UNIVERSITY OF CAPE COAST

OFF-FARM LABOUR PARTICIPATION AND FARM HOUSEHOLD

INCOME IN ABURA-ASEBU-KWAMANKESE DISTRICT OF THE

CENTRAL REGION OF GHANA

BY

JOSHUA SEBU

THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS OF THE

FACULTY OF SOCIAL SCIENCES, UNIVERSITY OF CAPE COAST, IN

PARTIAL FULFILMENT OF THE REQUIREMENTS FOR AWARD OF

MASTER OF PHILOSOPHY DEGREE IN ECONOMICS

AUGUST 2011

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature: ……………………….   Date: …….………………….

Name: Joshua Sebu

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: ………………..   Date: ………………

Name: Dr. Peter B. Aglobitse

Co-Supervisor's Signature: …………………………   Date: ………………

Name: Dr. Christian R. Ahortor

ABSTRACT

This study sought to determine the effects of off-farm economic activities on farm household income in the Abura-Asebu-Kwamankese District in the Central Region of Ghana. A cross-sectional survey design was used and data was collected from farm household heads and their spouses in the district for the purpose of analysis. An interview schedule was used for the collection of the data from the respondents. In total 253 married farm households were interviewed.

A bivariate probit model was first estimated to find the decision of household heads and spouses in a married farm household to participate in off-farm economic activities. Afterwards, a Heckman sample selection technique was used to estimate the effect of participation in off-farm economic activities on farm households' income.

For the participation equation, it was found out that age, farm size, household size, access to credit and also access to remittances were significant in explaining the decision to participate. For the income function, the participation in off-farm economic activities had a significant effect on the farm household income.

In order to raise farm households' income, it is recommended that employment activities, such as the National Youth Employment Programme, that train and provide income to beneficiaries be improved and expanded.

ACKNOWLEDGEMENTS

DEDICATION

To my parents, Emmanuel K. Sebu and Felicia Gasu, and to my sisters, Yayra and Mawukoenya.

TABLE OF CONTENTS

Content   Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AgSSIP	Agricultural Services Sub-Sector Investment Programme
ARMS	Agricultural Resource Management Survey
FASDEP	Food and Agricultural Sector Development Policy
GDP	Gross Domestic Product
GH	Ghana Cedis
GLSS	Ghana Living Standards Survey
GPRS	Ghana Poverty Reduction Strategy
JSS	Junior Secondary School
MOLSA	Ministry of Labour and Social Affairs
MRPf	Marginal Revenue Product of the farm
OLS	Ordinary Least Squares
SPSS	Statistical Product and Service Solutions
SSS	Senior Secondary School
USDA	United States Department of Agriculture

CHAPTER ONE

INTRODUCTION

Background to the study

Ghana like any other developing country is described as an agrarian economy since the main use of land as a resource is for agricultural purposes. The total land area of Ghana is approximately 239 million square kilometers of which agricultural land is about 57 percent with only 20 percent of this land been used for cultivation. Agro-ecological conditions in Ghana determine the type of crop grown in a certain region. The forest zones, for instance, are good for tree crops, while food crops generally do better in the transitional and savannah zones.

The major crops produced in Ghana include maize, rice, wheat, yam, cassava, plantain, oil palm, tobacco, and cocoa. These are grown purposely to provide food and raw materials for industries as well as for export. Nevertheless, this sector is dominated by smallholder subsistence farmers and mostly dependent on rainfall.

Despite the smallholder nature of agriculture in Ghana, the sector after the service sector is the second largest contributor to the Gross Domestic Product (GDP) recording a contribution of 37 percent in 2005 and 41 percent in 2007. Agricultural growth increased from about four (4) percent in 2000 to six (6)

percent in 2005 but much of the recent growth was stimulated by the cocoa sector (Ministry of Food and Agriculture, 2007).

Foreign exchange earnings by the agricultural sector was about 30 percent during the later part of the 1980s and declined to about 26 percent during the first-half of the 1990s. This contribution to foreign exchange was mainly from the export of cocoa and timber. From 1986, the government began to promote the export of non-traditional commodities like food crops, seafood and processed commodities. Between 1986 and 1989, the non-traditional agricultural exports contributed about 67 percent of the total foreign exchange earned from the agricultural sector, but this declined to about 34.3 percent in the first-half of 1990 (Seini, 2002). Also between the period 1999 and 2002, the agricultural sector contributed 38.5 percent, 35.4 percent, 33.9 percent, and 35.5 percent respectively to Ghana's foreign exchange earnings (Asuming-Brempong, 2003).

The agricultural sector also plays a major role by providing food for the large proportion of the non-agricultural and urban population. With the problem of rural-urban migration, the increasing population will have to be fed by the declining number of the rural population. The sector provides the highest employment opportunity for the Ghanaian labour force. Thus, according to the GLSS 5 report of 2005, 55.8 percent of the working population is employed in the agricultural sector.

Some of the gains in the agricultural sector discussed in the above paragraphs could be attributed to some policies taken over the years. According to Seini (2002) agricultural policies in Ghana could be divided into five distinct

periods of policy variations. The first period is the pre-independence period (1874-1950) which was mostly geared towards the production of export crops and raw materials which were exported to the United Kingdom. The concentration on export crop production encouraged infrastructural development in Southern Ghana and resulted in urbanization, expansion of the mining sector and in-migration of labour from the northern to the southern part of Ghana. While the northern part of Ghana mainly provided labour for the export based economy of Southern Ghana, the North remained predominantly a subsistence agricultural area (Songsore, 1979; Shepherd, 1978, as cited in Seini, 2002).

The second period was the era of mass government participation or the post independence socialist period (1951-1966). Agricultural policies that were formulated were mostly influenced by the desire of the government to satisfy two major issues:

- to satisfy the urban youth who were part of the struggle for independence but were unemployed or underemployed and

- to create the idea that industrialization was the most appropriate way for rapid structural changes, high rates of economic growth and economic independence of the nation.

Thus, the government deemed it necessary to formulate agricultural policies that avoided over reliance on the small scale farmers but instead creating employment opportunities. Another policy was to tax the agricultural sector both directly and indirectly as a means to finance a rapid import based industrialization which was to be the solution to the nations' economic development.

3

The third period was the era of Capitalist Means of Production (1966-1972). This was done purposely because of the change in government. This policy emphasized on the private capitalist development of agriculture. The government sold state rice farms to private rice farmers as a means of promoting rice farming in the northern part of Ghana to increase food production.

The fourth period according to Seini (2002) was the Slide to Economic Chaos (1970-1983). The nation faced its worst times during this period of development. The economy deteriorated steadily. Food production for export and local consumption were badly affected. Government expenditure fell from over 27 percent of GDP in 1975 to 10.1 percent in 1983 due to the fall in the output of cocoa, the major foreign exchange earner. Domestic policies pursued and external factors like world oil price increase all contributed to these problem. Output from agricultural was limited by inappropriate pricing, taxation policy and also inadequate levels of public investment.

The fifth period was the Stabilization and Structural Adjustment era. The first phase of the programme (1983-1985) aimed at stabilizing the decline in the tradable sectors and re-establishing the condition for higher overall growth. The second phase of the reform (1986-1988) was aimed at steering the economy towards long-term growth. The third phase was the adjustment period also termed liberalization and growth phase which began in 1989.

Between 1990 and 2009, some policies have also been implemented directly or indirectly to help improve the performance of the agricultural sector. Some of these policies include Agricultural Services Sub-Sector Investment

Programme (AgSSIP), Food and Agricultural Sector Development Policy (FASDEP I & II), Ghana Poverty Reduction Strategy (GPRS I & II), the Millennium Challenge Account Programme and Youth in agricultural Project among others.

These policy changes may have no doubt influenced agricultural production by farm households in one way or another. The sought for economic development that also brought about these policy changes has also had its effect on the agricultural sector of Ghana. Such effect has seen a decline in the labour force of the Agricultural sector of Ghana. The number of active people in the labour force of the agricultural sector of Ghana has declined from 60 percent in the 1970's to about 47 percent in 1994 (Seini, 2002).

Economic transformation strategies meant for the development and growth of the economy brings about structural changes in the agriculture sector. This has often led to agricultural diversification. Also, this economic transformation causes changes in labour force participation in agriculture. At the early stages of economic development, the agricultural sector which is the dominant sector plays a major role by supplying the labour force required by the other emerging sectors such as the service sector as shown in Figure 1. Further, Seini (2002) explains that when the level of agriculture is at the subsistence stage, where output is mostly for home consumption, capital and labour skills available are insufficient to create non-agricultural employment at a rate equivalent to the increase in the number of employment seekers. Further, the proportion of agricultural workers in the labour force is reducing, but their absolute number is still increasing.

5
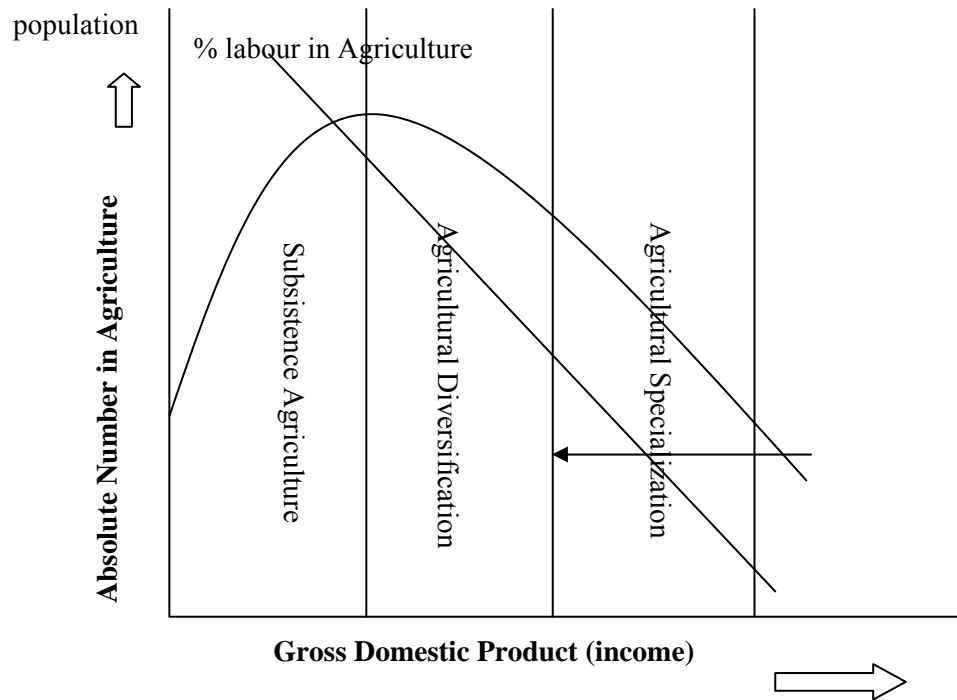
Figure 1: Labour force participation in agriculture in the process of economic transformation

Source: Seini (2002)

At the period of Agricultural diversification, which represents a transitional period, the rise in the demand for employment is almost equal to the rise in non-agricultural work opportunities. Here, Seini (2002) states that the proportion of those involved in agriculture is declining, but their absolute number remains somehow constant. The desired stage in economic transformation is the period of Agricultural diversification. This is where both the proportion and the absolute number employed in the agriculture sector are decreasing thereby releasing people to other sectors of the economy.

Apart from economic policies and economic transformation strategies that are under taken by policies makers, the traditional problems (such as drought,

bushfires, floods, price variability, high input prices, unreliable rainfall, and inadequate credit) faced by the agricultural sector can also contribute to the daily decisions taken by farm households. One of such decisions farm households usually make is the decision to allocate part or all of their time to off-farm activities. According to Becker (1965), household labour is allocated between farm and off-farm works so that the additional or marginal value of farm labour equals the wage rate of off-farm work.

Participation in a labour activity is a major source of obtaining income to meet one's daily needs. Income is spent on education, food, shelter, clothing, investment, etc. In Ghana, a major source of income comes from the agricultural sector contributing about 34.8 percent of total household income. This is followed by wage income from employment contributing 28.6 percent of total household income. The third largest contributor to total household income is the non-farm self employment sector with 24.5 percent (Ghana Statistical Service, 2008).

According to Gordon and Craig (2001), rural households diversifying their source of livelihood is mostly characterized by two processes: distress-push, where the poor are driven to search for non-farm work for want of adequate on-farm work which could also lead people into poorly remunerated low entry barrier activities; and demand-pull, where rural people are able to respond to new opportunities which may more likely offer a route to improved livelihoods.

Farm households' time allocation decision between farm work and off-farm work largely affects farm production decisions (including technology adoption), economic performance and the households' income. Farm households

that engage in rural-based off-farm activities (such as carpentry, masonry, transportation, processing and trading), are likely to intensify their production efforts and increase agricultural productivity and income which could provide the necessary resources needed for investment in the rural-based non-agricultural activities (Man & Sadiya, 2009). Also, Ellis (1998) explains that non-farm income makes it possible for poor households to overcome credit and risk constraints on agricultural innovation.

According to Lanjouw (1999), when the non-agricultural employment opportunities expand, there is likelihood for casual labour markets to tighten and by that raising wages in the agricultural labour market.

In a similar argument, Bakucs, Bojnec, Ferto and Latruffe (2010) explain that, information on the link between off-farm income and household farm investment has been largely documented for developing countries and that earlier research emphasized that the role of non-farm income may be in two different directions. In the first case, non-farm income provides extra resources that help farmers overcome their financial constraints, and enable them to invest or expand their farm (Rosenzweig & Wolpin, 1993; Reardon, Crawford & Kelly, 1994; Reardon, 1997). In the second case, there may be a competition between on-farm activities and off-farm activities for labour or resources (Ahituv & Kimhi, 2002). In that, a higher non-farm income may reduce the motivation to produce and to invest on the farm (Bakucs et al, 2010).

The contribution of off-farm income to household income in the developing countries in general and sub-Saharan Africa in particular is

considerable. Despite the large numbers that participate in non-farm activities, rural farm households continue to be among the poorest in developing countries especially in Ghana.

Lanjouw and Lanjouw (2001) explain that non-farm employment may be very important from a welfare point of view for some reasons. These may include off-farm employment income serving the purpose of reducing aggregate inequality; rural households may benefit even from low non-farm earnings where there exists seasonal or longer-term unemployment in agriculture; and for people that are unable to participate in the agricultural labour market, non-farm incomes offer a means to economic security.

Decision to work off-farm could be motivated by many factors which may include the opportunity for farm households to diversify their source of income. According to Gordon and Craig (2001) participation in the non-farm sector allows poor people to smooth out or offset fluctuations in income gotten from agriculture that might occur on a seasonal basis or as a result of unforeseen events. Further, in many rural areas in Africa, this is especially the case where savings, credit and insurance mechanisms are not available to smoothen consumption. Ghana experienced a rapid decline in poverty in the late 1980's and early 1990's (Canagarajah, Newman & Bhattamishra, 2001), and most of this was attributed to the non-farm sector (Newman & Canagarajah, 2000).

The alternative to farm income is of great interests for rural development as a first step in the transition from an agricultural based economy to a non-agriculturally based economy and as a means of coping with the scarcity of

agricultural resources (Gordon & Craig, 2001). Off-farm income therefore is of great importance to farm households and efficient use of household labour will lead to higher productivity and income in all aspect of the economy.

Statement of the problem

In many developing economies, unemployment and poverty reduction have been a major issue bothering policy-makers. A major source of income for most households is taking part in labour market activities to improve on their livelihood others also depend on remittances from relatives and friends while others choose to migrate out of their town of abode to places where they believe to obtain a well paying job.

The agricultural sector, though mostly located in the rural sector, employs a greater proportion of the labour force in most developing countries in general and Ghana in particular. Farmers continue to be poor despite the fact that the agricultural sector in Ghana continue to be among the major contributor to the Gross Domestic Product (GDP). The status of farmers could be attributed to the reasons that agriculture in Ghana continue to be rain-fed. Despite the improvement in agriculture technology, farmers continue to rely on simple farm tools for cultivation; and most farmers are largely uneducated and therefore inefficient in applying new farm technologies and proper allocation of limited farm resources. The sector is also largely unbanked and uninsured because financial institutions and insurance companies find the sector to be highly risky due to exposure to severe droughts, bush fires and fluctuating output prices. These

and other factors make them unproductive and thus giving them very low income after every production season.

According to Gordon and Craig, (2001), it is impossible for agriculture alone to provide sufficient livelihood opportunities and thus migration might also not be an option for everyone. He further states that in most part of the world, poor people in rural areas outnumber the volume of agriculture to give sustainable livelihood opportunities.

In order to survive, many farmers have in turn diversified their source of income by participating in different income generating activities other than agriculture. This has helped them to reduce their level of income uncertainty and improved their livelihood. Earlier research has ascertained that off-farm income is critical to the welfare of rural households (Rosenzweig, 1988). Partaking in non-farm activities offers a diversification strategy for the household, and non-farm incomes provide a source of liquidity in situations where credit is constrained (Man & Sadiya, 2009). Also, a higher payoff in the non-farm activity causes households to accumulate income which can be re-invested in the farming sector (Reardon, Pingali & Stamooulis, 2006) for a higher productivity.

Despite the importance of the off-farm sector in creating employment and supporting the livelihood of farm households, much is not known of how off-farm work participation assist farm households in smoothing income in Ghana. This study seeks to first identify the factors influencing the decision to participate in off-farm economic activities by farm households in Abura-Asebu-Kwamankese District of Ghana and secondly its effect on farm household income.

11

Off-farm work takes away some labour time from farm production which affects farm decision. But farm households that participate in off-farm work obtain income which they can directly or indirectly invest in their farms. But whether time spent away from the farm and income obtained away from the farm help in reducing the risk associated with farm income is really not known.

Objectives of the study

The general objective is to determine the effect of off-farm labour participation on farm household income.

The specific objectives are to

- Find the socio-economic factors that determine participation in off-farm economic activities by farm household heads and their spouses.

- Verify if off-farm labour participation of farm household heads and their spouses determine farm households' income.

Hypotheses

The specific objectives of the study are hypothesized as follows:

- There is no significant relationship between farm household's socioeconomic characteristics (like age, off-farm training and credit) and participation in off-farm economic activities.

- Off-farm labour participation does not determine farm household income.

Significance of the study

This study seeks to examine empirically the effect of participating in off-farm economic activities on farm household income. The results of the study will be helpful to both policy makers and donors to the agricultural sector. Policies targeted at agriculture and the rural economy has not taken into consideration the effect of off-farm work on farm household decision making which eventually affects productivity and income of farm households. This study seeks to bring this to light so as to motivate a change in policy directed towards the agricultural and rural sectors. Policy makers will be abreast with the other economic activities farmers allocate their time to so as to provide the necessary facilities and support needed by farmers to bring them out of poverty.

Also, the study will contribute to the exiting literature on the determinants of participation in off-farm economic activities and also fill in the gap on its effect on farm household income. A number of studies have analyzed the determinants of participation in off-farm economic activities but a few have tried to find its effect on farm household income thus the reason for this study.

Scope of the study

This study seeks to examine empirically the effect of participating in off-farm economic activities on farm household income among married farm households in the Abura-Asebu-Kwamankese District of the Central Region of Ghana.

Organisation of the study

      The work is organised into five chapters. Chapter One covers the introduction to the study and consists of the background to the study, statement of the problem, research objectives, hypotheses, significance of the study, limitations of the study and finally, organization of the study. Chapter Two reviews relevant literature and mainly consists of theoretical and empirical literature on farm household labour participation in off-farm economic activities and its effect on farm household income. Chapter Three looks at the research methodology whiles Chapter Four deals with the empirical analysis and discussion of the results of the study. The final chapter, Chapter Five, summarizes the whole work along with conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Introduction

This chapter reviews related works to the study. This is aimed at getting supporting theories and empirical evidence for the study. This chapter is divided into three sections. The first is a discussion on the off-farm sector in Ghana and its importance to farm households. The second section dwells on the theoretical literature on labour time allocation between off-farm and on-farm economic activities and leisure. The third looks at the empirical literature on farm household participation in off-farm economic activities and its effect on farm households' income.

The Off-Farm Sector in Ghana

The 2000 Population and Housing Census established that about 80 percent of the labour force work in the informal sector. This therefore shows that household enterprises play an important role in the Ghanaian economy. On the estimate, three million two hundred thousand households operate off-farm enterprises in Ghana. This number represents about 46.4 percent of total households in Ghana (Ghana Statistical Service, 2008).

The report further states that 50 percent of these households are involved in trading whiles 33 percent are in the manufacturing sector. Also, households located in rural Forest and Coastal areas are mostly engaged in trading whiles the rural Savannah are mostly involved in manufacturing. It is also noted that a larger proportion of the household enterprises are operated by females representing 72 percent with a greater proportion (79%) of these females involved in trading. It is also worthwhile to note that most off-farm enterprises are operated by skilled persons with most of the females being skilled.

According to the report, the major sources of capital for off-farm economic activities are obtained from household savings, help from friends and family members and sales from household farm outputs. In general, almost 60 percent of the off-farm enterprises are established with savings from household savings whiles about 20 percent are set up with assistance from friends and family members.

In Ghana, household income consists of income from wage employment, agricultural and off-farm activities, rent, remittances, and other sources. The major source of household income in Ghana according to the report is from agricultural activities, accounting for a third of the total yearly income. Wages from employment is the second important source of income accounting for 28.6 percent with income from off-farm employment following with 24.5 percent.

According to the national employment policy of Ghana, the rural sector is characterised by comparatively higher levels of economically active female population to males, high illiteracy, and poor nature of economic and social

infrastructure. These include health and education facilities, road and transportation, water supply, electricity, markets, housing, and banking services. Further, a larger majority of the economically active rural population is involved in agricultural activities, especially farming. The per capita incomes gotten from this activity is significantly smaller than the average national income. This has resulted in a high incidence of rural poverty. The unattractive rural sector has been a primary reason for the educated rural youth increasingly migrating to urban centers, with the aged and illiterate labour force being left behind.

The sector is also characterized by rain-fed crop farming. This fails to provide full employment for farm households all year round due to the fluctuating periods and seasonality in farming. Therefore, most of the active rural farm household labour engages in off-farm economic activities to profitably use their time so as to supplement their households' incomes. Further due to the higher percentage of small scale farming in the country, many of the farm household members are usually under-employed and therefore engage in some off-farm economic activities.

Income diversification

The role played by off-farm activities to household income in most developing countries especially sub-Saharan Africa is substantial. The old fact that the rural sectors of developing economies are purely agricultural is beginning to change. Farm households in many developing countries earn an increasing proportion of their income from off-farm sources. According to Boisvert and

Chang (2006) the reliance on income from the off-farm sources by farm households has continued to narrow the gap between incomes obtained from farm households and incomes obtained from non-farm households.

According to Gordon and Craig (2001), the percentage of the poor in rural areas exceeds the ability of agriculture to provide sustainable job opportunities. Further, whiles there is possibility of migrating out of these areas to the urban areas, it is unlikely that the urban areas are able to provide enough job opportunities for people who move out because they are not able to make a living in the farming or agriculture sector (Marsland, Robinson, Davis, Gordon, & Long, 2000). This shows even from empirical studies the possible importance of off-farm economic activities in the reduction of poverty. According to Gordon and Craig (2001), off-farm economic activities may take up extra labour in rural areas, aid farm households spread their risks, offer better remunerative jobs to supplement farm income, provide income possibility in times of off-farm seasons and offer alternatives means to cope when farming fails.

Haggblade, Hazell, and Reardon (2005) found that local off-farm income constituted between 30 to 45 percent of rural household incomes in the developing countries. Reardon et al. (1998) estimated it at 42 percent for sub-Saharan Africa and 32 percent for Asia and 40 percent for Latin America. Ellis (1998) gives higher numbers from case studies in sub-Saharan Africa in a range of 30 to 50 percent.

The Off-Farm Sector and poverty

Poverty is said to be predominantly rural with 75 percent of the world's poor living in rural areas. In Ghana, 86 percent of the population living below the poverty line dwell in the rural areas (Ghana Statistical Service, 2007). Poverty is also concentrated among women, the elderly, the landless and the minority groups. In Ghana, it is approximated that about 40 percent of the population fall below the poverty line, thus living on less than a dollar a day (Asuming-Brempong, 2003).

According to Ellis (1998), the main factors contributing to poverty in the rural areas are locational and not really on lack of land, but lack of location specific access to important services and opportunities such as schools, input supplies, roads, market services, power and non-farm activities.

Agriculture in developing countries is also predominantly rural and any development in agriculture will bring about a positive impact on the rural poor households especially on those who participate in agricultural activities. Tollens (2002) argued that growth in agriculture is almost always equitable and often favours women and a large number of the population share in the benefits from the sector. Further, growth in agriculture brings about assets accumulation by large numbers of smallholders, increased productivities and increasing incomes for many, and it is usually sustainable.

There have been arguments as to whether the agricultural sector can still be a driving force in reducing poverty in developing countries considering its small and uncompetitive nature. Among other views of "The Smallholder

Optimist", they give recognition to the importance of the off-farm sector since it contributes a significant proportion to farm households' income. But they argued that the off-farm sector in itself is largely driven by the performance of the agricultural sector. According to the Smallholder Optimist, 75 percent of the world's poor are rural and to reduce poverty the livelihood of the rural poor must be improved directly. This can therefore be done through agriculture since it is also rural. Thus direct investment in agriculture and rural development will lead to the growth in agriculture needed to contribute to the creation of opportunities in the off-farm sector. Therefore, there is a positive linkage between the performance of the agricultural sector and the non-agricultural sector.

But the "Rethinking Rural Development School" of the "The Smallholder Pessimist" argued that, the growing importance of the off-farm rural economy which refers to diversifying source of rural income should be a way out of poverty in developing countries and not agriculture. They further stated that migration and income diversification have reduced the need for agricultural growth as a strategy to help the poor. They also found that roughly 50 percent of rural households' incomes in sub-Saharan African are generated from off-farm activities. Therefore, where diversification and off-farm income is significant, agriculture is unable to satisfy basic livelihood requirements.

From the arguments of both the Smallholder Optimist and the Smallholder Pessimist, it can be deduced to some extent that both agree on the importance of off-farm activity though the smallholder optimist still believe developing agriculture is the way out of poverty for farm households. In conclusion, increase

in the off-farm sector can reduce the income inequality when incomes from these activities favour the poor. But income distribution may worsen the plight of the poor if the well to do benefit more from the off-farm economic activities than the poor.

Theoretical literature review

This section reviews theoretical literature on farm household participation in off-farm economic activities and its effect on farm households' income.

Marginal analysis of Off-Farm labour

According to Robinson, Mcmahon and Quiggin (1982), earlier studies approach to labour allocation between farm and non-farm activities were mostly captured in terms of the relative returns to labour accruing from diverse income-earning activities. The optimizing rule propounded by the marginal revolution found that any activity should be increased until its marginal return and competing alternatives were equal. Polzin and MacDonald (1971), in connection to the marginal revolution ideology found that a farm household will allocate his time between farm and off-farm activity so that the value of the marginal product of farm work and the off-farm wage rate, net of the costs incurred in the off-farm work, are equal.

According to Polzin and MacDonald (1971), due to technology improvement, marginal productivity of labour has increased in agriculture and also advances in transportation have reduced the cost and time for travel. This

further has increased the opportunities for farmers to be no longer tied to their farm lands alone but that they can divide their time between farm and off-farm economic activities.

Figure 2 shows a graphical presentation of the equilibrium between farm and off-farm labour. The vertical axes mark off a unit of labour time (one-man year). The time spent working on the farm is measured by the distance from the left origin and that from the right shows time spent off the farm.
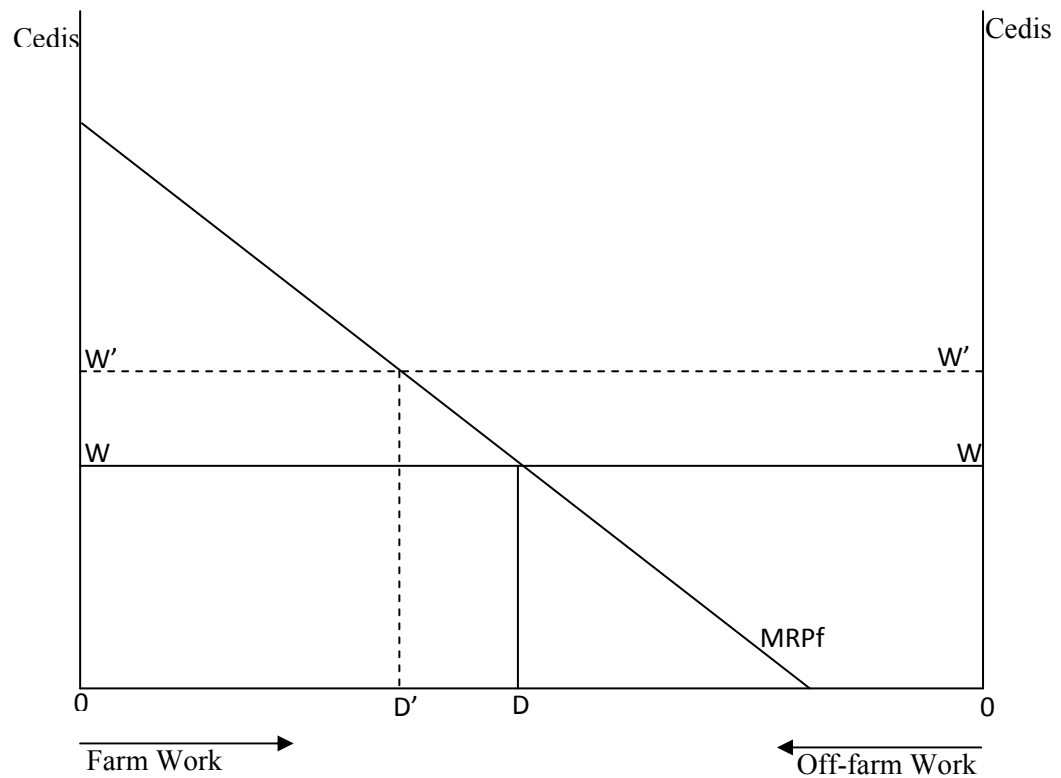
Figure 2: Participation in off-farm work

Source: Polzin and MacDonald (1971)

Marginal revenue product of the farm is represented by MRPf and WW is the net wage paid off the farm. The point where the marginal returns in both sectors are equal is shown by point D and represents the optimal division of time between farm work and off-farm activity.

An off-farm worker is assumed to be a price taker which makes WW horizontal. Also, the net wage allows for the costs per labour unit measured as travel time and distance incurred in working off-farm. An increase in the price of working off-farm (from WW to W'W') implies an increase in off-farm time (from D to D') for equilibrium to occur.

The assumption of decreasing marginal productivity due to increases in a factor of production explains the negative slope of MRPf. Therefore a shift of the MRPf curve to the left implies an increase in the equilibrium in off-farm work and a decrease in farm work whiles a shift to the right implies a decrease in the equilibrium in off-farm work and an increase in farm work.

But according to Robinson, Mcmahon and Quiggin (1982), the work of Polzin and MacDonald (1971) and those that followed the marginal revolution ideology only restated the theory of demand for labour facing the operator of the farm and off-farm work but said nothing about the time allocated between farm work, off-farm work and leisure.

Time constraint analysis of Off-Farm labour

In other studies, a time constraint was added to the theory of allocation of labour time between farm and off-farm economic activities and leisure to

maximize the utility of the resulting income and leisure (e.g. Lee 1965; Kerachsky, 1977). Given a set of product and factor prices, diminishing returns to labor and a stock of resources, a transformation function between income and leisure can be described as PP' in Figure 3. The line PP' depicts all economically important combinations of leisure and income in farming available to the farmer.
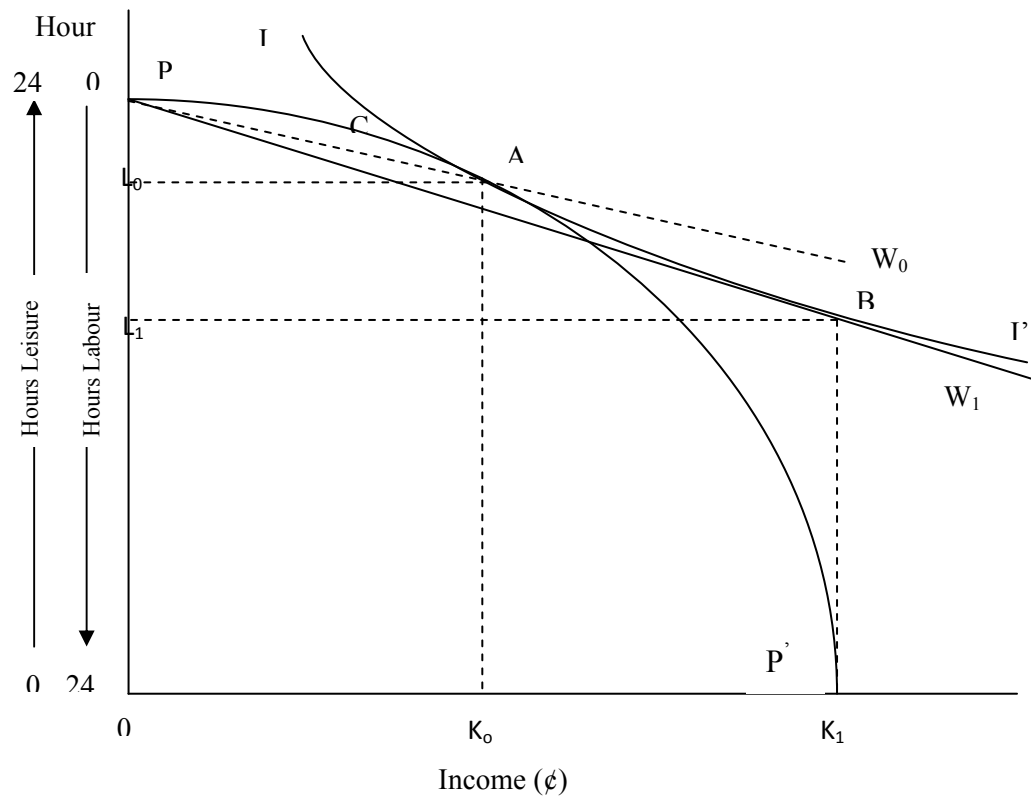
Figure 3: Theoretical optimum allocation of farm operator's time between leisure and income earnings

Source: Lee (1965)

The combination of K and L chosen will be explained by the shape of the farm operator's indifference map which has the indifference curve II' as one contour. In Figure 3, the indifference function and the transformation function are

tangent at point A, showing that, given the situation facing the farm operator, he can maximize his satisfaction by choosing OL_0 hours of leisure or equivalently PL_0 hours of work and OK_0 income. Any different combination along PP' would lie on an indifference curve lower than II' and this would make the farmer less satisfied. The average return per hour of work at this combination is equal to the absolute value of the reciprocal of the slope of a straight line drawn from P through A represented by line PW_0.

If the farmer finds an opportunity to supply his labor off the farm, the wage rate that would be equally satisfactory is shown by the reciprocal of the slope of the straight line from P tangent to the indifference curve II' at B. This wage rate is PW_1. For the farmer to stop farming the wage rate would have to be little higher in order to increase his satisfaction.

With the farming situation and the off-farm employment opportunity now available to the farmer, he now has an opportunity to move to a higher indifference curve thus maximizing his satisfaction. He is able to do this by becoming a part-time farmer.

From Figure 4, the rate of reward for forgoing the first portion of leisure time beginning at P for farm work is larger than the off-farm wage rate PW_1. Thus, the farmer will choose to allocate his labor time to the farm till the marginal rate of return obtained from farming is lesser than that for off-farm work. At this point, C, the slopes of PW_1 and PP' are the same. And to the right of point C the marginal rate of return is greater for off-farm work than for farm work. The farm operator works PL_2 hours on the farm and earns OK_2 income at point C. The wage

rate for additional hours worked beyond PL_2 will be greater off-farm than on-farm. Therefore, the farmer engages in part-time farming at the point C, and works L_2L_1 hours off-farm at wage rate PW_1. He gets K_3K_1 extra income. On the assumption that the utility of marginal income is positive thus greater than zero, the farm operator should be more satisfied now than before.
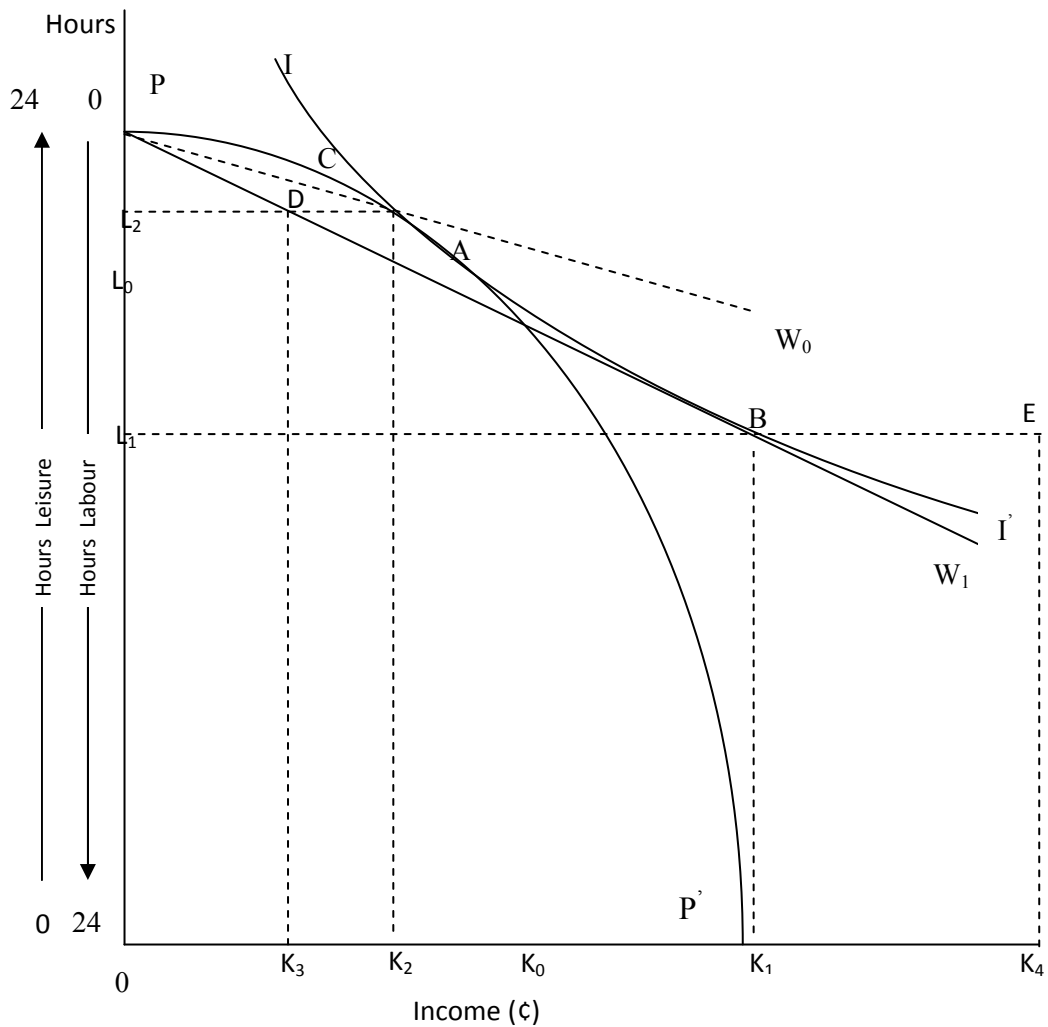
Figure 4: Combining farm and off-farm income to maximize satisfaction

Source: Lee (1965)

Point E in Figure 4 shows the new combination of leisure and income attained by combining farm and off-farm work at wage rate PW_1. For the fact that point E represents the same amount of leisure as in point B and a bigger amount of income than B, it shows that point E must be on a higher indifference curve than point B. Thus, by engaging in both farm and off-farm work, a higher level of satisfaction is attained than is possible through farming only.

Kinked demand and supply curve of a farm operator's labour

The allocation of farm households' labour and capital to off-farm economic activities may be grasped in the context of a demand and supply framework analysis. According to Parminter (1997), this framework may be used to show that the allocation of farm households' labour time to off-farm work is both rational and efficient. Economic theory suggests that the demand curves for the farmer's labour and capital is kinked (Bollman, 1979). Figure 5 shows a kinked demand curve for a farm operator. The kink in the demand curve for the farm operator's labour occurs where the wage rate for off-farm work (VV') is greater than the price of labour expended on the farm work (DD).

The kinked demand curve as explained by Parminter (1997) is supported by the following assumptions;

- That the production function for the farm has diminishing marginal returns to the farm operator's labour, therefore the operator has a downward sloping demand curve for on-farm labour work;

27

- The farm operator is a price taker in regards to the off-farm wage rate and the wage rate is determined exogenously;

- The farm operator can work as many hours as desired in an off-farm job;

- The farm operator is indifferent between working on his own farm, and working off the farm, at any given rate of return on the farmer's labour.
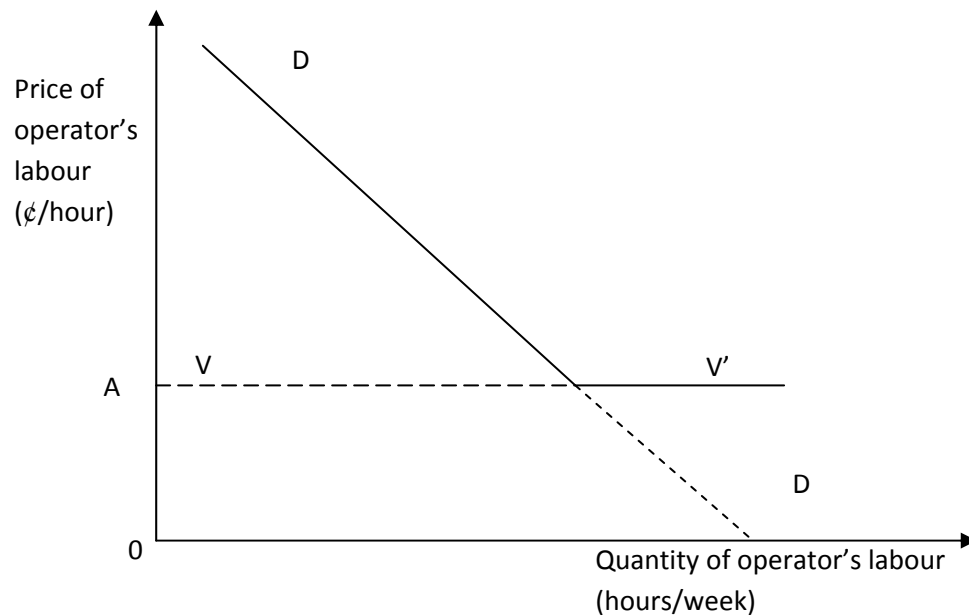
Figure 5: A kinked demand curve for a farm operator

Source: Parminter (1997)

Further explained by Parminter (1997), the price of the farm operator's labour in this framework is understood best as the opportunity cost of not doing an hour of work. Given diminishing marginal returns to the farm operator's labour; the first hour of farm work has a very high opportunity cost, and hence a very high price; the second hour of farm work has a lower opportunity cost, and so on. Once the opportunity cost of the marginal hour of farm work is equivalent

to the wage for the same hour of off-farm work, the farm operator will then allocate to off-farm work his subsequent hours or labour time given that he has full information and the assumptions underlying the kink demand function holds. The opportunity cost of the farm operators labour may include the improvement of capital value of the farm that is long-term costs may be included.

To establish whether the farm operator will allocate his time to off-farm work or otherwise, the farm operators labour supply curve must be derived. On the assumption that the more the farm operator earns per hour, the more hours he will work, then the supply curve is positively sloped or upward sloping this illustrated in Figure 6.

From Figure 6, if the supply curve, SS, cuts the demand curve, DD, to the left of the kink in the demand curve, then off-farm work will not be undertaken. But if the supply curve, (S'S'), cuts the demand curve to the right of the kink in the demand curve, means some off-farm work will be undertaken. In the example illustrated in Figure 6, if SS represents the operator's labour supply curve, 35 hours per week are worked on-farm, and no off-farm work is involved in. If S'S' represents the operator's supply curve, 40 hours are worked per week on the farm, and 12 hours (52-40) are worked off the farm. Supply curve S'S' in Figure 6 also demonstrates the increase in total hours worked (from 43 to 52 hours per week in this hypothetical example), and the decrease in hours devoted to on-farm work (from 43 hours to 40), when off-farm work is taken on after previously working only on the farm.
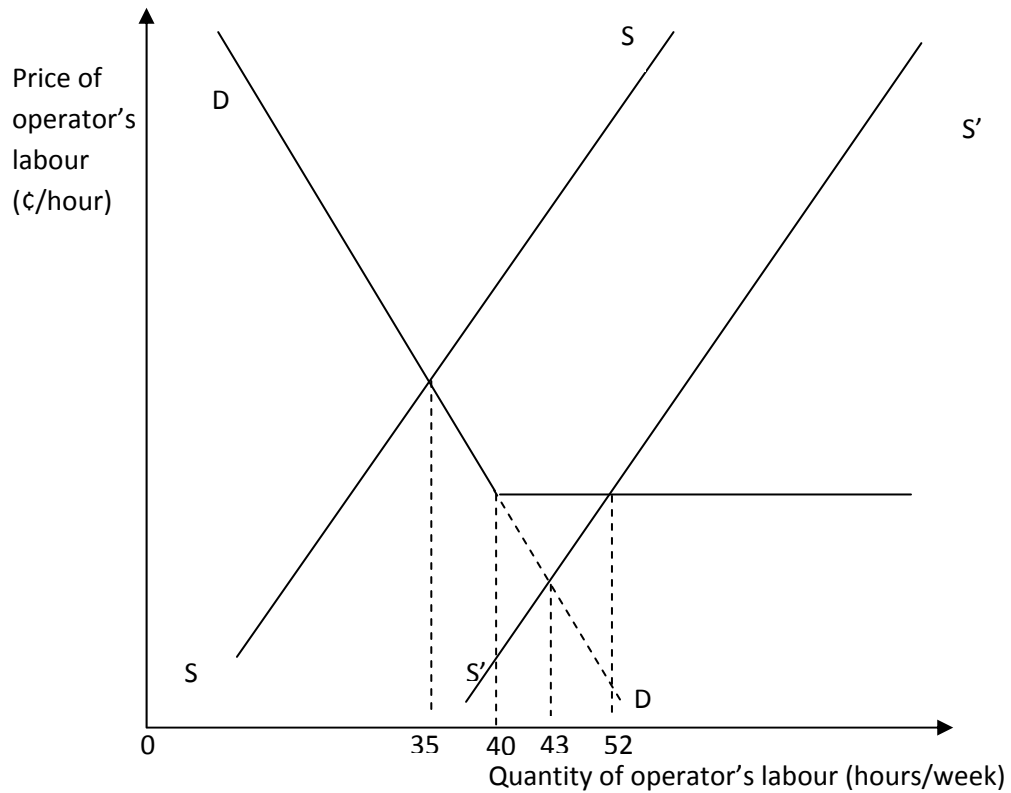
Figure 6: Demand and supply curves for the farm operator's labour

Source: Parminter (1997)

Determinants of labour supply

Huffman (1980) assumed a more practical approach to the off-farm supply of labour of farm households. Foremost, he assumed a family-utility, family budget constraint model. However, after assuming a two-commodity model with goods and leisure, he alluded to the interconnection between labour supply and family size, and therefore introduced elements of lifecycle and human capital effects on labour supply. Huffman in an informal way introduced many of the views suggested in the new home economics literature.

30

A household utility was formulated as a function of leisure and consumption, given household member's age and education and size of household (Huffman, 1980). He stated that a household's aim of maximizing utility is constrained by member's time endowment which is allocated between on-farm work, off-farm work and leisure; by household income which also includes off-farm wages, net farm income and other household income; and by farm output which restricts the potential size of the household's budget. Therefore, the total labour supply of a member of a household was stated to be a function of the off-farm wage rate, the price of farm output and inputs (not member's labour), price of household consumption, other household income, household size, education, age, extension and endowments (Robinson et al., 1982). Huffman (1980) further explained that since the labour supply function can be stated as the total time endowment of members minus leisure time (which is total work time), then the off-farm labour supply function is the labour supply function minus the demand function for the household member's farm labour, which is an excess supply function.

According to Robinson et al. (1982), Huffman's contribution partially overcame a major criticism of the conventional approach, which is the static approach and no thought was given to future time periods in which a farm operator may prefer to work longer hours in the current time period so as to have more income and leisure in the future time periods.

Huffman (1980) also explained that human capital which includes education, job skills and work experience may influence off-farm work decisions

through efficiency effects. Human capital is an indicator of a household member's productivity and thus, it can be expected to have a positive effect on the demand for a farm operator's labour in an off-farm work by raising the payment obtained from off-farm work and increasing the likelihood of obtaining a job (Hanson, 1972). For the supply side, human capital is thought to have an "allocative effect" because human capital contributes to production in a dynamic environment with information asymmetry and enhances a household member's ability to acquire and process information (Huffman, 1974).

Empirical literature review

This section reviews empirical studies on farm household participation in off-farm economic activities and its effect on farm households' income.

Off-farm participation

In Ghana, almost three million two hundred thousand households representing 46.4 percent of the total households operate non-farm enterprises and out of this 48 percent of these enterprises are located in the rural areas of Ghana (Ghana Statistical Service, 2008). Also according to the report a greater proportion (thus 72%) of the non-farm activities are operated by females. This makes off-farm activities a very important income generating enterprise for households in Ghana. Yet, Ghana still remains an agrarian economy but according to Huffman (1980), with modern economic growth, farm households reallocate

resources to emerging sectors of the economy in response to changes in economic conditions.

The rural nonfarm sector plays a critical role in promoting growth and welfare by slowing rural-urban migration, providing alternative employment for those left out of agriculture, and improving household security through diversification (Lanjouw & Lanjouw, 2001). Barrett, Reardon and Webb (2001) found that nonfarm activity typically relates positively with income and wealth in rural areas of Africa, and thus appears to offer a way out of poverty if nonfarm opportunities can be seized by the rural poor.

Reardon, Berdegue and Escobar (2001) suggest that decisions by rural farm households concerning participation in off-farm activities depend on two main factors: incentives offered and household capacity. Some poor rural farm households will make a positive choice to take advantage of opportunities in the rural nonfarm sector, taking into consideration the wage differential between the two sectors and the riskiness of each type of employment. Rising incomes and opportunities off-farm, however, reduce the supply of on-farm labor. Other households are pushed into the nonfarm sector by lack of on-farm opportunities, for example, resulting from drought or small size of land holdings (Davis, 2003).

The off-farm economy has over the past two decades increasingly become the major focus of attention in rural development policy, because of its positive contribution to food security and poverty reduction (Ellis, 1998; Lanjouw & Lanjouw, 2001; Davis, 2003). Mduma and Wobst (2005) argued that participation

in nonfarm activities is one of the livelihood strategies among poor rural households in many developing countries.

Empirical literature available on off-farm work tries to identify the factors that determine farm households' participation decision in off-farm work and off-farm labour supply (Beyene, 2008). A significant part of these studies were done for the developed countries with just a few for the developing countries. Previous studies on the rural non farm economy in Africa have concentrated on the characteristics of micro-enterprises in rural areas, quantifying the share of non-farm in total income and employment to show the range of roles played by off-farm activities in the household economy (Abdulai & Delgado, 1999).

Abdulai and Delgado (1999) using a bivariate probit model estimated the determinants of the joint decision of husbands and wives to participate in non-farm work in Northern Ghana. The study used a survey conducted during the period 1992-1993 in thirty-seven villages in four districts in the Northern region of Ghana. The study allowed for the joint participation decision of both couples in the farm household to be determined. The result of their work suggest that age has a direct effect on the likelihood of labour supply to the non-farm sector at younger ages whiles at older ages the likelihood of participating in non-farm work falls as one grows older. As years of schooling of husband and wife increased the probability of engaging in non-farm work was high.

Mduma and Wobst (2005) also found that availability of land, education level, and access to economic centers and credit were the most important factors in determining the number of households that participated in a particular rural

local labor market and the share of labor income of total cash income. Bezu Holden and Barrett (2009) also looked at the activity choice in rural off-farm employment. They found education, gender, and land holding to be the most significant determinants of activity choice.

In other works, De Janvry and Sadoulet (2001) studied the importance of off-farm activities in rural households in Mexico. Their work used the multinomial estimation method. The results from the estimation showed that ethnic origin, education, and regional availability of off-farm employment are significant in the participation decision of farm households in off-farm work. Higher years of education help the farm households to participate in the more remunerative off-farm activities. The result further shows that participation in off-farm work helps to reduce poverty and contributes to greater equality in the distribution of income.

A study by Corpal and Reardon (2001) also tried to examine the patterns in rural off-farm incomes and also find the determinants of individual participation off-farm activities in rural Nicaragua. The study used a Nicaraguan household nationwide survey thus, the second Living Standards Measurement Survey (LSMS) undertaken in 1998 by the Nicaraguan National Institute of Statistics and Census. To explain the individual primary-activity participation in off-farm work, probit regressions were estimated. The results showed that the education effect on participation decision is found to vary depending on the type of off-farm work. Also, land scarcity and access to roads have an effect on off-farm participation decision. The fascinating aspect of the work was that, the off-

farm activities were looked from three perspectives thus wage employment, off-farm wage employment and off-farm self employment. Therefore a probit model was estimated for each of these off-farm opportunities. But also the work failed to look at the joint participation decision of farm households.

Beyene (2008) studied the determinants of off-farm participation decision of farm households in Ethiopia. The research design used was a survey and the data was taken from the 1999 Ethiopian Rural Household Survey from which a total of 1681 farm households were randomly selected from 18 rural peasant associations from four administrative regions. Using a bivariate probit model he sought to find the determinants of female or male members in a farm household deciding to participate in off-farm activities. The results show that among the human capital variables, education was not significant in explaining participation decision. Health condition was significant so as training in non-farm activity. Credit and farm size were also significant in off-farm participation decision. Though the use of the bivariate probit in this study, it did not try to find the effect of off-farm work participation on the households' welfare.

Man and Sadiya (2009) studied the relationship between the determinants of off-farm employment and the off-farm participation decision. Their study also examined the income level of farm households which are attributed to farming activities and off-farm work with a further look at the effect of participation in off-farm work on paddy farmers. The study used descriptive analysis and the logit model for its analyses and estimation. A total of 500 paddy farmers were selected using a stratified random sampling technique. The findings of the study reported

that, farmers' age, gender, the number of dependants in a household, income type of farm were significant variables that influenced the likelihood of farm households to engage in off-farm employment. Farm size and education were not significant in the study.

A study of off-farm work decisions of French agricultural households by Benjamin and Guyomard (1994), show that for off-farm labour market participation decisions by the husband and wife in a farm household, higher education was noticed for higher off-farm labor market participation of both husband and wife. Also younger wives were more likely to engage in off-farm work than older wives. They also noticed that a wife's participation in the off-farm labor market decreases with the number of children and wives seem to be less responsive to farm characteristics than the men.

The Ministry of Labour and Social Affairs (MOLSA) (1997) in Ethiopia did a survey of the Agricultural Wage Employment and Rural Non-Farm Employment. Using a logit model for the study, the results showed in a contrasting view that the likelihood of working for wage was lower for literate households than illiterate ones. The reason was that casual labor is perceived as a low status work by the public and more so by educated people.

Woldehanna (2000) tried to determine the impact of education on the supply of labor for off-farm wage employment in Tigray in Ethiopia and concluded with the result that people with higher education did not find off-farm work attractive. From the results he argued that higher educational status of an

individual raised his productivity on the farm or in the household more than it increased productivity in off-farm employment in the rural areas.

Huffman (1980), using a household utility maximization as his objective subject to budget constraint on income, farm production and time tried to study off-farm labour supply in Iowa, North Carolina and Oklahoma. The study used the 1964 Census of Agriculture and supplemented by unpublished federal Extension Service data and the United States Department of Agriculture (USDA) publications. The study used a logistic estimation to find the decision to participate in off-farm economic activities. He found out that raising the educational level of farmers and also increasing the agricultural extension services increase the off-farm labour supply of household farmers. The study did not take into consideration the joint decision making of key members of the household particularly the household head and the spouse.

Also in the work of Sumner (1982), basing his work on marginal revolution ideology tried to examine the determinants of off-farm labour supply by farm households in Illinois. A sample of 832 farm operators was drawn from a 1971 survey of Illinois farmers to estimate the participation in off-farm work. A maximum likelihood estimation of a probit function was used for the estimation. Some of the main variables considered were education, farm training and some training in an off-farm work, which all had positive significant effect on participating in off-farm economic activity except for farm training though had the right sign, thus negative, was not significant. The major result from the work found off-farm work to be sensitive to both wage opportunities and other factors

influencing the marginal value of time in each activity. But this work also did not take into consideration the joint decision making process of the two major people in a married household.

A study undertaken in some districts of Pakistan by Fafchamps and Quisumbing (1999) indicated that off-farm productivity increased due to higher education and also induces rural Pakistan farm households to shift labor resources from farm to off-farm activities. According to them, one additional year of schooling for all adult males raises household incomes by 8.9 percent. The other human capital variable, health, also had a significant and positive effect for males but was not significant for females in rural Pakistan.

Joint decision making in a household seems important especially in participating in off-farm economic activities. Lass, Findeis and Hallberg (1989) in their study to find the off-farm labour participation and supply decision used a model that allowed for joint decision making by farm operators and their spouses. The study was carried out in Massachusetts with data obtained from a survey of farm households in Massachusetts. A bivariate probit model was estimated for the participation equations which captured the joint decision making process of the household whether or not to partake in off-farm work. Though the joint off-farm participation decision by farm operators and spouses was rejected, there was an evidence the farm operators' hours supplied to off-farm work depended on the decision by spouses to work off-farm. Farm operators responded to both family and farm characteristics in making participation in off-farm work decision. Decision to participate in off-farm work for the spouse depended on the farm and

family characteristics. Though joint decision making was important in the work the paper failed to establish that idea.

Reddy and Findeis (1988) using the Current Population Survey (CPS) of two years thus 1978 and 1984 sampled low income farm households to determine if these households have characteristics that will make them work off-farm in the United States of America. Maximum likelihood probit estimates were carried out for the farm operators and spouses separately for the two years (1978 and 1984) to achieve their objectives. The results showed that members of low income farm households are less likely to participate in off-farm work. Participation in off-farm economic activities among older farm households is restricted by the farm operator's education and the ages of both spouses. Also within the younger farm households, the presence of young children and regional location present important constraints in participating in off-farm economic activities. This study was able to compare two different years to see the level of participation in off-farm work but failed to find its effect on farm household income.

Using a panel data from Ethiopia, Bezabih, Gebreegziabher, GebreMedhin and Köhlin (2010) analyzed on the premise that off-farm work participation by farm households is influenced by the availability or changes of rainfall and financial constraints of households among other factors. The data was drawn from a survey of households in the central highlands of Ethiopia in 2005 and 2007. Approximately 1,500 farm households in 12 villages in 2 districts of the Amhara regional State of Ethiopia were interviewed after they were selected randomly in each of the years. Two different models were estimated. The first was a binomial

logit model and was used to estimate the determinants of participation in off-farm employment. For the second estimation a multinomial logit model was estimated for the activity choice between alternative employments in agriculture and three variants of off-farm employment. The results showed that variation of rainfall had a significant positive effect on off-farm work participation likewise for the effect of farmers' rate-of-time preferences on the participation decision in off-farm activities showed that there was a significantly positive increase in participation for lower rate-time preferences. This study had an advantage since it used a panel data which captured both random and pseudo-fixed effects.

Chang and Boisvert (2009) in their study tried to find the effect of participation in the Conservation Reserve Program and off-farm work on the level and distribution of farm household income. The farm household data was taken from the 2001 Agricultural Resource Management Survey (ARMS). Trivariate probit model estimation was used to identify the determinants of the participation in off-farm work by both spouses and also participation in the Conservation Reserve Program. Afterwards the effect of participation in the off-farm work and the Conservation Reserve Program on farm household income was analyzed. The result of the study showed that participation in the Conservation Reserve Program and off-farm work by both spouse increase the farm household income though these choices decrease the variability in household income among households that participate. Though the study looked at the effect of both spouses participating in off-farm work on household income, it did not tell if both spouses participated in the Conservation Reserve Program.

A study by Man (2009) looked at the relationship between the determinants of off-farm work and the off-farm participation decision among paddy farmers in Kemasin Semerak granary area in Malaysia. The study took into consideration 250 paddy farmers for the analysis. Using descriptive analysis and logit regression estimation, the study examined the income levels of farm households and the off-farm employments in the area whiles determining the effects of off-farm employment on the paddy household farmers. Some variables that the study considered were characteristics like the age and sex of the farmer, household size, education, farm size and other income. The study found that the household size to be significant whiles other variables like education and farm size did not help in explaining the participation decision of the farm households in off-farm work. It was also found that paddy farmers who combined the on-farm work with off-farm work had an increase in their income as compared to paddy farmers who only participated in farm work.

Kimhi (2004) investigates how time allocation decisions by farm households depend on family composition. Hence this study tried to extend the time allocation to other members of the farm household and not only to the operator and spouse. The research was conducted in Israel using a country-wide survey data collected by the State of Israel, Central Bureau of Statistics in 1995. A sample of 3,000 farm households was used for the study. A multivariate probit maximum likelihood model was used and considering the complexity in estimating such a model with more than two equations, a quasi-maximum likelihood approach explained by Kimhi (1994) was followed. Some variables

42

that were considered in the study included age, ethnic origin, educational dummies and level of agricultural education. The study found that, the farm household composition effect on the off-farm participation behaviour of farm both farm spouses was absolutely different thus the farm household couple was likely to work less off-farm as the number of adult children in the farm household increases. This study made a strong point in trying to extend the bivaraite probit model which considers only farm couples to a multivariate probit model that considers other members of the farm household.

Benjamin and Kimhi (2003) present in their study an initial attempt to estimate three types of discrete-choice labour decisions of farm household couples namely: farm work, off-farm work and hired farm labour. Using a French survey data from the 2000 General French Census of Agriculture, 65,593 farm households representing 10 percent of the total sample were drawn for the study. The paper used a 16-choice multinomial logit model which included the permutation of four binary decisions: farm operator's off-farm work, spouse's farm work, spouse's off-farm work and hired farm labour. Some of the explanatory variables included were personal characteristics like age, agricultural and general education, family compositions indicators and farm attributes like major crop cultivated and livestock reared and also farm subsidy. The results of the study indicate that hired farm labour increases with farmers' educational qualifications with other adults in the farm household substituting for or replacing the farm labour input of farm couples and hired labour.

The relationship between farming efficiency and off-farm labour supply was looked at in a study by Goodwin and Mishra (2004). They tried to first estimate the determinants of off-farm labour supply and then evaluate the relationship between off-farm work and farming efficiency. The empirical analysis used a survey data collected in the 2001 by the National Agricultural Statistics Service under the Agricultural Resource Management Survey project funded by the United States Department of Agriculture. The data involves 7,699 farm households. The model used consisted of two reduced-form equations that represented the off-farm supply of labour equation and the efficiency equation implied by the ratio of gross sales to variable input costs. The two equations were jointly estimated using instrumental variable techniques which allowed for the joint determination of farming efficiency and off-farm labour supply. From the results of the study, an increase in the household size and years of education increased off-farm labour supply of farm operators. It was also clear that much involvement in off-farm work decreased efficiency on the farm.

The effect of off-farm work on the adoption of capital intensive practices and conservative practices was studied by Gedikoglu and McCann (2007) in states of Iowa and Missouri in 2006. A mail survey was used to collect the data for the study. A multivariate probit model was used to estimate jointly the decision to adopt among four kinds of technologies namely injecting manure, grass filter, soil test and record keeping. The variable of interest was participation in an off-farm economic activity. The results showed that adoption of a capital intensive practice, that is injecting manure into the soil, was significantly and

positively influenced by off-farm work. Whiles adoption of labour intensive practice which is the keeping of records was negatively influenced by off-farm work. The study failed to look at the possibility of the participation in the off-farm being endogenous despite the fact that it was still significant.

Pfeiffer, Lopez-Feldman and Taylor (2008) studied empirically the effect of off-farm income on some activities in agricultural production in Mexico. The study used a cross-sectional data constructed from the Mexico National Rural Household Survey in 2003 from rural Mexico. This was used to examine the effect of income gotten off-farm on agricultural output and on the use of agricultural inputs of rural households. The study used an instrumental variable-tobit estimation technique to achieve the research objectives. The findings of the study show that off-farm income has a significant negative effect on agricultural output and also reduced the supply of family labour to farm. But it also had a positive impact on the demand for input purchase. Further the study showed that there was a slight gain in efficiency in farm households who obtained off-farm income. The study did not examine the possible effect of other farm household members' income generated from off-farm economic activity on the agriculture productivity.

A study in China by Glauben, Herzfeld and Wang (2007) analyzed the participation of farm household labour in rural labour market by Chinese farm households. The study considered four labour market alternatives that farm households participated in. They include hiring on-farm labour, supplying labour off-farm, supplying and hiring labour at the same time or autarky with respect to

labour. The study tried to look at this phenomenon over a period of twenty years. The data used for the analysis was drawn from a rural survey data collected by the Chinese Research Center of Rural Economy across 10 regions in the Zhejiang province and covered the period 1986–2002 so as to cover the various regimes of China. The study used a multinomial logit model for the empirical estimation. It considered variables like education, family composition, farm size, and agricultural income. The findings from the study showed that members of the farm households with higher level of education had significant probability of participating in off-farm labour work. But in contrast, a farm household with a higher number of male members and unearned income increased the participation in on-farm work.

Tokle and Huffman (1991) examined the effects of location differences in local economic conditions on wage labour demand and labour force participation decisions of farms and rural off-farm couples in the United States. The data used was collected from the Current Population Surveys extracting information on farm and rural off-farm households from 1978-1982. A bivariate probit estimation on the equations determining the probability of wage work for farm and rural off-farm couples. Results of the study showed that farm household labour participation decisions were influenced by changes in anticipated local economic conditions. Also, the probability of off-farm wage work increased when expected farm output prices reduced and also declined when labour demand increased. This study extended the debate on the determinants of farm labour supply by including into its analyses the local economic conditions which was missing in most studies.

Huang, Wu, Zhi and Rozelle (2008) examined linkages between labour supply to off-farm markets and the labour allocated to on-farm work by fruit crop farm households in Shandong, China. The study used a stratified random sampling in Shandong Province capturing information of apple and grape farm households. Probit, ordinary least squares, and tobit estimations were used for the study. The results of the study showed that young members as well as the educated members of the farm households tend to work more in off-farm economic activities and that off-farm employment reduced the probability and intensity of production of fruit crop. Though the study did different regression analysis comparing one with another, it also did not look at the joint participation decision of farm couples.

In a study by Babatunde and Qaim (2010), they tried to establish the driving forces and household access to off-farm labour market participation in Nigeria. The objective of the study was in three folds. First they examined the structure of the household incomes across sizes of farm and income strata, then they looked at the determinants of farm household participation in off-farm work and the factors influencing the magnitude of incomes from different sources. They finally examined sources of income inequality among households. The study used a cross-sectional survey of 220 households in Kwara State which was collected in 2006. The paper disaggregated the off-farm employment into various off-farm activities. A multivariate probit model was then used for estimation and analysis of the disaggregated off-farm activities. Variables used included household size, sex, education, infrastructure and productive assets. The results of the study

47

showed that 90 percent of farm household sampled had some off-farm income which accounted for 50 percent of total household income. Also the share of off-farm income was positively correlated with overall income. Further, the share of off-farm income increased with farm size suggesting important complement between on-farm and off-farm income. Household members with little or no education and no access to infrastructure were constrained in their ability to participate in a well paying off-farm economic activity. The study did not look at the joint participation decision of farm household members in off-farm work and also the possibility of endogeneity of off-farm work on the overall household income.

El-Osta, Mishra and Morehart (2008) also looked at the determinant of off-farm work by married farm couples. The study used primary data for the analysis. The data was extracted from the 2004 Agricultural Resource Management Survey. A multinomial logistic regression was used for the estimation purpose to achieve the objective of the study. The main variable of interest was government payment. The objective was to see the effect of government payment on the decision of the married couples to work off-farm. The results showed that government payment was important in reducing the probability of off-farm work strategies involving work by the man only. Also, the marginal impact of government payments on the probability of the wife working off-farm only was positive. This study though it looked at the effect of both couples working off-farm, it did not take into consideration the joint decision to participate in off-farm work by both couples.

Matshe and Young (2004) used a double hurdle model to analyze the off-farm labour participation decisions of small-scale agricultural household members. The study was carried out in the Shamva District of Zimbabwe. The data used for the work was collected over 34 weeks during the 1996-1997 crop years. The hurdle approach used for the estimation allowed for the joint modeling of the decision to participate in off-farm labour market and also the decision concerning the amount of time allocated to work. Some of the variables used included sex, education, productive assets, agricultural terms of trade and remittances. The empirical analysis of the study found these variables to be significant in explaining the off-farm labour market participation of rural farm households.

Kimhi and Lee (1996) estimated the off-farm work decisions of farm couples in Israel using structural simultaneous equations with ordered categorical dependent variables. This approach according to the study was chosen so as to jointly estimate structural parameters in a four-equation model, which included on-farm and off-farm labour supplies of the married couples in a farm household. The data was derived from the 1981 Census of Agriculture in Israel where 16,219 observations were used for the empirical study. The paper first used an ordered probit model to estimate the reduced form equations and then minimum distance estimation was also done to obtain the identified structural coefficients. The findings from the analysis showed that an hour increase in farm labour supply caused an hour decrease in off-farm labour supply for male household members. In this study, the adopted estimation technique was able to produce estimates of

reduced-form and structural parameters that showed how each dependent variable reacted to changes in another endogenous variable.

In sum, "push-and-pull" factors appear to be involved in decisions by rural households to participate in rural nonfarm activities. For example, some might be attracted by the incentives offered and labor availability whereas others might be pushed into the nonfarm sector due to a lack of opportunities on the farm. Also the characteristics of farm households also contribute to the participation in off-farm economic activity. Involvement in off-farm activities, as a livelihood strategy among poor rural households, plays a vital role in promoting growth and welfare and offers a pathway out of poverty if nonfarm opportunities can be seized by the rural poor. However, no empirical analysis has been done to find the effect of participation in off-farm employment on farm household income.

Farm households' income smoothing strategies

Households that engage in agriculture in developing countries often have to cope not only with severe poverty, but also with fluctuating incomes. The income of these households is mostly determined by factors beyond their control (e.g., weather conditions and output prices). Farm households that live close to subsistence level do not only face income risks but often this leads to consumption fluctuations (Wik, 1999). Wik further explained that farmers in developing countries need ways to shield themselves against the bad seasons and for them, discovering ways to smooth out their income or consumption between good and bad seasons can often make the difference between life and death.

50

According to Morduch (1995), there are two ways that farm households cope with risk. First, households can cope with risk by smoothing income. They do this by making conservative production and employment choices, taking tenancy contracts and diversifying their income sources. Through these methods, households try to protect themselves from adverse income shocks before they happen. Second is through consumption smoothing. In this way, households could borrow, save, deplete their assets, adjust labour supply or employ informal and formal insurance contracts. These mechanisms usually take place after income shocks have occurred to the household so as to insulate consumption patterns from income fluctuations.

In developing countries, formal financial institutions that deal with risk related to agriculture are mostly poorly developed and inadequate in rural areas. According to Holden and Binswanger (1998), formal credit institutions were mostly developed in low-risk rather than in high-risk markets. The lack of these institutions is mostly attributed to the problem of adverse selection and moral hazard. Despite the lack of these credit and insurance institutions, farm households find other ways in dealing with income variability or risk.

Deaton (1997) in his study explained that consumption and income move parallel over people's life cycles and that consumption and income are tied jointly over longer periods. Short periods within which smoothing were practiced revealed the extent to which farm households maintain their consumption and living standard in the period of short term fluctuations in their income. This implied that farm households set aside something during the good seasons to cater

for periods in the bad seasons. In theory, this could be explained by the permanent income hypothesis propounded by Friedman (1957).

The theory explains that consumption is not determined by current income but by permanent income. And that if current income is the total of permanent income and transitory income, whiles consumption depends on permanent income, then the difference between the current income and permanent income which is the transitory income is used to smooth consumption. According to Deaton (1997), the propensity to consume out of permanent income is greater than the propensity to consume out of transitory income which suggests some consumption smoothing.

A study of rice farmers in Thailand by Paxson (1992) provided evidence that farmers responded differently to transitory income and permanent income. She found that most rice farms in Thailand were not irrigated therefore depended on rainfall. The amount of rainfall determined the yield with more rainfall implying high harvest or yield and high income. With her regression analysis, she was able to separate transitory income from permanent income and found that permanent income was more important in determining consumption than transitory income. Therefore rice farmers from Thailand recognized that it was important to set aside a substantial amount of the rain-induced income to cushion consumption at bad times.

Rosenzweig and Wolpin (1993) in a study in India found that sales of bullocks decreased significantly during poor weather hence low income whiles

sales increased when rainfall was enough. This showed that these households used the sales of bullocks as a smoothing strategy.

Another way farm households cope with risk is through risk pooling. Townsend (1995) revealed that there was much risk pooling among farmers than among entrepreneurs. He found that farmers in the north and northeast areas of Thailand facing the lowest growth levels appeared to share risk and suggested that it was an indication of consumption insurance.

In northern Nigeria, a study by Udry (1994) on informal credit institutions found that loans were made without witnesses or written records. The borrower and the lender only negotiated on the size of the loan with the interest rate and the time for payment were not set. He also noticed that information flowed freely between borrowers and lenders within a small geographical area and this allowed for credit contracts to play a duty of insuring these households against risk. Return rates were usually low and repayment also took longer periods usually when these households faced adverse shocks. But it had been noticed that the progress of such insurance and credit institutions depended on the close social relationships. According to Besley (1995), these traditional institutions seemed to be vanishing due to the introduction of formal capital markets.

Due to the non perfect nature of insurance and credit institutions for farm households, these households usually engage in income generating activities to smooth income (Wik, 1999).

In a study by Bliss and Stern (1982) though fertilizer usage was seen as a highly productive input in wheat farming, farmers used less fertilizer than they would have. This was to done to reduce investment losses in bad times.

According to Wik (1999), diversifying income sources was another way farm households smooth their income. He explained that diversifying was an effective strategy to reduce income risk especially when the covariance between the different income sources is low. Diversifying could come in the way of cultivating different crops and also combining crop and livestock farming. Other strategies that farm households did included hiring out labour and bullocks, or receiving remittances from members of the household who had migrated.

Reardon, Delgado and Matlon (1992) in a study in Burkina Faso found that participation in non-farm economic activities tends to be quite effective as a tool for risk reduction. They explained further that incomes from non-farm activities tended to be less correlated with crop income than the correlation between different crop incomes with each other.

Conclusion

This chapter looked at the off-farm sector in Ghana as well as the theoretical and the empirical literature on off-farm labour participation and its effect on farm households' income. The goal was to identify the key variables that determine the decision to participate in off-farm economic activities and its importance and effect on farm households' income.

The review of the off-farm sector in Ghana revealed that almost 46.4 percent households in Ghana engage off-farm economic activities. Off-farm sector contributes about 24.5 percent of income to households in Ghana. It was also noticed that the rural sector lacked economic developing facilities which was predominantly dominated by rain-fed small scale farmers. This makes the farmers mostly under-employed and thereby allocating part of their time to off-farm economic activities so as to profitably use their time in earning income to supplement their on-farm earnings.

Also, it was noted from the review of the literature that there were certain socio-economic characteristics that influenced the decision for a farm household member to participate in off-farm economic activities. These included variables such as age, educational level, off-farm training, access to credit and remittances, farm size and household size. It further noted that some of these variables including participation in off-farm economic activities affected farm household income.

It was realized in most of the literature that discrete choice models such as logit, probit, tobit and multivariate probit models were used to determine participation decision whiles ordinary least squares was employed to find the effect of participation on farm household income.

CHAPTER THREE

METHODOLOGY

Introduction

The study seeks to find the effect of off-farm labour participation on the income of farm households. This chapter focuses on the analytical framework, research design, population, sample and sampling procedure, data collection instrument and procedure, and data analysis that were used in order to achieve the objective of the study.

Analytical framework

The model is based on the agricultural household model that combines agricultural production, the households' consumption, and the labour-supply for the off-farm work decision by the household in a single framework. This is based on the farm household model by Huffman (1991). The study considers a household with two members, the household head and the spouse of the household head. Households utility function (U) according to the agricultural household model, depends on household consumption goods (G), leisure time (Li) of husband (household head) and wife (spouse), Human capital (Hi), and other factors,τ, including household and area characteristics. Thus:

(1) $Max\ U = U(G, L_i; H_i, \tau)$ $\partial U/\partial N > 0,\ \partial^2 U/\partial N^2 < 0,\ N =$

$L_i, G, H_i; i = h, w$

Where $i = h$ is household head, and $i = w$ is spouse of the household head. The utility function (*U*) is assumed to be monotone increasing in its arguments and strictly concave and has continuous second partial derivatives. The household utility-maximization is subjected to constraints on income, technology, and endowed time. Individuals can allocate time endowment to farming, off-farm work, and leisure:

(2) $PgG = PqQ - Wx\,X' + W_{of}T_{of} + A$ (Income constraint)

(3) $Q = Q[X, F, H, R]$ (Production constraint)

(4) $T = F + T_{of} + L,\ \ T_{of} \geq 0$ (Time constraint)

where *Pg* is the price of goods purchased for consumption and *G* denote the quantity of goods purchased for consumption; *Pq* is the price for farm output and *Q* represent quantity of output produced from the farm; *Wx* and *X* are the price and quantity (row) vectors of farm inputs; W_{of} represents off-farm wages paid to the household head and spouse; T_{of} is the amount of time working off-farm by the household head and spouse; *F* is the amount of time working on the farm by the household head and spouse; *A* is other incomes such as credit and remittances, *R* is a vector of exogenous factors that shift the production function such as input price. *T* denotes the (annual) time endowments for the household head and spouse. Substituting (3) into (2), a production-constrained measure of household income is obtained (Huffman, 1991):

(5) $Pg\,G\ =\ Pq\,Q[X,F,H,R] - Wx\,X' + W_{of}T_{of} + A$

The Kuhn-Tucker conditions are obtained by maximizing the lagrangian expression $\mathcal{L}$ over (G, L) and minimizing it over the Lagrange multipliers (λ, μ), where $\mu\ =\ (\mu_h, \mu_w)$:

(6) $\mathcal{L}\ =\ U(G,L,H,\tau)\ +\ \lambda\{Pq\,Q[X,F,H,R] - Wx\,X' + W_{of}T_{of}\ +\ A\ -$

$Pg\,G\}\ +\ \mu[T\ -\ F\ -\ T_{of}\ -\ L]$

The off-farm participation decision may be obtained from the following Kuhn-Tucker conditions:

(7) $\partial\mathcal{L}/\partial X\ =\ \lambda\,(Pq\,\partial Q/\partial X\ -\ Wx)\ =\ 0$

(8) $\partial\mathcal{L}/\partial F\ =\ \lambda\,Pq\,\partial Q/\partial F - \mu\ =\ 0$

(9) $\partial\mathcal{L}/\partial T_{of}\ =\ \lambda\,W - \mu \leq 0,\ \ T_{of} \geq 0,\ \ T_{of}(\lambda\,W - \mu)\ =\ 0$

(10a, b) $\partial\mathcal{L}/\partial G\ =\ UG\ -\ Pg\,\lambda\ =\ 0,\ \ \partial\mathcal{L}/\partial L\ =\ UL\ -\ \mu = 0$

(11) $Pq\,Q[X,F,H,R] - Wx\,X'\ +\ W_{of}T_{of}\ +\ A\ -\ Pg\,G\ =\ 0$

(12) $T\ -\ F\ -\ T_{of}\ -\ L\ =\ 0$

where $UL,\ UG$ are the partial derivatives of the function U. Without loss of generality, both the household head and spouse of the farm household are assumed to have positive optimal hours of leisure and farm work, i.e., equation (8) and (10b) are equalities.

The off-farm participation decision conditions for the household head and spouse in the farm household may be obtained from the optimality conditions for off-farm work from equations (8) and (10b):

(13) $W_{of}\ \leq \mu/\lambda\ =\ Pq\,\partial Q/\partial F$

Where μ/λ is equal to the marginal rate of substitution between leisure and consumption goods (from equations 10a and 10b) and $Pq\ \partial Q/\partial F$ represents the value of the marginal product of farm labor for household head and spouse of a farm household. Examining the components of (13), $W_{of} < \mu/\lambda$ indicates that the total time endowment for the household head and spouse is allocated between farm work and leisure and non for off-farm work; this implies a corner solution, i.e., $T_{of}* = 0$. On the other hand, if $W_{of} = \mu/\lambda$, optimal hours of off-farm work will be positive $(T_{of}* > 0)$ and $W_{of} = \mu/\lambda = Pq\ \partial Q/\partial Fi$ and an interior solution for that matter. This implies that the value of the marginal product of farm labor is equal to the off-farm wage rate. Also if $W_{of} > \mu/\lambda$, then total time endowment for the household head or spouse is allocated to only off-farm work.

An interior solution occurring for T_{of} means that equations (7) and (8) can be solved together, independently of the rest of the Kuhn-Tucker conditions, to get the demand functions for on-farm labor, i.e., the optimal production and consumption decisions can be separated since the off-farm wage determines the value of the husband's and wife's time $(W_{of} = \mu/\lambda)$ (Huffman & Lange, 1989; Huffman, 1991).

The demand function for on-farm labor is then $F^* = F(W_{of}, Wx, Pq, H, R)$ and the demand for purchased farm inputs is $X^* = X(W_{of}, Wx, Pq, H,, R)$. Substituting these optimal input demand functions into the production function yields the farm supply output $Q^* = S(W_{of}, Wx, Pq, H, R)$ and the maximum net household income may be expressed as:

(14) $NI^* = Pq\, S(W_{of}, Wx, Pq, H, R) - Wx\, X^{*'} + W_{of} T_{of} + A$

Solving equations (9), (10), and (14) jointly yields the demand for leisure

$L^* = L(W_{of}, Pg, NI^*, H, \tau, T)$ and   for   consumption

goods $G^* = G(W_{of}, Pg, NI^*, H, \tau, T)$. Substitution of the optimal levels of leisure

hours and farm work hours into T_{of} yields the supply function for off-farm time

(Huffman, 1991):

(15) $T_{of}^* = T - F^* - L^* = T_{of}(W_{of}, Wx, Pq, Pg, NI^*, H, \tau, R, T)$

Finally, a reduced-form expression of total household income which is a

function of the exogenous variables is obtained as:

(16) $NI^* = NI(Wx, Pq, Pg, A, H, \tau, R, T)$

As Huffman (1991) notes, when the husband and wife do not work off the

farm, the decision process is not self-repeating and production and consumption

decisions must be made together. This implies that the arguments for the reduced-

form expression of household income are the same as in (16).

Considering the cross-sectional structure of the data, we can use the

implicit function theorem to derive expressions for off-farm labour supply for

farm household head and spouse (which affect off-farm labor supply of farm

household head and spouse) that are functions of human capital, non-labour

income, and other exogenous factors. These factors are replaced in reduced-form

representations of labour supply by observable farm, farmer, and household

characteristics, including human capital. The ambient variables such as family

size which might influence the participation in an off-farm economic activity by

the farmer and the spouse are also included.

Estimation techniques

A two-stage econometric model was specified for estimation. A decision model will be specified to estimate the participation decision of farm households in off-farm employment. This will be the first stage. The second stage will be to specify a model that will capture the effect of off-farm labour participation decision on farm household income.

Bivariate probit estimation

A bivariate probit model is used to estimate the joint participation decision of household head (17a) and spouse (17b) in a farm household in an off-farm activity. The bivariate probit model captures the possible existence of correlated disturbances between two probit equations. Thus the assumption is that the decision to participate in an off-farm activity by a farm operator and spouse in a certain household are taken jointly therefore correlated. The equations are;

(17a) $y^*_h = \beta_h Z_h' + \varepsilon_h$ $\qquad\qquad\qquad y_h = 1 \;\; if \; y^*_h > 0, 0 \; otherwise$

(17b) $y^*_w = \beta_w Z_w' + \varepsilon_w$ $\qquad\qquad\qquad y_w = 1 \;\; if \; y^*_w > 0, 0 \; otherwise$

h = household head

w = spouse

β = parameters to be estimated.

$E[\varepsilon_h] = E[\varepsilon_w] = 0,$

$Var[\varepsilon_h] = Var[\varepsilon_w] = 1,$

$Cov[\varepsilon_h, \varepsilon_w] = \rho$

The probability is,

$$p_{11} = \Pr[y_h = 1, y_w = 1]$$

$$= \Pr[y_h^* > 0, y_w^* > 0]$$

$$= \Pr[-\varepsilon_h < \beta_h\, Z_h\,', -\varepsilon_w < \beta_w\, Z_w\,']$$

$$= \Pr[\varepsilon_h < \beta_h\, Z_h\,', \varepsilon_w < \beta_w\, Z_w\,']$$

$$= \int_{-\infty}^{\beta h\, Zh'} \int_{-\infty}^{\beta w\, Zw'} \phi_2(n_h, n_w; \rho)\, dn_h\, dn_w$$

Where ϕ_2, the bivariate normal density function, is

$$\phi_2(n_h, n_w; \rho) = [2\pi(1 - \rho^2)^{1/2}]^{-1}\exp\left[-(1/2)(1 - \rho^2)^{-1}(n_h^2 + n_w^2 - 2\rho n_h n_w)\right]$$

and the resultant cumulative distribution function yields

$$= \Phi(\beta_h\, Z_h\,', \beta_w\, Z_w\,'; \rho)$$

The (row) vectors $Zh \text{ and } Zw$ in equations 17a and b represent factors influencing off-farm participation decision of husband and wife respectively. These attributes include:

- Farm factors (farm size.)

- Human capital (age, experience and education)

- Household characteristics (presence of children, household size)

- Credit

- Other incomes

The empirical model for the bivariate probit model for participation decision in off-farm economic activity to be estimated is specified as follows:

(18) $\quad y_i = \beta_0 + \beta_1 Agehd + \beta_2 Agehd^2 + \beta_{3j} Educhd + \beta_{4j} Educsp +$

$\beta_5 Hhsize + \beta_6 Child5 + \beta_7 lnfms + \beta_8 Offrmtrnhd + \beta_9 Offrmtrnsp +$

$\beta_{10} Credithd + \beta_{11} Creditsp + \beta_{12} Remithd + \beta_{13} Remitsp + \varepsilon_i$

Where $j =$ no schooling, primary, JSS and secondary/tertiary, $Agehd$ is age of household head; $Agehd^2$ represents the squared age of household head; $Educhd$ and $Educsp$ depict education levels of household head and spouse respectively; $Hhsize$ represent the household size; $Child5$ represents children who are five (5) years or below; $lnfms$ is log of farm size, $Offrmtrnhd$ and $Offrmtrnsp$ depict off-farm training in off-farm work by household head and spouse respectively; $Credithd$ and $Creditsp$ also represent access to credit by household head and spouse respectively; $Remithd$ and $Remitsp$ is access to remittances by household head and spouse respectively.

The expected signs of the coefficients are: $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 and \beta_4 > 0$ (for all educational levels except no schooling), $\beta_5 > 0$, $\beta_6 >/< 0$, $\beta_7 < 0$, $\beta_8 and \beta_9 > 0$, $\beta_{10} and \beta_{11} >/< 0$, $\beta_{12} and \beta_{13} >/< 0$. The definitions of the variables in equation (18) are presented in Table 1.

Table 1: Definition and measurement of variables

List of variables	Definition and measurement of variables
Agehd	Age of household head in years
Agehd^2	Squared age of household head
Educhd	Education levels of household head
No schooling	=1 if head have no level of schooling, 0 otherwise
Primary	=1 if head have primary education, 0 otherwise
JSS	=1 if head have JSS education, 0 otherwise
SSS/Tertiary	=1 if head have SSS/Tertiary, 0 otherwise
Educsp	Education levels of spouse
No schooling	=1 if spouse have no level of schooling, 0 otherwise
Primary	=1 if spouse have primary education, 0 otherwise
JSS	=1 if spouse have JSS education, 0 otherwise
SSS/Tertiary	=1 if spouse have SSS/Tertiary, 0 otherwise
Hhsize	Number of household members
Child5	Number of children 5 years and below
Infms	Log of farm size in acres
Offrmtrnhd	=1 if head has off-farm training, 0 otherwise
Offrntrnsp	=1 if spouse has off-farm training , 0 otherwise
Credithd	=1 if head has access to credit, 0 otherwise
Creditsp	=1 if spouse has access to credit, 0 otherwise
Remithd	=1 if head has access to remittances, 0 otherwise
Remitsp	=1 if spouse has access to remittances, 0 otherwise

Source: Field Survey, 2011

Heckman sample selection estimation

The impact of participation in off-farm economic activity on farm income is estimated within a linear regression framework by placing a dummy variable for participation in off-farm activity as part of the dependent variables. This will

be the second stage. The linear regression equation, based on equation (16), to be estimated is

(19) $NI_i = \vartheta_1 Educ_i + \vartheta_2 Hhsize + \vartheta_3 lnfms + \vartheta_4 Offrmtrn_i + \alpha_i y_i + \mu_i$

Where $i = h, w$

NI_i is household income, $Educ_i$ is educational levels, $Hhsize$ represents the household size, $lnfms$ is log of farm size, $Offrmtrn_i$ depicts training in off-farm work, y_i is an indicator variable for participation ($y_h = 1, y_w = 1$ if household head and spouse respectively participate in off-farm economic activity and $y_i = 0$ otherwise). ϑ and α are appropriately dimensioned parameters. μ_i is a random disturbance term assumed to be normally distributed. The expected signs of the coefficients are: $\vartheta_1 > 0$ (for all educational levels except no level of education), $\vartheta_2 > 0, \vartheta_3 > 0, \vartheta_4 > 0, \alpha_i > 0$.

The impact of participation in off-farm work activity on household income is measured by the estimate of the parameter α. This implies that farmers should be randomly assigned whether or not they choose to participate in off-farm work. However, the dummy variable y cannot be treated as an exogenous variable since the decision to participate in off-farm work or not to participate in off-farm work is based on individual self-selection.

Self-selection is a term that explains the fact that individuals self-select (make their own choice) into certain programs or behaviours which make participation in the program or behaviour not randomly determined (Wooldridge, 2005). He further explains that the term is mostly used when a binary indicator of participation might be systematically correlated with unobserved factors. Thus,

this makes the self-selection problem another way an explanatory variable can also be described as endogenous.

In this case, a farmer self-selects whether to participate in an off-farm economic activity or not depending on the perceived marginal benefit. But a farmer who makes a choice to participate in an off-farm economic activity will likely have relatively high income even if he does not participate. Since y cannot be treated as an exogenous variable, estimating equation (19) by the Ordinary Least Squares (OLS) method will yield an inconsistent result and biased estimates.

To obtain a consistent result, the process of correcting for self-selection bias using the Heckman Sample Selection Model (also known as the Heckman Two-step procedure) proposed by Heckman (1979) and also done by Maddala (1983) is followed. An equation explaining the sample selection is included into the equation to be estimated. The equation in this case is the participation equations represented by the equations (17a and b) thus;

(17a) $y^*_h = \beta h \, Zh' + \varepsilon h$ $\quad\quad\quad\quad\quad$ $y_h = 1 \;\; if \; y^*_h > 0, 0 \; otherwise$

(17b) $y^*_w = \beta w \, Zw' + \varepsilon w$ $\quad\quad\quad\quad\quad$ $y_w = 1 \;\; if \; y^*_w > 0, 0 \; otherwise$

The predicted probability of participation in off-farm work (y^*_i), obtained from the participation equation is used as an instrumental variable for y in equation (19). Equation (20) can therefore be estimated using the Ordinary Least Squares (OLS). This process yields consistent estimates of the parameters ϑ and α by regarding self-selection and simultaneity as sources of endogeneity.

For identification, variables like age, age squared, children who are five (5) years or below, access to credit and access to remittances were used as instrumental variables in the selection equation. This was because they were highly correlated with the participation variable but not or less correlated with household income. This therefore made the outcome equation or the income equation to be identified.

Justification of the variables

Participation in off-farm economic activities and its effect on income of arm households are assumed to be influenced by socio-economic and demographic characteristics namely age, educational levels, household size, number of children, farm size, off-farm training, and access to credit and remittances.

Age

The age distribution of farm households has important effect on participation decisions in off-farm economic activities. One major role agricultural household's play is to supply labour to meet farm needs. This variable when squared is used to capture the life-cycle effect to participate in the off-farm work. It is generally observed that the probability of off-farm participation increases with age up to a maximum and then begins to decline (Kimhi and Lee, 1996). It is thought that individuals increase their work effort in earlier years as they accumulate assets to draw on later in life (Lass, Findeis, and Halberg, 1991).

The ability of farm households to secure the same level of income from off-farm employment, changes in intergenerational relationships between parents and children within the extended household.

Level of Educational

This variable represents the human capital endowment. There is evidence of a positive linkage between access to or the level of education and the participation in more paying off-farm economic activities. According to Lanjouw (1999), salaried employment reveals a high probability of gaining employment in a regular non-agricultural wage employment as the education levels rise. According to Gordon and Craig (2001), there are various processes that strengthen the impact of education on incomes they include: (a) the ability of education to increase skill levels which are needed in the off-farm activities to contribute to higher productivity, (b) education setting in train processes that increases ones confidence, establishing useful contacts or even contribute to productive investment, (c) education is closely correlated with other variables like pre-existing wealth that also improve access to higher income employment, and (d) uneducated household members may benefit from the advice from the educated ones. But Sander (1983) argues that the effect of education on off-farm labour participation is indeterminate.

Household family size

This is defined as the number of individuals living in a household. The size of the family affects the ability of a household to supply labour to the on-farm and the off-farm sector. The probability of a member of a household in a large family to participate in an off-farm economic activity is expected to increase. Larger household size implies an increase in burden and gives extra reason to participate in off-farm work by the active individuals in a household.

Presence of children

This is defined to mean the existence of children in the farm household. This study used the number of children who were five (5) years or below. The probability of working off-farm for farm households is expected to increase since the presence of children in the family requires additional income for the up keep of the household.

Off-farm training

This is a dummy variable which represents whether the member of the farm household has undertaken training in an off-farm activity or not. Household members with such training are more dynamic and entrepreneurial individuals. This is possible for them to show a higher degree of success. The expectation is that the probability of the member of the farm household with off-farm training will increase participation in off-farm economic activity.

Size of land cultivated or farm size

This is the size of the farm land cultivated by the farm household in acres. It is assumed that small farm size is related to poor farm household with large farm size related to well to do farm households. The expectation is that farm households with large farm sizes for cultivation will have a less likelihood of participating in off-farm economic activities.

Access to credit

Household members take credit to invest into their businesses be it the on-farm or off-farm business. Therefore access to credit boost the chance in participating more in the economic activity for which the credit was taken. The expectation is that if members of farm households have access to credit then the probability of participating in an off-farm economic activity may either increase or decrease.

Access to non-labour income

Access to non-labour income increases the capital of the farm household so as to inject into their on-farm work or off-farm work. The expectation is that a member of a farm household who has access to non-labour income like remittances is less or more likely to participate in an off-farm economic activity.

Description of study area

The research was conducted in the Abura-Asebu-Kwamankese district in the Central Region of Ghana in February and March 2011. The district has a population density of 277.2 per sq. km. The urban population is 26,200 which represents 29.1 percent of the district population with the rural population being 63,893 which also represents 78.9 percent. This makes the district predominantly rural. Farming and fishery are the main occupations of most households in the District. Industry follows due to the fact that there are many enterprises that use raw materials from agriculture for their production.

Household incomes are generally low in the district. The average household income earning is about GH 60 per annum. Bakers generally earn uniform income levels throughout the year since the demand for their produce is fairly stable so as garages, market women and petty traders. Farmers in general usually earn low income since they only make high sales during the harvest periods and also usually lose when they find no market for their bumper harvest. Furthermore, their produce has unstable market prices. Many farmers borrow during the off-season for farming and defray them during harvest times. A larger population in the district survives through the combination of two or more income generating activities, and this ensures some regular flow of income throughout the year. The majority of the skilled and literate labour force in the district work outside the district. It has been established that migration is so high that out of the District households, 47-50 percent have at least one member migrated.

Research design

The study uses the cross-sectional survey design to determine the factors that influence participation in off-farm economic activities and its effect on farm households' income by farm household heads and their spouses in the Abura-Asebu-Kwamankese District in the Central Region of Ghana. Using a survey design implies that the researcher has a clear view of the phenomena being investigated before the data collection was done. A major strength of using a survey design according to Singleton, Straits and Straits (1993) is that, a survey work can be used for both exploratory and descriptive purposes and also allows for direct contact between the researcher and the respondents of the study during the process of data collection. It further helps in obtaining detailed and precise information from the respondents.

Though the survey design comes with these advantages, it has also got its weakness. Respondents might not give true responses to some or all of the questions posed. This is due to the fact that survey design depends on reports of behaviour rather than observation of the behaviour. Sometimes respondents find it difficult to give answers to questions they find sensitive such as income, age and sexual behaviour. According to Singleton et al, (1993) the result of this problem is that of measurement error brought about by respondents lack of truthfulness, not understanding the questions or worse of all not able to recollect past events and situations accurately.

Population

The population for the work was made up of married farm households in the Abura-Asebu-Kwamankese District in the Central region of Ghana. The population of farm holders in this district is 12,587 with 6,950 total farm households. Since the study considered only married farm households the population size was not known.

Sample and sampling procedure

This study was designed to gather data from household head and spouse of married farm households in the Abura-Asebu-Kwamankese District. Due to the fact that there was no available list of farmers and especially the married ones from the district office of the Ministry of Agriculture, a multi-stage sampling technique was employed. First, with the help of a district agriculture officer at the district office of the Ministry of Agriculture, seven (7) towns that cultivated major crops like maize, cassava, plantain, palm fruit, citrus and cocoa were selected from the district. This process is known as purposive sampling. These towns included Asebu, Amosima, Edumfa, Batanyaa, Asuansi, Pra Awusi and Abuase.

Second, a quota was given to each town depending on the population of each town and on the assumption that the larger the town the greater the married farm households. The bigger towns like Asebu and Amosima were assigned 50 married farm households each; Edumfa, Asuansi and Batanyaa were assigned 40 each while the smaller towns Pra Awusi, and Abuase were assigned 30 each. Third, farm households were first screened to identify the married farmers. Random sampling was done to select the sample from each town. Table 2 shows

73

the number of married farm households identified from each town and the actually number obtained for the study. Some observations were dropped because of non-responses and refusal of some respondents to answer questions after their spouses had been interviewed. Therefore 253 respondents were finally obtained.

Table 2: Distribution of married farm households by towns

Towns	Households Identified	Sample
Asebu	107	43
Amosima	118	47
Edumfa	85	34
Batanyaa	98	39
Asuansi	95	38
Pra Awusi	68	27
Abuase	62	25
Total	633	253

Source: Field Survey, 2011

Research instrument

A gender-disaggregated data was collected by way of interview using a structured interview schedule. This allowed for examination of the behaviour of both female and male farmers thus married farmers in a household. The interview schedule was structured with both open and closed ended questions. This was to ensure that sufficient responses were obtained.

Data collection procedure

After the preparation of the interview schedule, a pre-test was carried out at Abrafo-Odumase in the Twifo Hemang Lower Denkyira District also in the Central Region of Ghana. This town was selected for its similar characteristics in both on-farm and off-farm economic activities as the selected area of study. The pre-test was done to make certain that the research instrument was appropriate and understandable. Also it was to ensure the validity, reliability and unbiasedness of the data to be collected. In all 30 farm households involving both spouses were interviewed during the pre-test. The test exposed some problems with certain questions which made some questions to be reframed and others taken out because they were irrelevant.

The main data was collected with the help of trained research assistants under the supervision of the researcher. The research assistants were taken through the process and mechanism of interviewing so as to obtain the right response from the respondents in order to achieve the objective of the study. The research assistants involved in the data collection were chosen based on their educational background, proficiency in the Fante language and their ability to translate from English to Fante. In total 253 married households were obtained.

Method of data analysis

Data collected was edited to ensure coherence and consistency of the information gathered. Edited data was inputted into the computer using Statistical Product and Service Solutions (SPSS) software since it was very convenient for

inputting data. The data was then transferred from SPSS to Stata for analysis. Stata was used for the analysis because it contained the bivariate probit estimation feature which is not found in the SPSS software.

Descriptive statistics was done on the biographic characteristics of the respondents and also on the characteristics of the household, farming and off-farm activities. The joint participation decision of the farm operator and spouse in an off-farm economic activity was then estimated using the bivariate probit model. Since the data was a cross-sectional data there was a high possibility of the presence of heteroscedasticity. But the bivariate probit model does not have any way of testing for it. To correct for the possible presence of heteroscedasticity, robust bivariate probit estimation was performed which reported robust standard errors. In order to find the effect of household labour participation in an off-farm economic activity on farm household income, the Heckman Sample Selection estimation was done. A significant rho (ρ) coefficient from the Heckman estimation will show that labour participation in off-farm work is endogenous in the income equation.

The analyzed and estimated data was then presented using tables (percentages, frequencies and estimation results) and interpreted appropriately.

Errors in data

Though household surveys are one of the good sources of collecting household data, it does come with some factors that limit the quality of the data collected for the study. Most farm households in Ghana have a high illiteracy rate

in terms of formal education therefore most of the respondents could not speak the English language. The interview had to be done in the local dialect thus Fante. Translation of the items on the interview schedule from English to Fante could pose a challenge in terms of accuracy and quality of data especially when it is not done well.

Most of the farm households kept no record of their on-farm and off-farm activities. This meant that approximation had to be done for some of the important variables. Variables like age and income had to be approximated for most household members. This was done with caution so as to reduce the negative effect or biasness this situation could pose on the estimation and the results.

Conclusion

This chapter looked at the methodology used for the study. A survey design was used for the study where primary data was collected. The data was collected from Abura-Asebu-Kwamankese district which happens to be the study area. The study used an interview schedule for the data collection. A pre-test of the research instrument was first conducted outside the district. For the analytical framework, the study adopted the agricultural household model developed by Huffman (1991). For the first objective, the bivariate probit model was used to estimate the joint participation decision of household heads and spouses in off-farm economic activities. To achieve the second objective of the work, the Heckman Sample Selection process was followed.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter of the research presents the empirical analysis of the determinants of the participation of farm households in off-farm economic activities and its effect on farm household income. This is captured in tables and regression analyses indicating the household characteristics of farm household heads and spouses, characteristics of farm and off-farm economic activities and participation in off-farm economic activities.

Socio-economic characteristics of farm households

The study used a survey data collected using an interview schedule from farm households. For the purpose of this study, only married couples were interviewed and both the household head and spouse were interviewed to capture the joint decision making process of the household. Information on individual characteristics which included age, educational level, type of off-farm economic activities, levels of farm and off-farm income were obtained.

Two hundred and fifty three (253) households were used for this study. Among these households, all household heads were males implying that the

spouses of the household head were all females which follow the traditional system pertaining in the region.

For the age variable, the maximum age of the household head is 88 years while the minimum age is 24 years. The mean age of the household head is approximately 49 years with a standard deviation of 11.52. For the age categories of the household head as shown in Table 3, 13 household heads were below 30 years representing 5.14 percent, between ages of 31 and 45 years all inclusive, there were 91 heads representing 35.97 percent. Between the ages of 46 and 55 years all inclusive, there were 86 heads representing 33.99 percent of the household heads in that age group. Those above the age of 56 years were 63 representing 24.90 percent.

Table 3: Age categories of household head and spouse

	Household Head		Spouse	
Age categories	Frequency	Percent	Frequency	Percent
30 and below	13	5.14	36	14.23
31-45	91	35.97	130	51.38
46-55	86	33.99	59	23.32
Above 55	63	24.90	28	11.07
Total	253	100	253	100

Source: Field Survey, 2011

Generally, majority of the household heads fall within the adult age categories (thus 46 years and above) having a cumulative percentage of 58.89 percent. This leaves 41.11 percent in the young adult and economically active category.

The minimum age of the spouses was 21 years and the maximum age was 72 years. The mean age of the spouses was approximately 42 years with a standard deviation of 10.49. Also from Table 3, 36 spouses were below 30 years which represents 14.23 percent of spouses. 130 spouses were between the ages of 31 and 45 years representing 51.38 percent of spouses. In the age ranges of 46 and 55, there were 59 spouses representing 23.32 percent whiles 28 spouses were above the ages of 56 years representing 11.07 percent of the spouses. Majority of the spouses were within the young adult and economically active category (below 45 years) having a cumulative percentage of 65.61.

Among the household heads, 27 (10.67%) had no formal education as presented in Table 4. Also, 37 (14.62%) heads had at least primary education. The majority of the household heads, thus 147 (58.10%), had attended Junior Secondary School or the Middle School. With the secondary, technical or vocational education level, there were 27 (10.67%) heads while only 15 (5.93%) heads had obtained one form of tertiary education.

Also in Table 4, 92 (36.36%) spouses had no form of formal education. 56 (22.13%) spouses had obtained a primary education, while 94 (37.15%) spouses representing the majority of spouses had attended Junior Secondary School (or Middle School). There were 10 (3.95%) spouses who had attended a secondary,

technical or vocational School with only one (0.40%) spouse attending one form of Tertiary School.

Table 4: Level of education of household head and spouse

	Household head		Spouse	
Educational level	Frequency	Percent	Frequency	Percent
No education	27	10.67	92	36.36
Primary	37	14.62	56	22.13
JSS/Middle school	147	58.10	94	37.15
SSS/Tech/Voc	27	10.67	10	3.95
Tertiary	15	5.93	1	0.04
Total	253	100	253	100

Source: Field Survey, 2011

The mean household size was approximately six (6) members with a standard deviation of 2.5. The minimum household size was two (2) members and the maximum being 15 members.

There were 134 (52.96%) households that reported the presence of children who were five (5) years old or younger with 119 (47.04%) households having no children who were five (5) years or younger. Also, 40 (15.81%) households had members who were 65 years old or older with 213 (84.19%) households having no members who were 65 years old or older. This is shown in Table 5.

Table 5: Presence of younger and older household members

	Members 5 years or below		Members 65 years or above	
	Frequency	Percentage	Frequency	Percentage
No	119	47.04	213	84.19
Yes	134	52.96	40	15.81
Total	253	100	253	100

Source: Field Survey, 2011

Table 6 shows that among the household heads, 71 (21.06%) reported one sought of ailment or another with 182 (71.94%) reporting good health in the past 12 months. Also, 76 (30.04%) spouses also reported sick with 177 (69.96%) having no ailment in the past 12 months. Among some of the ailment included malaria, severe waist pains and general body pains, diarrhea, cholera and also having to be surgically operated on.

Table 6: Household members reporting an ailment

	Household head report any ailment		Spouse report any ailment	
	Frequency	Percent	Frequency	Percent
No	182	71.94	177	69.96
Yes	71	28.06	76	30.04
Total	253	100	253	100

Source: Field Survey, 2011

The major crops cultivated in the area included maize, cassava, yam, plantain, palm tree, orange and cocoa with a planting tomatoes, garden eggs, pepper and cocoyam. All the households interviewed had both spouses cultivating

on the same land. From Table 7, it is seen that among the 253 households 124 (49.01%) cultivated maize while 129 (50.99%) did not cultivate maize, 183 (72.33%) households cultivated cassava while 70 (27.67%) did not cultivate cassava, 10 (3.95%) cultivated yam with 243 (96.05%) not cultivating yam.

Further the number of households cultivating plantain were 86 (33.99%) while 167 (66.01%) did not cultivate plantain, also 72 (28.46%) households cultivated palm tree, while 181 (71.54%) did not cultivate it. 69 (27.27%) of the households cultivated citrus while 184 (72.73%) did not cultivate citrus and 62 (24.51%) cultivated cocoa while 191 (75.49%) of households did not cultivate cocoa.

Table 7: Crops cultivated by households

| | Crops cultivated by farm households | | |
	No	Yes	Total
Maize	129 (50.99%)	124 (49.01%)	253 (100%)
Cassava	70(27.67%)	183 (72.33%)	253 (100%)
Yam	243 (96.05%)	10 (3.95%)	253 (100%)
Plantain	167 (66.01%)	86 (33.99%)	253 (100%)
Palm tree	181 (71.54%)	72 (28.46%)	253 (100%)
Citrus	184 (72.73%)	69 (27.27%)	253 (100%)
Cocoa	191 (75.49%)	62 (24.51%)	253 (100%)

Source: Field Survey, 2011

Table 8 and Table 9 present some further statistics on the farm characteristics. The farm size cultivated by the farm households ranged from half an acre to 23 acres. The mean farm size was 5.29 acres with standard deviation

3.81. In addition to the crops cultivated, 143 (56.52%) households out of the 253 households reared animals like fowls, goats or sheep and these were for domestic use but not for commercial purposes. 187 (73.91%) households said they hired extra labour for purposes of weeding the farm and harvesting.

Table 8: Farm characteristics

Farm Characteistics	Minimum	Maximum	Mean
Farm size	0.5	23	5.286561
Distance to farm	0.25	11.2	2.876877
Hours on farm	0.5	12	6.304348

Source: Field Survey, 2011

The distance of the place of residence of farm households in the district from their farms ranged from 0.25 kilometers to 11.2 kilometers. The mean distance from the house to the farm was 2.88 kilometers. A few households had more than one farm land at different locations. On hours spent on the farm work in a day, the mean hours was approximately six (6) hours a day with minimum hours spent being half an hour and maximum hours spent on the farm was 12 hours.

Table 9: Farm characteristics

Farm Characteristics	No	Yes
Rear animals	110 (43.48%)	143 (56.52%)
Apply fertilizer	218 (86.17%)	35 (13.83%)
Apply other chemicals	194 (76.68%)	59 (23.32%)
Hire extra labour	66 (26.09%)	187 (73.91%)

Source: Field Survey, 2011

Also, out of the 253 households, 35 (13.83%) of them apply fertilizer to their farms with 218 (86.17%) not applying fertilizer to their farms. Further 59 (23.32%) of the households apply chemicals like weed killers and pesticides to their farms while 194 (76.68%) did not apply any chemical to their farms.

From Table 10, the number of farm household heads that participated in off-farm economic activities was 149 (58.89%) while those who did not participate in any off-farm economic activity numbered 104 (41.11%).

Table 10: Household participation in Off-Farm economic activity

	Household head		Spouse	
Responses	Frequency	Percent	Frequency	Percent
No	104	41.11	74	29.25
Yes	149	58.89	179	70.75
Total	253	100.00	253	100.00

Source: Field Survey, 2011

Among the spouses of the household head, 179 (70.75%) of them participated in an economic activity apart from the farm work and 74 (29.25%) did not participate in any off-farm economic activity.

The off-farm economic activities engaged in by the farm households include trading, processing of farm produce, masonry, carpentry, driving and dress making. From Table 11, 28 (18.79%) household heads were traders, 27 (18.12%) were masons, 25 (16.78%) were drivers, 14 (9.40%) processed farm produce and also another 14 (9.40%) being carpenters. Among the spouses of the household head, majority of them representing 131 (73.18%) were traders with only 27 (15.08%) partaking in processing farm produce and also 13 (7.26%) being dress makers.

Table 11: Off-farm economic activities participated in by farm households

Economic Activities	Household head		Spouse	
	Frequency	Percent	Frequency	Percent
Trading	28	18.79	131	73.18
Farm produce processing	14	9.40	27	15.08
Masonry	27	18.12	-	-
Carpentry	14	9.40	-	-
Driving	25	16.78	-	-
Dress making	-	-	13	7.26
Others	41	27.51	8	4.48
Total	149	100.00	179	100.00

Source: Field Survey, 2011

In Table 12, out of the 253 household heads, 131 (51.78%) had training in one form of off-farm economic activity or another with 122 (48.22%) having no training in any off-farm economic activity. Among the spouses, only 49 (19.37%) had training in off-farm economic activity with the majority being 204 (80.63%) not having any training in any off-farm economic activity. Among the 149 household heads who participated in an off-farm economic activity, 116 (77.85%) had an off-farm training whiles 33 (22.15%) did not have any training. With the spouses, out of the 179 who participated in an off-farm economic activity only 43 (24.02%) had off-farm training whiles 136 (75.98%) did not have any training.

Table 12: Households with training in an off-farm economic activity

| | Farm households with training | | Those with training who participate in off-farm work | |
	Head	Spouse	Head	Spouse
No	122 (48.22%)	204 (80.63%)	33 (22.15%)	136 (75.98%)
Yes	131 (51.78%)	49 (19.37%)	116 (77.85%)	43 (24.02%)
Total	253 (100%)	253 (100%)	149 (100%)	179 (100%)

Sources: Field Survey, 2011

Education levels and off-farm labour participation

The level of education of an individual could determine if an individual will participate in an off-farm economic activity or not. Likewise it could also determine the productivity of farm households on the farm due to proper

application of fertilizer and good farm management. On the part of participation in off-farm economic activity, Jollife (2004) states that a rise in school attainment by farm households increases the gain from off-farm work than gains from farm work. This they respond to by allocating more labour to the off-farm economic activities as their educational levels rise.

From Table 13, among the 149 household heads who participate in an off-farm economic activity only 11 (7.38%) did not have any level of formal education. Also, 16 (10.74%) household heads who participated in off-farm economic activity had a primary level of education and this increased to 96 (64.43%) for those who had attended Junior Secondary School (Middle School). But this fell to 13 (8.72%) for those who had secondary, technical or vocational level of education and the same figure for those who had attained tertiary education. It was therefore realized that 138 (92.62%) household heads who participated in off-farm economic activities had attained one form of formal education.

Also in Table 13, of the 179 spouses of the household heads who participated in off-farm economic activity, 65 (36.31%) of them had no level of formal educational which could be described as relatively high. For primary education there were 28 (15.64%) spouses, this increased for those who had attended Junior Secondary School (Middle School) with 76 (42.46%) spouses. For those who had secondary, technical or vocational education, the number fell to nine (5.03%) and further to just one (0.56%) spouse who participated in off-farm economic activity and had a tertiary education.

Table 13: Education level and participation in off-farm economic activity

| Education level | Head and Spouse participating in off-farm economic activity | | | |
| | Household head | | Spouse | |
	Frequency	Percent	Frequency	Percent
No Education	11	7.38	65	36.31
Primary	16	10.74	28	15.64
JSS/Middle	96	64.44	76	42.46
SSS/Tec/Voc	13	8.72	9	5.03
Tertiary	13	8.72	1	0.56
Total	149	100.00	179	100.00

Source: Field Survey, 2011

Though the household members with the higher form of education (SSS and tertiary) are few, the possibility of working off-farm for those with a form of formal education was high especially for those who had attended Junior Secondary School. This is because for both spouses those with this level of education were the ones participating most in off-farm economic activity.

Farm earnings and participation in off-farm economic activities

Farm households who allocate their time between farm activities and off-farm economic activities tend to have mixed earnings from their farm work. This may depend on the type of off-farm job they do (be it self-employed worker, private sector worker or public sector worker) and also the time allocated to the farm work. Whiles a non off-farm worker might spend close to the whole day on

the farm, one who does an off-farm work in addition to the farm work will have to split the days time between the two. Earnings from the farm work might be relative depending on the efficiency and productiveness of the farmer.

As shown in Table 14, out of the 253 households sampled, 50 (19.76%) household heads and also spouses earned less than GH¢279 annually. For those who earned between GH¢751 and GH¢1320, there were 51 (20.16%) households participating in off-farm economic activities.

Table 14: Farm earnings and participation in off-farm economic activities

Levels of farm income	Head works off-farm			Spouse works off-farm		
	No	Yes	Total	No	Yes	Total
< GH 279	20	30	50(19.76)	11	39	50(19.76)
GH 280-490	20	32	52(20.55)	20	32	52(20.55)
GH 491-750	26	25	51(20.16)	18	33	51(20.16)
GH 751-1320	24	27	51(20.16)	10	41	51(20.16)
>GH 1320	14	35	49(19.37)	15	34	49(19.37)
Total	104	149	253(100)	74	179	253(100)

Note: Percentages in bracket

Source: Field Survey, 2011

Off-farm earnings and participation in off-farm economic activities

Table 15 presents the annual earning categories from off-farm economic activities by the households who participated in off-farm economic activities. Among the 149 household heads who participated in off-farm economic activities, 17 (11.41%) earned below GH¢600, 32 (21.48%) earned between GH¢960 and GH¢1440 with the majority being 38 (25.5%) earning above GH¢2889 a year. For the 179 spouses who participated in off-farm economic activities, 42 (23.46%) earned below GH¢600, 52 (29.05%) earned between GH¢960 and GH¢1440 while those who earned above GH¢2889 were 19 (10.61%).

Table 15: Earnings from off-farm economic activity

	Participation in off-farm work			
Household off-farm income categories	Household head		Spouse	
	Frequency	Percentage	Frequency	Percentage
GH 600 and below	17	11.41	42	23.46
GH 600 - 960	22	14.77	35	19.55
GH 960 - 1440	32	21.48	52	29.05
GH 1440 - 1800	18	12.08	11	6.15
GH 1800 - 2889	22	14.77	20	11.17
Above GH 2889	38	25.5	19	10.61
Total	149	100.00	179	100.00

Source: Field Survey, 2011

Determinants of off-farm labour participation of farm households

The decision to participate in an off-farm economic activity by farm households (household head and spouse) is said to be taken jointly (see Fernandez-Cornejo, Hendricks & Mishra, 2005, and Abdulai & Delgado, 1999). The off-farm labour participation decision is hypothesized to depend on a number of socio-economic characteristics. These include age, experience in farm work, educational levels, household size, presence of children, farm size, training in any off-farm economic activity, access to credit and access to remittances. The coefficients of these explanatory variables were estimated using the maximum likelihood bivariate probit method. The results of the estimations are shown in Table 16.

From Table 16, the correlation between the error terms of the two estimated equations captured by rho (ρ) that maximizes the bivariate probit likelihood function is 0.35 and is significantly greater than zero at one (1) percent level of significance. This implies that the random disturbances in the off-farm participation decisions of household heads and spouses are influenced in the same direction by the random shocks (Abdulai & Delgado, 1999). Further their participation decisions are not statistically independent. This then suggests that estimating the household head and spouse participation equation separately will have yielded inefficient parameter estimates.

Table 16: Bivariate probit estimates of off-farm labour participation

Variables	Household Head		Spouse	
	Coefficients	P-value	Coefficients	P-value
Agehd	0.212***	0.003	0.0741	0.268
Agehdsq	-0.00235***	0.001	-0.000817	0.223
Educhd				
Primary	0.147	0.689	0.125	0.727
JSS	0.511*	0.096	0.256	0.423
SSS/Tertiary	0.356	0.317	0.0909	0.807
Educsp				
Primary	0.254	0.398	-0.622***	0.009
JSS	0.264	0.265	0.151	0.480
SSS/Tertiary	0.605	0.212	0.581	0.330
Hhsize	0.000706	0.989	0.0310	0.484
Child5	-0.00406	0.972	-0.0361	0.764
lnfms	0.145	0.359	0.128	0.354
Offrmtrnhd	1.827***	0.000	0.344*	0.066
Offrmtrnsp	0.385	0.167	0.489*	0.064
Credithd	1.081**	0.016	-0.332	0.309
Creditsp	-0.656*	0.059	0.789**	0.024
Remithd	-0.523	0.295	-0.541	0.159
Remitsp	-1.353**	0.016	-0.238	0.635

Constant	-5.822***	0.001	-1.672	0.286

(Table 16 Continued)

No. of observation	253	
Wald chi square	139.64***	0.0000
Pseudo R^2	0.0148	
Rho	0.3558***	0.0094

Note: Significant levels *** p<0.01, ** p<0.05, * p<0.1

Source: Field Survey, 2011

The Wald test statistic of the estimated model is significant at one (1) percent level. This suggests that the explanatory variables taken together influence or explain the decision to participate in off-farm economic activities by household heads and spouses. The McFadden (pseudo) R^2 is an indication of the goodness of fit of the model though it is not as important as statistical and economical significance of the independent variables (Wooldridge, 2005). It has the value 0.0148.

Head of Household

The estimated coefficient for age of the household head is significant in explaining the participation of the household head in an off-farm economic activity. It is significant at one (1) percent level and has a positive effect. The positive coefficient for head of household implies that the probability of the household head participating in an off-farm economic activity increases as his age

increases. The negative and significant coefficient of age squared implies that there is a non linear relationship between age and participation and this relationship is convex. This implies that at younger ages farm household heads live the farm to participate in an off-farm economic activity but at a certain age, as they increase in age, they retire from the off-farm work and participate in the farm. This result is consistent with previous studies (e.g. Sumner, 1982; Reddy & Findeis, 1988; Abdulai & Delgado, 1999; Man & Sadiya, 2009). They found that as young farm household members increase in age, they tend to participate more in off-farm work but at older ages, they work more on-farm.

It is expected that at higher levels of education, there will be a greater opportunity of one participating in an off-farm economic activity. As shown in Table 16, only the household head with a Junior Secondary School (J.S.S) level of education is significant in explaining the participation of the household head in an off-farm economic activity. This is significant at 10 percent level and has a positive effect. Therefore, the probability of a household head with a J.S.S. level of education increases the chance of the household head participating in an off-farm economic activity compared to one without J.S.S. level of education. Though the primary and the S.S.S level of education are not significant, higher level of education which includes J.S.S level which is significant is consistent with the work of Newman and Canagarajah (2000) who found that higher levels of education play an important role for the decision of farm households in participating in off-farm work. It is realised from the data that, majority of the household heads who participate in off-farm economic activity (64.43%) have

J.S.S level of education. This could be attributed to the vocational and technical skills lessons given to them at this level which is meant to give them skills in off-farm economic activities such as carpentry, masonry, dress making and bead making. The significance of higher levels of education on off-farm participation is also confirmed studies by De Janvry and Sadoulet (2001), Benjamin and Guyomard (1994) and Huffman (1980).

A person with off-farm training is expected to have a greater chance of participating in an off-farm economic activity. The household head with off-farm training has significant and positive effect in explaining the household head's participation in an off-farm economic activity. This is significant at one (1) percent level. Therefore, the probability of a household head with off-farm training increases the chance of the household head participating in an off-farm economic activity compared to a household head with no training. A farmer with off-farm training in activities such as carpentry, driving and the like will engage more in this off-farm work during the off-farm seasons unlike one who has no training, except engaging in an off-farm activity which does not involve any conscious training such as trading. This finding is consistent with the works of Beyene (2008) and Sumner (1982) that saw off-farm training to be important in explaining farmers' participation in off-farm work. They stated that male members of the farm households with training in handicraft skills or vocational training were more likely to participate in off-farm work.

People take credit to mostly invest into their businesses be it farm or off-farm business. Therefore access to credit boost the chance in participating more in

the economic activity for which the credit was taken all other things being equal. From Table 16, access to credit is a very important variable in explaining participation of farm household heads in off-farm economic activity. Access to credit by the household head is significant in explaining the participation of the household head in an off-farm economic activity. This is significant at five (5) percent level and has a positive effect. Thus, the possibility of a household head participating in off-farm economic activity increases when the household head has access to credit. Access to credit by the spouse of the household head also has significant but negative effect on the household head participating in an off-farm economic activity. It is significant at 10 percent level. This therefore implies that access to credit by the spouse of the household head reduces the probability of the household head participating in an off-farm economic activity. This is confirmed in the works of Beyene (2008) and Mduma and Wobst (2005).

Remittances like credit also help in increasing the working capital of farm households thereby increasing their chance of participating in an economic activity. In Table 16, the spouses' access to remittances has a significant effect in explaining the participation of the household head in an off-farm economic activity. This is significant at 10 percent level and has a negative influence. Therefore the possibility that a household head will participate in an off-farm economic activity falls when the spouse of the head has access to remittances to when she does not have access. This results is also consistent with findings of Abdulai and Delgado (1999), suggesting that non-labour income such as

remittances tends to reduce the probability of farm households in engaging in off-farm work.

Spouse of the Head of Household

It was expected that at higher levels of education, there will be a greater chance of one participating in an off-farm economic activity. From Table 16, only spouses who have attained primary education have a significant coefficient and this is significant at one (1) percent level. But this has a negative impact in participating in an off-farm economic activity. Therefore, the probability of a spouse with primary education compared to one with no education participating in an off-farm economic activity reduces. This could probably be because at an early stage of their life most people who do not have any formal education tend to engage in off-farm work (like petty trading) which does not require any formal education.

The probability of a household head with training in an off-farm economic activity increases the probability of the spouse participating in an off-farm economic activity compared to a household head with no training. This is significant at five (5) percent level. Though this is confirmed in literature, it could be explained from the view that farm household heads with training could transfer their acquired skills (like processing of farm products) to their spouses which also induces them to participate in off-farm economic activities. Also spouses with off-farm training have a positive and significant effect on the spouse participation in an off-farm economic activity. It is also significant at five (5) percent level. This implies that spouses with off-farm training are more likely to engage in works

such as processing, weaving and trading. This is consistent with the studies of Beyene (2008) and Sumner (1982).

Further in the spouses' participation equation, access to credit by the spouse is significant in explaining their participation in off-farm work. It is significant at five (5) percent level and also has a positive effect. Thus the probability of spouses participating in an off-farm work increases when they have access to credit compared to those who do not. Therefore credit creates avenues for farmers to engage in off-farm work so as to support the household with the extra income earned and also repay back the credit taken. This is consistent with the study of Beyene (2008).

Effect of participation in off-farm work on farm household income

It is expected that income generated from participating in off-farm economic activities would help raise the income levels of farm households who participate in off-farm economic activities. Hence the result that would be obtained from estimating the household income on the socioeconomic characteristics of those who participate in off-farm economic activity will be biased since it does not consider the population as a whole. This is what Heckman (1979) termed sample selection bias. To correct for this sample selection bias, the Heckman Selection Estimation was followed.

Table 17 and 18 shows the estimated results for the Heckman Two-step estimation for the effect of participation in off-farm economic activity on farm household income for the household head and the spouse respectively. For the

Heckman selection estimation for spouse's household income equation, the constant was suppressed to yield a significant result. The tables show the results for both the participation equation (also known as the selection equation) and the log farm household income equation also known as the outcome equation.

The variables used were age, age squared, educational levels, household size, number of children who were five (5) years or below, log of farm size, training in off-farm activity, access to credit and access to remittances. For identification, variables like age, age squared, children who are five (5) years or below, access to credit and access to remittances were dropped from the outcome equation and used as instrumental variables in the selection equation. This was because they were highly correlated with the participation variable but not or less correlated with household income. This therefore made the outcome equation to be identified. For the unlogged explanatory variables (semi-logged), their anti-logs were calculated for proper interpretation. This is found in Table 19.

The coefficient of rho (ρ) shows the correlation between the two equations, thus the selection equation and the outcome equation. From Table 17, rho (ρ) has an estimated coefficient of -0.85 implying that the two equations (the heads participation equation and household income equation) are negatively correlated. The Wald test indicates that the correlation between the two equations is significant at five (5) percent level. This therefore shows that participation in an off-farm economic activity by farm household head affects the incomes of farm households. This further shows that the Heckman Sample Selection estimation is the appropriate technique to achieve the objective of this study.

Table 17: Household head's Heckman estimate for farm household income

	Head participation		Log Income	
Variables	Coefficient	P-value	Coefficient	P-value
Agehd	0.191***	0.005		
Agehdsq	-0.00218***	0.002		
Educhd				
Primary	0.0287	0.941	0.375*	0.080
JHS	0.287	0.383	0.146	0.402
SHS/Tertiary	-0.0482	0.903	0.354*	0.077
Hhsize	0.0141	0.732	-0.0337*	0.088
Child5	-0.155	0.152		
lnfms	0.0104	0.942	0.224***	0.001
Offrmtrnhd	1.816***	0.000	-0.260*	0.097
Credithd	0.846**	0.021		
Remithd	-0.797**	0.040		
Constant	-4.630***	0.003	8.213***	0.000
Wald chi square	22.34***	0.0011		
Rho	-0.8463**	0.0217		

Note: Significant levels *** p<0.01, ** p<0.05 and * p<0.1. No level of education the base for the level of education (Educhd) variable.

Source: Field Survey, 2011

Also from Table 18, the correlation coefficient, rho (ρ), showing the correlation between the two equations (participation equation of the spouse and the farm household income) has a coefficient of 0.97 with Wald test highly significant at one (1) percent level of significance. It has a positive coefficient showing a positive correlation between the two equations. Therefore the participation in an off-farm economic activity by the spouse of the household head is very important in explaining farm household income. This is consistent with the findings of Man (2009).

For the educational level variables, it is expected that, the higher ones' educational qualification, the greater chance of one earning a higher income. From Table 17, both primary level of education and higher levels of education, thus secondary and tertiary, of the household head have coefficients other than zero and are both significant at 10 percent level. Whiles for the spouses, all the educational levels are significantly different from zero at 10 percent for primary and JSS and five (5) percent for SSS/Tertiary. This is confirmed in the study of Gordon and Craig (2001). This implies that they help in explaining the income levels of the farm household as seen in Table 18. Also, the spouses have their primary level of education having a negative influence on farm household income whiles this is positive for the household head. The negative influence of spouse's education on farm household income is not confirmed in literature but that of the positive effect of household heads is confirmed the study of Fafchamps and Quisumbing (1999).

Table 18: Spouse's Heckman estimate for farm household income

	Spouse Participation		Log Income	
Variables	Coefficient	P-value	Coefficient	P-value
Agesp	0.0622	0.205		
Agespsq	-0.000840*	0.095		
Educsp				
Primary	-0.267	0.226	-0.659*	0.084
JHS	0.310	0.132	0.556*	0.064
SHS/Tertiary	0.667	0.143	1.357**	0.027
Hhsize	1.267***	0.000	0.030***	0.000
Child5	-0.161**	0.024		
lnfms	0.364***	0.004	0.841***	0.000
Offrmtrnsp	0.561**	0.017	1.010***	0.000
Creditsp	0.123	0.595		
Remitsp	-0.247	0.337		
Constant	-3.595***	0.001		
Wald chi square	2912.73***	0.0000		
Rho	0.9748***	0.0000		

Note: Significant levels *** $p<0.01$, ** $p<0.05$ and * $p<0.1$. No level of education

is the base for the level of education (Educsp) variable.

Source: Field Survey, 2011

From Table 19, a farm household head with primary education has an income of 45.5 percent greater than those with no level of education. A spouse with primary level of education has an income of 93.4 percent lesser than those without any level of education. Also, a farm household head with higher levels of formal education (secondary and tertiary) have an income of 42.4 percent greater than those without any level of formal education. But for the spouses with JSS level of education have an income of 74.4 percent greater than those without any level of education.

Table 19: Anti-log of semi-logged coefficients from Heckman

Variables	Household Head	Spouse
Primary	45.5%	93.4%
JSS	-	74.4%
SSS/Tertiary	42.4%	288.5%
Household size	3.43%	3.06%
Off-farm training	29.6%	174.5%

Source: Author's computation, 2011

Also a spouse with a higher level of education has an income of 288.5 percent greater than those without any level of education. This is consistent with the work of Lanjouw (1999) who explain that people are employed in high paying sectors of the economy as their education levels rise and this will have a great and positive impact on their income. Also Islam (1997), suggest that primary education improve the productivity of labour. Whiles secondary education

stimulates entrepreneurial activity thereby raising the income levels of farm households.

A farm household with higher household size is expected to have a greater number of its members working either off-farm or on-farm. Therefore it is expected that a household with a large family size will have higher income. From Table 18, though household size for the household head is significant at a 10 percent level, it has a negative impact. But it is positive for the spouse and significant at one (1) percent level. From Table 19 and for the household head, an increase in the family size by one person reduces the household income by 3.4 percent while for the spouse this would rather increase by 3.06 percent. The net effect on income is thus negative. The negative effect of the household size on income from the household head equation could be because most of the members of the farm household are younger and of school going age and therefore do not work to bring in income. It could also be because of the goal of poor married farmers to have more children as old age security and household labour (Jensen, 1990). Also the majority of farm households being children requires more time to be allocated towards taking care of them and therefore reduces the options to generate additional income and this could also put a strain on the little income of the household restricting further reinvestment.

Large farm size gives opportunity for diversification of crops cultivated so as to have both perennial and short period yielding crops. This helps in cushioning the farm household at all times. Therefore a farm household with a large farm size is expected to have a higher income. From Table 17 and 18, the farm size is

significant at one (1) percent level of significance and has a positive impact on household income. This implies that for the household head, an increase in the farm size by one (1) percent increases household income by 0.224 percent whiles for the spouses, it increases by 0.84 percent. This also implies that the spouse's contribution to farm household income in this regard is greater than that of the household head. This implies that farm households with large farm size are productive in the use of farm lands which therefore generates higher income.

A farm household member with a form of training in an off-farm economic activity has a greater chance of participating in it thereby obtaining higher income. In contrast, as seen in Table 17, a farm household head with training in an off-farm economic activity has a significantly negative effect on farm household income at 10 percent level. But for the spouses, training in an off-farm activity has a positive effect on farm household income and significant at one (1) percent as shown in Table 18. From Table 19, a farm household head with training in any off-farm economic activity contributes an income of 29.6 percent lesser than those without training in any off-farm economic activity. Whiles a spouse with off-farm training contributes an income of 174.5 percent greater than those without any off-farm training. The negative coefficient of training for household head is inconsistent with available literature. But this could be explained that household heads with such training might have retired from the off-farm work which yields higher income to the on-farm work which yields lower income due to probably old age as already discussed.

Conclusion

This chapter of the study looked at the empirical results of the determinants of household head and spouse joint participation decision in off-farm economic activities and also the effect of their participation on their household income. For the participation equation, it was noticed that age, farm size, household size, access to credit and also access to remittances are significant in explaining the decision to participate. For the income function, the participation in off-farm economic activities had a significant effect on the farm household income.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This final chapter summarizes the major findings of the empirical study undertaken on the effect of off-farm economic activities on farm households' income in the Abura-Asebu-Kwamankese District in the Central Region of Ghana. It also includes the main conclusions drawn from the study and recommendations derived from the analysis of the available data. Suggestions for further research are also outlined.

Summary

Diversifying sources of farm household income has been a very important strategy farm households use to smooth out or offset fluctuations in farm income. One way farm households do this is by participating in off-farm economic activities. This has no doubt helped some farm households out of poverty.

The purpose of this study was to examine the effect of off-farm economic activities on farm households' income. Thus the study meant to find out the effect of farm households participation in off-farm economic activities on their total household income. To sample the respondents for the study, a multi-stage sampling technique was used. The unit of analysis was farm households in the

Abura-Asebu-Kwamankese district. The respondents sampled number 253 households where each household consisted of both the household head and the spouse. A structured interview schedule was the instrument used in collecting data for the study. Data obtained included the demographic and socio-economic characteristics of the households.

A two stage model was used for the study. The first model was a bivaraite probit model. This model estimated the joint participation decision in an off-farm economic activity by both households and their spouses. This model sought to suggest that in a household the decision to participate in an off-farm economic activity is taken jointly by both the household head and the spouse. Therefore estimating two binary probit equations will not capture that correlation between the two equations. There were therefore two dependent variables which were participation in an off-farm economic activity by household head and also by the spouse. Age, educational levels, household size, farm size, access to credit and other variables were used as explanatory variables in the regression equation.

The second stage model was to look at the effect of participating in an off-farm economic activity on farm household income. The Heckman Sample Selection procedure was followed to achieve this objective since the participation variable is an endogenous variable. This technique solves the problem of endogeneity while also giving the result for the outcome equation which is the income equation. To meet the exclusion restriction criteria some variables that were correlated with the participation equation but were quite or not correlated with the outcome equation were dropped from the outcome equations. Some of

the variables used were the educational levels, training in an off-farm economic activity and farm size.

Empirically, the study shows evidently that participation in an off-farm economic activity affects farm household income. Through the analysis, it was observed that the educational levels, household size, farm size and training in an off-farm economic activity and also participation in an off-farm economic activity have a significant influence in explaining farm household income.

Conclusions

From the analysis and findings of this study, the following conclusions are made. Firstly, participation in off-farm economic activities is explained by socio-economic and demographic characteristics of the farm households. It was noticed that decision to participate in off-farm economic activities is explained by age, training in off-farm economic activity, access to credit and access to remittances. It was found that at younger ages, household members tend to participate in off-farm economic activities as they increase in age due to off-farm economic opportunities in the area. But at older ages, farm household members retire from working off-farm to working on-farm. Also, farm household members with a sought of training in an off-farm economic activity were more likely to participate in an off-farm economic activity. This shows that training in an off-farm economic activity is important in participating in an off-farm economic activity. Access to credit influenced participation in an off-farm economic activity. This implies that household members with access to credit had a better chance of

110

participating in an off-farm economic activity. Likewise those who have access to remittances have higher chance of participating in an off-farm economic activity.

Secondly, factors like participation in an off-farm economic activity, education levels, farm size, household size and training in an off-farm economic activity influenced the farm household income. The very important variable participation in an off-farm economic activity was seen to be very significant in explaining the farm household income. This shows that income obtained from participation in an off-farm economic activity helps in smoothing the fluctuations from farm income since income from the farm land might not be enough and available all year round. And also considering the fact that most farm households are the poorest, according to literature, it would be very difficult for them economically if they only relied on income from farming activities only. Other factors like the educational levels were also significant in influencing farm household income. A household member with one form of education especially a higher form of education has a better chance of obtaining a job in an off-farm economic activity and also practicing good farm management skills in order to obtain higher income. A large household size is significant in explaining the income of the farm household. A larger farm household size could influence family members to work in order to obtain income for the family. Farm households with large farm size are important in explaining farm household income. A larger farm land size increases the possibility of diversifying crops cultivated thereby gaining income all year round. Also training in an off-farm economic activity is also very necessary in explaining farm household income.

Farm household with training in off-farm economic activity have a better opportunity to participate in off-farm economic activities thereby increasing or influencing the farm household income.

This study as part of other studies will add to the growing body of literature on the effects of participation in an off-farm economic activity on farm household income. It is hoped that, other studies that will be done in future will learn from and build upon this study so that better understanding will be gained on the effect farm households' off-farm participation have on farm households' income.

Recommendations

From the results and findings of this study, a number of recommendations are made to policy makers and other stakeholders in the agriculture and rural sectors.

The Ministry of Youth and Employment and the District Assemblies should create avenues where farm households could be trained in some off-farm economic activities. This will give them the opportunity to participate in off-farm economic activities thereby gaining more income to raise their income levels and also to smooth fluctuations in farm income. It is also recommended that the National Youth Employment Program (NYEP) be sustained since this program also trains the youth in some economic activities.

Farm households should be encouraged to attain higher levels of education even if not for the older members then for the younger members of the household.

A person with a higher level of education has a greater chance of obtaining good paying jobs in order to increase their income. The Ministry of Education and the Ghana Education Service should make an effort to build modern schools in the rural and agricultural areas of Ghana so as to encourage farm households to attend school.

Also the Ministry of Youth and Employment should make an effort towards increasing off-farm work opportunities in the rural areas of Ghana since this has the ability to reduce the effects of low farm productivity and low farm incomes which are also related to poverty in rural Ghana. When there are employment opportunities in an area, individuals or households are able to obtain employment which creates room for them to increase their income levels.

Rural and agriculture financing must be developed and improved. The Agricultural Development Bank, rural community banks and microfinance institutions must be encouraged to establish branches in the rural and agriculture communities so as to make financing rural off-farm projects and agriculture much easier. This will help these folks to obtain credit needed for investment in their various economic activities so as improve their income levels and also smooth their consumption and income.

Limitations of the study

This study is limited by some factors. The population of the study which was basically married farm households was not known and therefore makes the sample size used for the study as a representation of the whole population

doubtful. This could limit the generalisation of the findings of the study to the whole population.

The statistical package used for the study, thus Stata, did not separate the marginal effects of the household heads and their spouses participation in off-farm economic activity but gave a joint marginal effect for both spouses. This made interpretation very difficult. This was therefore not included in the study and limited the interpretation of the results to the significance and sign of the coefficients.

Suggestions for further study

The study found an area for further research to expand more on the understanding and literature on the effect of participation in off-farm economic activity on farm household income. Investigating the separate effect of participating in wage off-farm employment and self off-farm employment on incomes of farm households could determine which off-farm employment type is more beneficial.

REFERENCES

Abdulai, A., & Delgado, C. L. (1999). Determinants of non-farm earnings of farm based husbands and wives in Northern Ghana. *American Journal of Agricultural Economics,* 81(1), 117-130.

Ahituv, A. & Kimhi, A. (2002). Off-farm work and capital accumulation decisions of farmers over the life-cycle: The role of heterogeneity and state dependence. *Journal of Development Economics*, 68, 329-353.

Asuming-Brempong, S. (2003). *Economic and Agricultural Policy Reforms and their Effects on the Role of Agriculture in Ghana.* Paper presented at the Agriculture Project International conference. Agricultural and Development Economics Division, Food and Agriculture Organization, United Nations.

Babatunde, R. O., & Qaim, M. (2010). *Off-farm labour market participation in rural Nigeria: Driving forces and household access.* Paper presented at the 5th IZA/World Bank conference on Employment and Development, Cape Town, South Africa.

Bakucs, L. Z., Bojnec, S., Ferto, I., & Latruffe, L. (2010). *Farm growth in Hungary, Slovenia and France.* Paper presented at the 114th European Association Agricultural Economist Seminar, Berlin, Germany.

Barrett, C. B., Reardon T., & Webb, P. (2001). Non-farm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy,* 26(4), 315–331.

Becker, G. S. (1965). The theory of allocation of time. *The Economic Journal*, 75, 493-517.

Benjamin, C., & Guyomard, H. (1994). Off-farm work decisions of French agricultural households. In F. Caillavet, H. Guromard & Litran R (Eds.), *Agricultural household modeling and family economics* (pp. 65-85). Amsterdam: Elsevier.

Benjamin, C., & Kimhi, A. (2003). *Farm work, off-farm work, and hired farm labor: estimating a discrete-choice model of french farm couples' labor decisions* (Discussion Paper No. 5.03). Jerusalem, Israel: The Hebrew University of Jerusalem, The Center for Agricultural Economic Research, The Department of Agricultural Economics and Management.

Besley, T. (1995). Nonmarket institutions for credit and risk sharing in low-income countries. *Journal of Economic Perspectives*, 9(3), 115-127.

Beyene, A. D. (2008). Determinants of off-farm participation decision of farm households in Ethiopia. *Agrekon,* 47(1), 140-161.

Bezabih, M., Gebreegziabher, Z., Gebremedhin, L., & Köhlin, G. (2010). *Participation in off-farm employment, rainfall patterns and rate time of preferences: The case of Ethiopia* (RFF Discussion Paper EfD 10-21). Washington DC: Environment for Development (EfD) Initiative and Resources for the Future (RFF), Environment and Development Economics.

Bezu, S., Holden, S., & Barrett, C. B. (2009). *Activity choice in rural non-farm employment: Survival versus accumulation strategy*. Paper presented at

the 8th Nordic conference in Development Economics, Oscarsborg, Drobak, Norway.

Bliss, C., & Stern, N. (1982). *Palanpur: The economy of an Indian village*. Oxford: Oxford University Press.

Boisvert, R. N., & Chang, H. (2006). *Does Participation in the Conservation Reserve Program and Off-Farm Work Affect the Level and Distribution of Farm Household Incomes?* Paper presented at the American Agricultural Economic Association Annual Meetings, Long Beach, CA.

Bollman, R. D. (1979). Off-farm work by farmers: an application of the kinked demand for labour. *Canadian Journal of Agricultural Economics, 27*(1), 37-60.

Canagarajah, S., Newman, C., & Bhattamishra, R. (2001). Non-farm income, gender and inequality: evidence from rural Ghana and Uganda. *Food Policy,* 26(4), 405–420.

Chang, H., & Boisvert, R. N. (2009). *The conservation reserve program, off-farm work, and farm household technical efficiencies* (Working paper 2009-33). Ithaca, New York, USA: Cornell University, Department of Applied Economics and Management.

Corpal, L., & Reardon, T. (2001). Rural non-farm incomes in Nicaragua. *World Development*, 29(3), 427-441.

Davis, J. R. (2003). *The rural non-farm economy, livelihoods, and their diversification: Issues and options* (NRI report No: 2753). Chatham, Kent, UK: Natural Resources Institute.

117

De Janvry, A., & Sadoulet, E. (2001). Income strategies among rural households in Mexico: The role of off-farm activities. *World Development*, 29(3), 467-480.

Deaton, A. (1997). *The analysis of household surveys: A microeconometric approach to development policy.* Baltimore, Maryland: Johns Hopkins University Press.

Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies,* 35(1), 1–38.

El-Osta, H. S., Mishra, A. K., & Morehart, M. J. (2008). Off-farm labour participation decisions of married farm couples and the role of government payments. *Review of Agricultural Economics,* 30(2), 311-332.

Fafchamps, M., & Quisumbing, A. R. (1999). Human capital, productivity, and labor allocation in rural Pakistan. *Journal of Human Resources,* 34(2), 347-380.

Fernandez-Cornejo, J., Hendricks, C., & Mishra, A. (2005). Technology adoption and off-farm household income: The case of herbicide-tolerant soybeans. *Journal of Agricultural and Applied Economics,* 37(3), 549-563.

Friedman, M. (1957). *A Theory of the Consumption Function*, Princeton: Princeton University Press.

Gedikoglu, H., & McCann, L. (2007). *Impact of Off-Farm Income on the Adoption of Conservation Practices.* Paper presented at the meeting of the American Agricultural Economics Association, Portland, Oregon.

Ghana Statistical Service (2007). *Pattern and trends of poverty in Ghana 1991-2006.* Accra: Ghana Statistical Service.

Ghana Statistical Service (2008). *Ghana living standards survey: Report of the fifth round (GLSS 5).* Accra: Ghana Statistical Service.

Glauben, T., Herzfeld, T., & Wang, X. (2007). Labour market participation of Chinese agricultural households: Empirical evidence from Zhejiang province. *Food Policy, 33,* 329-340.

Goodwin, B. K., & Mishra, A. K. (2004). Farming efficiency and the determinants of multiple job holding by farm operators. *American Journal of Agricultural Economics,* 86(3), 722-729.

Gordon, A., & Craig, C. (2001). *Rural non-farm activities and poverty alleviation in sub-Saharan Africa* (Policy series 14). Chatham, UK: Natural Resources Institute, Social and Economic Development Department.

Gronau, R. (1973). The Intra-family allocation of time: The value of the housewife's time. *American Economic Review,* 63, 634-651.

Haggblade, S., Hazell, P., & Reardon, T. (2005). *The rural non-agricultural economy: Pathway out of poverty or pathway in?* Paper presented at the meeting of the International Food Policy Research Institute on the Future of Small-Farms, Washington D.C.

Hallberg, M. C., Findeis, J.L., Lass, D.A. (Eds.). (1991). *Multiple job-holding among farm families.* Ames: Iowa State University Press.

119

Hanson, R. J. (1972). *An economic analysis of off-farm income as a factor in the improvement of the low farm income farmers in Illinios*. Unpublished master's thesis, University of Illinios, Illinios.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica,* 47(1), 153-161.

Hill, B. (1996). Monitoring incomes of agricultural households within the EU's information new needs and new methods. *European Review of Agricultural Economics,* 23, 27-48.

Holden, S. T., & Binswanger, H. P. (1998). Small farmer decision making, market imperfections, and natural resource management in developing countries. In E. Lutz (Ed.), *Agriculture and the Environment: Perspectives on sustainable rural development*. Washington, DC: The World Bank.

Huang, J. K., Wu, Y. H., Zhi, H. Y., & Rozelle, S. (2008). Small holder incomes, food safety and producing, and marketing China's fruit. *Review of Agricultural Economics,* 30(3), 469–479.

Huffman, W. E. (1974). Decision making: the role of education. *American Journal of Agricultural Economics,* 56(1), 85-97.

Huffman, W. E. (1980). Farm and off-farm work decisions: The role of human capital. *The Review of Economics and Statistics,* 62(1), 14-23.

Huffman, W. E. (1991). Agricultural household models: Survey and critique. In M. C. Hallberg, J. L. Findeis, and D. A.Lass (Eds.), *Multiple job-holding among farm families* (pp. 79-111). Ames, IA: Iowa State University Press.

Islam, N. (1997). *The non-farm sector and rural development* (Food, agriculture and environment discussion paper No. 22). Washington DC: International Food Policy research Institute.

Jensen, E. R. (1990). An econometric analysis of the old-age security motive for childbearing. *International Economic Review,* 31(4), 953–968.

Jollife, D. (2004). The impacts of education in rural Ghana: Examining household labour allocation and returns on and off the farm. *Journal of Development Economics,* 73, 287-314.

Kerachsky, S. T. (1977). Labour supply decisions of far families. *American Journal of Agricultural Economics,* 59(5), 869-873.

Kimhi, A. (1994). Quasi maximum likelihood estimation of multivariate probit models: Farm couples' labour participation. *American Journal of Agricultural Economics,* 76, 828-835.

Kimhi, A. (2004). Family composition and off-farm participation decision in Israeli farm households. *American Journal of Agricultural Economics, 86*(2), 502-512.

Kimhi, A., & Lee, M. (1996). Off-farm work decision of farm couples: Estimating structural simultaneous equations with ordered categorical dependent variables. *American Journal of Agricultural Economics, 78*(3), 687-698.

Lanjouw, J., & Lanjouw, P. (2001). The rural nonfarm sector: Issues and evidence from developing countries. *Agricultural Economics,* 26(1), 1–23.

Lanjouw, P. (1999). Rural non-agricultural employment and poverty in Ecuador. *Economic Development and Cultural Change,* 48(1), 91-122.

Lass, D. A., Fiendeis, J. L. & Hallberg, M. C. (1991). Factors affecting the supply of off-farm labour: A review of empirical evidence. In M. C. Hallberg, J. Findeis and D. Lass (Eds.), *Multiple job-holding among farm families* (pp. 239-262). Ames: Iowa State University Press.

Lass, D. A., Fiendeis, J. L., & Hallberg, M. C. (1989). Off-farm employment decisions by Massachusetts farm households. *Northeastern Journal of Agricultural and Resource Economics,* 18(2), 149-159.

Lee, J. E., Jr. (1965). Allocating farm resources between farm and nonfarm uses. *Journal of Farm Economics,* 47(1), 83-92.

Maddala, G. S. (1983). *Limited dependent and qualitative variables in econometrics*. Cambridge, UK: Cambridge University Press.

Man N., & Sadiya, S. I. (2009). Off-farm employment participation among paddy farmers in the Muda Agricultural Development Authority and Kemasin Semerak granary areas of Malaysia. *Asia-Pacific Development Journal*, 16(2), 142-157.

Man, N. (2009). Factors affecting the decision making in off-farm employment among paddy farmers in Kemasin Semerak. *Pertanika Journal of Social Sciences & Humanities*, 17(1), 7-15.

Marsland, N., Robinson, E., Davis, J., Gordon, A., & Long, S. (2000). *Policy and research on the rural non-farm economy: A review of conceptual, methodological and practical issues*. Chatham, UK: Natural Resources Institute.

Matshe, I., & Young, T. (2004). Off-farm labour allocation decisions in small-scale rural households in Zimbabwe. *Agricultural Economics,* 30, 175-186.

Mduma, J., & Wobst, P. (2005). Determinants of rural labor market participation in Tanzania. *African Studies Quarterly,* 8(2), 32-47.

Ministry of Food and Agriculture (2007). Food and Agriculture Sector Development Project (FASDEP II). Accra: Ministry of Food and Agriculture.

Ministry of Labour and Social Affairs (1997). *Agricultural wage employment and rural non-farm employment in Ethiopia: Survey results.* Addis Ababa: Ministry of Labour and Social Affairs.

Morduch, J. (1995). Income-smoothing and consumption-smoothing. *Journal of Economic Perspectives*, 9(3), 103-114.

Newman, C., & Canagarajah, S. (2000). *Gender, poverty, and nonfarm employment in Ghana and Uganda* (Policy research working paper No. 2367). Washington DC: World Bank.

Parminter, I. (1997). *Off-farm income: Theory and practice* (Technical paper 97/5). Wellington: Ministry of Agriculture and Forestry.

Paxson, C. H. (1992). Using weather variability to estimate the response of savings to transitory income in Thailand. *American Economic Review,* 82(1), 15-33.

Pfeiffer, L., Lopez-Feldman, A., & Taylor, J. E. (2008). Is off-farm income reforming the farm? Evidence from Mexico. *Agricultural Economics,* 40, 125-138.

Polzin, P., & MacDonald P. (1971). Off-farm work: A marginal analysis. *The Quarterly Journal of Economics,* 85(3), 540-545.

Reardon, T (1997). Using evidence of household income diversification to inform study of the rural non farm labour market in Africa. *World Development,* 25(5), 735–747.

Reardon, T. (2001). Rural nonfarm employment and incomes in Latin America: Overview and policy implications. *World Development,* 29(3), 395-409.

Reardon, T., Berdegue, J., & Escobar, G. (2001). Rural non-farm employment and incomes in Latin America: Overview of issues, patterns, and determinants. *World Development,* 29(3), 395-409.

Reardon, T., Crawford, E., & Kelly, V. (1994). Links between nonfarm income and farm investments in Africa households: adding the capital market perspective. *American Journal of Agricultural Economics,* 76(5), 1172-1176.

Reardon, T., Delgado, C. & Matlon, P. (1992). Determinants and Effects of Income Diversification amongst Farm Households in Burkina Faso. *Journal of Development Studies,* 28(1), 264-296.

Reardon, T., Pingali, P. L., & Stamoulis, K. G. (2006). *Impacts of agrifood market transformation during globalization on the poor's rural nonfarm employment: Lessons for rural business development programs* (Staff

paper 2006-25). East Lansing, Michigan: Michigan State University, Department of Agricultural Economics.

Reardon, T., Stamolous, K., Balisacan, A., Cruz, M.E., Berdegue, J., & Banks, B. (1998). Rural non farm income in developing countries. Special Chapter in *The State of Food and Agriculture* (pp. 283-356), Rome: Food and Agricultural Organization of the United Nations.

Reddy, V. K., & Findeis J. L. (1988). Determinants of off-farm labour force participation implications for low income farm families. *North Central Journal of Agricultural Economics,* 10(1), 91-102.

Robinson, C., Mcmahon, P., & Quiggin, J. (1982). Labour supply and off-farm work by farmers: Theory and estimation. *Australian Journal of Agricultural Economics,* 26(1), 23-38.

Rosenzweig, M. R. (1988). Risk, implicit contracts and the family in rural areas of low-income countries. *The Economic Journal,* 98, 1148-1170.

Rosenzweig, M. R., & Wolpin, K. I. (1993). Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: Investments in bullocks in India. *Journal of Political Economy*, 101(2), 223-224.

Sander, W. (1983). Off-farm employment and in-comes of farmers. *Oxford Agrarian Studies,* 12, 34-47.

Seini, A. W. (2002). *Agricultural growth and competitiveness under policy reforms in Ghana* (Technical Publication No. 61). Legon: Univerity of Ghana, Institute of Statistical, Social & Economic Research (ISSER).

Singleton, R. A., Straits, B. C., & Straits, M. M. (1993). *Approaches to social research* (2nd ed.). Oxford: Oxford University Press.

Sumner, D. A. (1982). The off-farm supply of farmers. *American Journal of Agricultural Economics,* 64(3), 499-509.

Tokle, J. G., & Huffman, W. E. (1991). Local economic conditions and wage labor decisions of farm and rural nonfarm couples. *American Journal of Agricultural Economics,* 73, 652-670.

Tollens, E. (2002). *The challenges of poverty reduction with particular reference to rural poverty and agriculture in sub-Saharan Africa* (Working paper 2002/67). Flanders, Belgium: Katholieke Universiteit Leuven, Department of Agricultural and Environmental Economics.

Townsend, R. M. (1995). Consumption insurance: An evaluation of risk-bearing systems in low-income economies. *Journal of Economic Perspectives,* 9(3), 83-102.

Udry, C. (1994). Risk and insurance in a rural credit market: An empirical investigation in northern Nigeria. *Review of Economic Studies*, 61(3), 495-526.

Wik, M. (1999). Coping with risk in agriculture: Income and consumption smoothing strategies in LDCs. *Forum for Development Studies,* 2, 329–344.

Woldehanna T (2000). *Economic analysis and policy implications of farm and off-farm employment, a case study in Tigray Region of Ethiopia.*

Unpublished master's thesis, Wageningen University, Wageningen, The Netherlands.

Wooldridge, J. M. (2005). *Introductory Econometrics: A modern approach* (3rd ed.). Boston, MA: South-Western College Publishing.

APPENDIX

INTERVIEW SCHEDULE

Household ID: ……….. Individual ID: …………… Date of Interview: ………….

Name of Interviewer: ……..Start Time: ……………..

Good morning/afternoon/evening. I am a student of the Department of Economics, University of Cape Coast. I am conducting this research in partial fulfillment of the requirement for the award of a Master of Philosophy Degree in Economics. I assure you that the responses you give will be treated with strict confidentiality. All information provided in this interview schedule will be added to those of other respondents for a general analysis so there will be no way of figuring out your specific responses after the analysis is done. I would be grateful if you would agree to answer the questions below.

If you do not understand any of the questions, please tell me and I will explain it again.

Background:

Question	Household head	Spouse
1. Sex	1= male 2= female	1= male 2= female
2. Age (in completed years)	**Please state**	**Please state**
3. Marital status	1= never married/not in union 2= in union 3= married (currently) 4= separated	1= never married/not in union 2= in union 3= married 4= separated

		5= divorced 6= widowed	5= divorced 6= widowed
4.	Level of schooling	0=No schooling 1=Primary 2=JSS/JHS/Middle school 3=Sec/SHS/SSS/Tec/Voc 4=University/Polytechnic/Post sec	0=No schooling 1=Primary 2=JSS/JHS/Middle school 3=Sec/SHS/SSS/Tec/Voc 4=University/Polytechnic/Post sec
5.	Size of Household	**Please state**	**Please state**
6.	Is there a member of the household who is 5 years or younger?	0= No 1=Yes (specify no…….)	0= No 1=Yes(specify no…...)
7.	Is there a member of the household who is 65 years or older?	0= No 1=Yes (specify no ……….)	0= No 1=Yes (specify no………)
8.	Over the last 12 months did you suffer from any ailment?	0= No 1= Yes	0= No 1= Yes
9.	Specify ailment		
10.	Did it interfere with your day to day activities?	0 = Didn't interfere 1 = Interfered 2 = Greatly interfered	0 = Didn't interfere 1 = Interfered 2 = Greatly interfered
11.	Did it prevent you from work?	0= No 1=Yes	0= No 1=Yes
12.	How many days did it prevent you from work?	**Please state**	**Please state**

13. **Questions on farming activities**
    a.   **Household head**

a. Which Crops do you cultivate?	b. Area (Acres)	c. Total yield	d. Qty Consumed	e. Qty Sold	f. Price per unit	g. Who determines price?	h. Method of selling?
1=Maize		(Bags)			(Cedis)		
2= Cassava		(Bags)			(Cedis)		
3=Yam		(Tubers)			(Cedis)		
4= Plantain		(Heads)			(Cedis)		
5= Oil palm		(Bags)			(Cedis)		
6= Citrus		(Bags)			(Cedis)		
7=Cocoa		(Bags)			(Cedis)		
8=					(Cedis)		
9=					(Cedis)		
10=					(Cedis)		

    b.   **Spouse**

a. Which Crops do you cultivate?	b.Area (Acres)	c. Total yield	d. Qty Consu-med.	e. Qty Sold	f. Price per unit	g. Who determines price?	h. Method of selling?
1= Maize		(Bags)			(Cedis)		
2= Cassava		(Bags)			(Cedis)		
3= Yam		(Tubers)			(Cedis)		
4= Plantain		(Heads)			(Cedis		

					)		
5= Oil palm		(Bags)			(Cedis)		
6= Citrus		(Bags)			(Cedis)		
7= Cocoa		(Bags)			(Cedis)		
8=					(Cedis)		
9=					(Cedis)		
10=					(Cedis)		

Key for 13.g	Key for 13.h
1= Buyers	1= Cash
2= Farmer	2= Credit
3= The market	3= Both
4= Other (Specify)	4= Other (Specify)

14.

	Household Head	Spouse
Animals	Number	Number
1= Fowls		
2= Goats		
3= Sheep		
4= Cattle		
5= Pig		
6= Turkey		
7= Other (Specify)		
8=		

Questions	Household Head	Spouse
15. What is the distance of the farm from your house?	Please state (kms)	Please state (kms)

16. What is the distance of the farm from the nearest market?	**Please state (kms)**	**Please state (kms)**
17. How many hours, on the average, do you work on your farm in a day?	**Please state**	**Please state**
18. How many days, on the average, do you work on your farm in a week?	**Please state**	**Please state**
19. What is the type of ownership of the farm land on which you work?	1= self ownership 2= share tenancy 3= rent tenancy 4= family land 5= free use	1= self ownership 2= share tenancy 3= rent tenancy 4= family land 5= free use
20. What farm implements do you possess?	**List them:**	**List them:**
21. How many household members work on the farm? (Including you)	**Please state**	**Please state**
22. Do you hire extra labour (non family member) on your farm?	0= No 1=Yes	0= No 1= Yes
23. If YES, for what purpose do you hire extra labour?	**Please state**	**Please state**
24. Do you apply fertilizer to your farm?	0= No 1= Yes	0= No 1= Yes
25. How much did you spend on fertilizers?	**Please state**	**Please state**
26. Do you apply other chemicals (weedicide, fungicides, etc)?	0= No 1= Yes	0= No 1= Yes
27. How much did you spend on these other chemicals?	**Please state**	**Please state**

Questions on off-farm activities (Q28-35)

Questions	Household head	Spouse
28. Do you participate in an economic activity apart from the farm work?	0= No 1= Yes	0= No 1= Yes
29. If YES, what type of off-farm economic activity do you participate in?	1= Trading 2= Processing of farm products 3= Masonry 4= Carpentry 5= Driving 6= Dress making 7= Teaching 8= Other, (Specify)…………	1= Trading 2= Processing of farm products 3= Masonry 4= Carpentry 5= Driving 6= Dress making 7= Teaching 8= Other, (Specify)……..
30. Did you have any training in the non-farm economic activity?	0= No 1= Yes	0= No 1= Yes
31. Why do you participate in an economic activity apart from farm work?	1= purchase inputs 0 =No 1= Yes 2= feed family 0=No 1= Yes 3= use off-farm time 0=No 1=Yes 4=support school 0=No 1=Yes 5=pay rent 0=No 1=Yes 6=build house 0=No 1=Yes	1= purchase inputs 0 =No 1= Yes 2= feed family 0=No 1= Yes 3= use off-farm time 0=No 1=Yes 4=support school 0=No 1=Yes 5=pay rent 0=No 1=Yes 6=build house 0=No 1=Yes
32. How long have you been participating in the off-farm work?	**Please specify**	**Please specify**
33. How much on the average do you earn in the off-farm	**Please specify**	**Please specify**

work in a week?		
34. How many hours, on the average, do you spend on the off-farm work in a day?	**Please specify**	**Please specify**
35. How many days, on the average, do you work on the off-farm work in a week?	**Please specify**	**Please specify**

Questions	Household head	Spouse
36. Did you have access to any form of credit within the last 12 months?	0= No 1= Yes	0= No 1= Yes
37. Where did you obtain the credit and amount borrowed?	1= Relatives........................ 2= Friends.......................... 3= Farmers union................ 4= Bank............................ 5= Other (Specify).............	1= Relatives........................ 2= Friends.......................... 3= Farmers union................ 4= Bank............................ 5= Other (Specify).............
38. For what purpose was the credit taken?	1= Agric inputs/equipments 2= Business 3= Housing 4= Education/Training 5= Health 6= Ceremonies (weddings/funeral) 7= Other consumer goods 8= Other (specify)......................	1= Agric inputs/equipments 2= Business 3= Housing 4= Education/Training 5= Health 6= Ceremonies (weddings/funeral) 7= Other consumer goods 8= Other (specify)..........................
39. Did you in the last 12 months	0= No 1=Yes specify	0= No 1=Yes specify

have to repay some credit you took?	amount………………… …	amount………………… …
40. Do you have access to a non-labour income (specifically, remittances)?	0= No 1=Yes specify amount………………… …	0= No 1=Yes specify amount………………… …
41. Do you earn any income through renting an asset?	0= No 1= Yes specify amount.............................	0= No 1= Yes specify amount.................
42. How do you rate the following facilities in the town? **1= Poor, 2= Fair, 3= Good, 4= Very Good 5= Excellent**	1= Roads 1 2 3 4 5 2= Electricity1 2 3 4 5 3= Water 1 2 3 4 5 4= Banks 1 2 3 4 5 5= Schools 1 2 3 4 5 6= Hospitals 1 2 3 4 5	1= Roads 1 2 3 4 5 2= Electricity1 2 3 4 5 3= Water 1 2 3 4 5 4= Banks 1 2 3 4 5 5= Schools 1 2 3 4 5 6= Hospitals 1 2 3 4 5
43. Approximate total expenditure of your household per month on the following items	Education.......................... Water............................... Food............................... Medicine.......................... Transport.......................... Other (specify).................	Education.......................... Water............................... Food............................... Medicine.......................... Transport.......................... Other (specify).................