one of the limiting factors in taking up off-farm activities and gaining more income. Farmers in the area with free time will always have the opportunity to engage in more work. This can explain the reason why the younger ones are usually the ones that engage in more off farm works.

Finally, health status of the farmers also loaded as a limiting factor to their engagement in off farm activities. The farmers' health status may be ill health or sound health. Most of the farmers who are not sound in health always have the tendency of sticking to their farm alone. More work will only lead to deterioration of the farmer's health. Therefore, it is not surprising that ill health will be a limiting factor to engaging in off farm activities.

Other factors such as household size, unavailability of off farm work, insufficient fund, high yield, and unstable government policies were among the possible limiting factors, however, since their mean values were less than 3, these variables were not considered as constraints to taking up off farm activities.

4.6 Test of Hypothesis

HO_1: Off-farm income has no significant relationship with rice output in the study area.

The estimated t-value of the off – farm income of the rice farmers with corresponding P-value of 0.000 was found to be significant. Therefore, the null hypothesis that off-farm income of the rice farmers has no significant effects on their output was rejected and the alternative hypothesis accepted.

HO_2: Socio-economics characteristics of the rice farmers have no significant influence on their participation in off-farm activities

The estimated z-values of gender, farm size and access to credit with corresponding P-values of 0.000, 0.03 and 0.005 respectively, were found to be statistically significant. Therefore, the null hypothesis that socio-economics characteristics of the rice farmers had no significant influence on their participation in off-farm activities was rejected and the alternative hypothesis accepted.

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CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Generally, in Nigeria, due to the small farm size of rice farmers, low returns and the need to make ends meet, majority of rural rice farmers are exposed to food insecurity and chronic poverty. These households therefore, usually participate in off-farm activities to supplement their agricultural income. It is expected that off-farm income generated would be used to enhance productivity in farming. The basis of this study was to investigate the effects of off-farm income on smallholders' rice production in Ebonyi State, Nigeria. To achieve this, the study specifically described the socio-economic characteristics of the smallholder rice farmers, described the off-farm activities of rice farmers, estimated the factors determining participation in off-farm activities among the smallholder rice farmers, determined the effects of off-farm income on the output of rice farmers and identified factors limiting farmers' participation in off-farm activities in the study area.

The study was carried out in Ebonyi State, Nigeria. The research employed a multistage sampling technique in the selection of respondents for the study. Data were collected from One hundred and twenty (120) rice farmers using well-structured questionnaires as an interview guide. Descriptive statistics like frequency, percentage mean and inferential statistics like regression model were used in data analysis.

The study showed that out of the 120 rice farmers (respondents) interviewed, 60 were males constituting half (50%) of the sample size. 51 out of 120 respondents interviewed representing 42.50% of the sample were married, 37 respondents were single representing 30.83% and 12 of them were widowed representing 10%. The highest age bracket is between the ages of 21 to 30 years representing 55.83% of the entire respondents. The average household size was approximately five persons. Four of the respondent interviewed

constituting 3.3% of them had no formal education, 24 of them constituting 20% spent 1-6 years in education. Forty-three respondents constituting 35.83% spent 7-12 years in education while 33 of the respondents constituting 27.50% acquired tertiary education. Majority of the respondents (74.17%) participated in off farm activities. The average farming experience was above 18years, and half of the respondents have access to extension services delivery.

Results of the findings showed that Gender, Farm size and Access to credit by the rice farmers were the major determinants of their participation in off farm activities among other factors that could influence it. More so, the result of the simple regression analysis showed that off-farm income significantly influenced the output of rice produced by the farmers. It equally showed that about 51% increase in the quantity of rice produced per hectare of land was as the result of the off – farm income earned by the rice farmers.

The identified constraints/factor limiting farmers participation in off farm income in the study area include: lack of Education, Farm size, Age of the farmer, Health status, limited time, poor access to credit, poor assess to extension services, among others.

5.2 Conclusion

Based on the findings of this study, one can agree that; off-farm income reduces poverty and enhances income of rice farmers and should be encouraged. Previous studies merely highlighted the involvement of farmers in off-farm income generating activities without investigating the determinants and its impact on their level of production. This study filled these gaps. The socioeconomic factors which influenced rice farmers participation in the off farm income generating activities were determined. There was a significant relationship between off farm income and the rice output of the farmers. Rural economies in Ebonyi state, Nigeria are quite diversified, but agriculture is still the main economic activity for many households. Many households have started new income-generating activities such as civil

services, trading, motor cycle and tricycle riding among others. Many problems and constraints such as the lack of financial resources has to be tackled. Harnessing farm diversification especially in the non-farm economic activities requires improving the health status of the farmers, thus strengthening incentives and reducing risks for the actors. Addressing these issues will definitely ensure food security, good health and at the same time improve the living standard of the rural people.

5.3 Recommendations

Diversification of farm households into other activities affects rice farmers, by raising the level of farm income and the viability of farms. However, household livelihoods' diversification depends on the existence of a healthy and diversified rural economy, which provides off-farm work opportunities as well as services.

For rural policy to be more effective, small fragmented programmes should be replaced by an integrated rural development policy, that rural farm and non-farm households can benefit from, which requires a strong horizontal coordination effort at all governance levels. In fact, it is necessary to reframe and redesign the rural development policy as agriculture is no more the only way to alleviate poverty and to improve rural living standards.

Fully exploiting rural economy diversification potential in Ebonyi state, and Nigeria at large requires also improving rural governance, upgrading rural people's human capital, strengthening rural social capital and improving physical capital as well as access of the rural population to finance. That requires also a favourable and enabling legal and legislative environment fostering farm activity diversification.

From the major findings of this research work, the following recommendations were made:

i. Rice farmers should be encouraged to take up off farm activities to argument their income, which will improve their production output and raise their standard of living.

ii. Creation of accessible credit schemes can facilitate the establishment of off-farm businesses

iii. Farmers should be encouraged to engage in other off farm activities, such as skilled works and properly informed on its advantages to livelihood.

iv. Farmers should be encouraged to belong or form cooperative societies to enable them have access to extension services and as well pull their resources together to access some government credits available for the farmers in the area.

v. Some of the constraints highlighted such as health status can be improved on, through provision of well resources equipped hospitals and clinics within the rural areas by the various levels of government, where the farmers can afford proper check-up bills.

vi. Increase in farm size as one of the determinant factors for participation in off farm income can be achieved through the government reviewing of the land decree Act of in the nation. This will make it possible for farmers to have access to farmland.

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APPENDIX I

QUESTIONNAIRE

Department of Agricultural Economics,
Faculty of Agriculture,
University of Nigeria,
Nsukka.
22nd May, 2018.

Dear Respondent,

EFFECTS OF OFF-FARM INCOME ON SMALL HOLDERS' RICE PRODUCTION IN EBONYI STATE, NIGERIA.

I am a postgraduate student (MSc) in the above department. I am carrying out research on the topic underlined above as one of the requirement for the qualification for the award of the certificate of the Master's Degree.

Kindly provide me with the relevant information as contained in the questionnaire in order to achieve the stated objective.

Please be assured that all information obtained from you will be treated with strict confidence and used for research purpose only.

Thanks,

Yours sincerely,

Ucha, Samuel Obinna.

SECTION A

Socio-Economics Characteristics of the Respondents

Please respond accordingly

1. village : ……..
2. community : ……
3. L.G.A. : ……
4. Agricultural zone : ……
5. Age (years): ……
6. Gender: a. male ( ) b. female ( )
7. marital status : a. single ( ) b. married ( ) c. widowed ( ) d. Divorced ( )
8. Household size: …….
9. How many years did you spend in education? ……..
10. Farming experience (years) : ……
11. Farm size (hectare) : ……
12. Membership of cooperative society. a. Yes ( ) b. No ( )
13. Extension contact. a. Yes ( ) b. No ( )
14. Participation in off farm activity (ies) . a Yes ( ) b. No ( )
15. if you participated in off farm activities, what is your annual off farm income (Naira) ₦ ...
16. Sources of labour. a. family members ( ) hired labourers ( )
17. Total output per hectare of rice farm in tonnes…….
18. What is your main occupation? a. farming ( ) b. trading ( ) c. civil service ( ) d. artisans ( )
19. What is your minor occupation? a. farming ( ) b. trading ( ) c. civil service ( ) d. artisans ( )
20. Do you have access to credit? a. yes ( ) b. No ( )
21. Do you have access to irrigation facilities? a. yes ( ) b. No ( )

SECTION B and C

Off – Farm Activities Participated by the Rice Farmers in the Study Area.

18. Which of the following off farm activities do you participate in and income generated per month?

Off-farm activities	**Sub-activities**	**Income**
Unskilled wage works	in others' farm	
	In non-farm works	
Teaching		
Clerical works		
Government and health works		
Trading		
Driving	okada riders	
	tricycle riders	
	bus drivers	
Weaving		
Tailoring		
Palm wine tapping		
Craft making	wood and calabash carving	
	Carpentry	
	pot making	
	leather work and weaving	
	hair saloon	
Mechanics	bicycle reapers	
	Volcanizes	
	tricycles repairers	
	motorcycle repairers	
	car repairers	
	electronic repairers	

SECTION D.

Factor Limiting Farmers Participation on Off Farm Income.

which of the following factors hinders your participation on off farm income.

Constraining factors	S. A	A	N	D	S. D
Lack of Education					
Age of the farmer					
Health status					
Household size					
Unavailability of the off-farm works					
Insufficient capital					
limited time					
poor access to credit					
poor assess to extension services.					
High yield					
Unstable government policies					
Inadequate power supply					
Poor communication network					
Others (Specify)					

APPENDIX II

Binomial Logistic Analysis on the Determinants of Off-Farm Actives' Participation among the Smallholder Rice Farmers in the Study Area.

```
. logit participationinofffarmactivity age gender maritalstatus householdsize educationallevel farmingexperience farmsize membershipofcooperativesociety pooraccesst
> ocredit

Iteration 0:   log likelihood = -68.556769
Iteration 1:   log likelihood = -31.244048
Iteration 2:   log likelihood = -25.859504
Iteration 3:   log likelihood =  -25.05805
Iteration 4:   log likelihood = -25.054769
Iteration 5:   log likelihood = -25.054769

Logistic regression                             Number of obs   =        120
                                                LR chi2(9)      =      87.00
                                                Prob > chi2     =     0.0000
Log likelihood = -25.054769                     Pseudo R2       =     0.6345
```

participationinofffarmactivity	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.0115579	.0502684	0.23	0.818	-.0869665	.1100822
gender	5.020839	1.172514	4.28	0.000	2.722752	7.318925
maritalstatus	.4802191	.63765	0.75	0.451	-.7695519	1.72999
householdsize	-.3645743	.223856	-1.63	0.103	-.8033241	.0741754
educationallevel	.0290165	.5620876	0.05	0.959	-1.072655	1.130688
farmingexperience	.2000096	.2016055	0.99	0.321	-.1951298	.5951491
farmsize	.4385095	.2126162	2.06	0.039	.0217894	.8552295
membershipofcooperativesociety	-.5121164	1.086897	-0.47	0.638	-2.642395	1.618163
pooraccesstocredit	1.467709	.5262696	2.79	0.005	.436239	2.499178
_cons	-6.427572	2.323781	-2.77	0.006	-10.9821	-1.873044

Appendix III

Four Functional Form of Simple Regression Analysis on the Effects of Off-Farm Income on the Output of Rice Farmers in the Study Area.

```
. reg totaloutputperhectare offfarmincome
```

Source	SS	df	MS		
Model	111.616995	1	111.616995	Number of obs	= 120
Residual	159.374671	118	1.35063281	F(1, 118)	= 82.64
				Prob > F	= 0.0000
Total	270.991667	119	2.2772409	R-squared	= 0.4119
				Adj R-squared	= 0.4069
				Root MSE	= 1.1622

totaloutput~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
offfarmincome	.5306882	.0583772	9.09	0.000	.4150855	.6462909
_cons	1.391388	.2393345	5.81	0.000	.9174401	1.865335

```
. reg totaloutputperhectare logofffarmincome
```

Source	SS	df	MS		
Model	104.153946	1	104.153946	Number of obs	= 120
Residual	166.837721	118	1.41387899	F(1, 118)	= 73.67
				Prob > F	= 0.0000
Total	270.991667	119	2.2772409	R-squared	= 0.3843
				Adj R-squared	= 0.3791
				Root MSE	= 1.1891

totaloutputper~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logofffarmincome	1.611052	.1877058	8.58	0.000	1.239343	1.98276
_cons	1.480493	.2424981	6.11	0.000	1.00028	1.960705

```
. reg logtotaloutputperhectare logofffarmincome
```

Source	SS	df	MS		
Model	11.4794655	1	11.4794655	Number of obs	= 120
Residual	15.1220848	118	.128153261	F(1, 118)	= 89.58
				Prob > F	= 0.0000
Total	26.6015504	119	.22354244	R-squared	= 0.4315
				Adj R-squared	= 0.4267
				Root MSE	= .35799

logtotaloutput~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logofffarmincome	.5348506	.0565115	9.46	0.000	.4229425	.6467587
_cons	.485047	.0730074	6.64	0.000	.3404724	.6296216

```
. reg  expofffarmincomeexptotaloutputperhectare
expofffarmincomeexptotaloutputperhectare not allowed
r(101);

. reg exptotaloutputperhectare expofffarmincome
```

Source	SS	df	MS		
Model	11380265.5	1	11380265.5	Number of obs	= 120
Residual	10853924.8	118	91982.4135	F(1, 118)	= 123.72
				Prob > F	= 0.0000
Total	22234190.3	119	186841.935	R-squared	= 0.5118
				Adj R-squared	= 0.5077
				Root MSE	= 303.29

exptotaloutput~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
expofffarmincome	.5424562	.0487687	11.12	0.000	.4458809	.6390314
_cons	17.40643	29.72559	0.59	0.559	-41.45832	76.27118

```
.
```