DETERMINANTS OF HOUSEHOLD PARTICIPATION IN AGRICULTURAL PRODUCTION IN SHATALE REGION OF THE BUSHBUCKRIDGE LOCAL MUNICIPALITY, MPUMALANGA PROVINCE

By

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DECLARATION

I declare that the dissertation hereby submitted to the University of Limpopo (UL) for the degree of Master of Science in Agricultural Economics has not previously been submitted by me for the degree at this or any other university, that is my own work in design and in execution, and all material contained therein has been duly acknowledged.

Signed_____

Date_____

DEDICATION

This study is dedicated to my mother who always encouraged me to study hard to have a brighter future. The study is also dedicated to Bushbuckridge Local Municipality (BLM) and Department of Agriculture, Rural Development and Land Administration (DARDLA).

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ABSTRACT

Determinants of Household Participation in Agricultural Production in Shatale Region of the Bushbuckridge Local Municipality, Mpumalanga Province

The role of agriculture in poverty alleviation in the rural areas has been acknowledged and supported in South Africa. In former homelands, households generate livelihoods from agriculture and agricultural related activities. However, in some areas, the role of agriculture in alleviating poverty has not been appreciated but instead households participate in off-farm activities more frequently. Bushbuckridge area in the Mpumalanga province is such an area with few households engaging in agriculture. The study aims to investigate the determinants of household participation in agricultural production in Shatale region of Bushbuckridge Local Municipality (BLM). The study had three objectives; the first objective was determine socio-economic factors influencing household labour participation in agricultural production, the second was to analyse socio-economic factors influencing the amount of time allocated to agricultural production and the third objective was to analyse household income diversification in Shatale region of BLM. Multi-stage sampling and stratified sampling approaches were used to collect primary data from 86 households in ward 7 and ward 13 in Shatale region of Bushbuckridge Local Municipality (BLM). The double-hurdle model which comprises a probit model and a truncated regression model was used to analyse the data on assumption that the decision to participate in agricultural production and the amount of time allocated are influenced by different factors. Income diversity was analysed using the Number of Income Sources (NIS) method. The results of the first hurdle showed that gender of the household head, highest level of education, occupation of the household head, access to irrigation water, access to extension service and farming experience negatively influenced household participation in agricultural production and age of the household head and land size positively influenced household participation in agricultural production. The results of the second hurdle showed marital status of the household head, infants and irrigation water negatively influenced the amount of time allocated in agricultural production. Land size and farming experience positively influenced the amount of time allocated in agricultural production. About 49% of the households' diversified income into four sources and 18.6 percent diversified into on five sources on incomes which included farming, old age pension, child support grant, trading and remittances. There is a need of government intervention in Shatale region to encourage household participation in agricultural production. Government can intervene through provision of land for farming, capacitating farming households, infrastructural development, increasing extension support services to farming households and expansion of canal networks.

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LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
BFAP	Bureau for Food and Agricultural Policy
BLM	Bushbuckridge Local Municipality
CASP	Comprehensive Agricultural Support Programme
CRDP	Comprehensive Rural Development Programme
CWP	Community Work Programme
DHET	Department of Higher Learning and Education
DAFF	Department of Agriculture, Forestry and Fisheries
DPLG	Department of Provincial and Local Government
EDM	Ehlanzeni District Municipality
FARA	Forum for Agricultural Research in Africa
FOA	Food and Agriculture Organisation
GDP	Gross domestic Product
HIV	Human Immunodeficiency Virus
HPHC	Home Production for Home Consumption
IDASA	Institute for Democracy in Africa
IDP	Integrated Development Plan
LED	Local Economic Development
KNP	Kruger National Park
ML	Maximum Likelihood
MDG	Millennium Development Goals
NIS	Number of Income Sources
PROVIDE	Provincial Decision-Making Enabling
RDP	Reconstruction and Development Programme
SAT	Southern Africa Trust

StatsSA	Statistics South Africa
WEF	World Economic Forum
WIA	Women in Agriculture

CHAPTER 1

INTRODUCTION

1.1 Introduction and background

The South African agricultural sector is characterised by a dual agricultural economy comprising of well-developed commercial farming, with an established supply chain, and small (subsistence) based production (DHET, 2010). Small-scale farmers encompass farming households that use their own labour to produce food for own consumption and sell surplus produce for cash (Cousins, 2009).

Farming activities range from intensive crop production in high summer rainfall areas to cattle ranching in the bushveld and sheep farming in the more arid regions (Du Plessis, 2010). Livestock production uses less labour than intensive crop production, which in turn uses less labour than the production of fruit and vegetables (BFAP, 2012). In commercial farming, more labour is generally used in harvesting than in production because labour is substituted with machines in agricultural production This adoption of technology in agricultural sector exacerbated unemployment in South Africa (BFAP, 2012)..

Agriculture plays an important role in job creation and poverty alleviation though it contributes a relatively small share to the total Gross Domestic Product (GDP). Agriculture's share of GDP in South Africa has declined from over 3% in 1994 to below 2% in 2012, and employment in agriculture had declined from above 15% in 2000 to 5% in 2012 (BFAP, 2012). Hall (2009) reported that employment has been on the decline since 1970 as farms became more mechanised and employment in the sector shifted from permanent to temporary and seasonal employment, leaving farm workers and their households vulnerable and insecure. These shifts in employment limit the potential of household heads to have sources of income and provide food continuously in the households.

The majority of households in the former homelands in South Africa generate their livelihood from agriculture and agricultural related activities (Machethe, 2004). This diversification of livelihood activities by the households plays an important role in

income generation for the households. Babatunde and Qaim (2010b) in Nigeria reported that share of off-farm income[1] is positively correlated with overall income in the households and relatively richer households benefit much more from off-farm sector. This has also been shown in a number of other studies carried out in different countries of Africa (e.g. Schwarze and Zeller, 2005; Adebayo *et al.,* 2012; Fausat, 2012).

Aliber *et al.*, (2009) have shown that there has been a shift from households which engage in agricultural production as a main source of food towards producing for income and women participate more in agriculture than men. Cousins (2009) observed that farming households need cash income to purchase many other goods for purposes of both production and consumption. Whenever cash income from marketed farm produce is insufficient to meet these needs then family members engage in other activities, in addition to farming, such as wage labour, crafts or petty trading.

In overcrowded Southern African cities, low-income households who live on properties of less than 350 square metres do not have enough land on their own plots. Urban agriculture which also improves the food security of household in the urban areas is practised on the land that is not owned by the user for example roadsides, riverbanks, along railroads, idle public lands, parks, (Crush *et al.,* 2010). Therefore agricultural production is the cornerstone of farming household's livelihood and safety net for low-income households. The study will determine some of the socio-economic factors which affect agricultural production in the rural municipality of Ehlanzeni District in Mpumalanga.

1.2 Key concepts in the study

1.2.1 Participation and Agricultural production

Agricultural production generally involves cultivation of land, production crops and raising livestock for food to sustain and enhance human life. For the purpose of the study, agricultural production is production of crops and keeping of livestock for

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[1] Off-farm income and non-farm income is used interchangeably in this study. Off-farm income is much broader because it includes agricultural wage plus non-farm income. Off-farm income includes income from another farmers farm and non-farm exclude agricultural wage (Beyene, 2008)

income and subsistence purposes. Agricultural production is different from agricultural productivity; the latter measures the ratio of agricultural outputs to agricultural inputs (DAFF, 2011). Agricultural productivity measures the responsiveness of the given level of input to output in agricultural production. Participation in agricultural production is the supply of household's members (labour) to the farms or gardens which are utilized by the household in production of food for subsistence or sale.

1.2.2 Household

The definition of a household is important either to understand the characteristics of the sample and in the analysis of the data when inferences have to be done. The Wyne group (2007), defined a household as a small group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food. In this definition, a household is deemed as a unit of consumption. Anderson (2002), defined household as an economic unit consisting of either a single person or a group of persons who live together, depend on common income and within the limits of that income, exercise choices in meeting specific objectives. The study adopts this latter definition of household because it deems a household as a unit of consumption and production.

1.3 Problem statement

Agriculture plays an important role in provincial development and for most provinces provides a source of employment as well as being a potential focus for increased employment and sustainable livelihoods. Agriculture therefore features as a key focus for economic development and growth in all the provinces. Mpumalanga Province is one of the provinces in which agricultural expansion has potential to fuel employment growth of the provinces (DHET, 2010).

However at the municipal level, agricultural production has not been growing. In the Bushbuckridge Local Municipality (BLM) most households reside in the rural areas, where there is arable land (Bushbuckridge LED document, 2010). In spite of rural households having arable land, agricultural production in the BLM has been poor

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(Bushbuckridge IDP document, 2010). Household members participate more in non-agricultural activities which include public and manufacturing sectors (DPLG, 2005) than in agricultural production. In the Local Economic Development (LED) plan of 2010 to 2014, BLM acknowledged that the agricultural sector's performance is poor and the residents can benefit substantially from agricultural production because there is potential agricultural land in the rural areas.

Households working in the public and manufacturing sectors are faced with the decision of allocating household labour to agricultural production. This can allow the household to save money because food production at household level will increase and instead of buying food in the markets, households can consume products produced in their own farms. Participation in agricultural production may free up money for other items (Altman *et al.,* 2009).

Shatale region is characterised by informal markets. Participants in the informal markets sell agricultural products supplied by farmers producing outside the Shatale region. Failure of the agricultural sector in the municipality to produce sufficient amount of food compel participants in the informal markets to seek suppliers in other regions inside the BLM and beyond. Most studies (e.g. Matshe and Young, 2004; Baganda *et al.,* 2009; Beyene, 2008; Bedemo *et al.,* 2013) conducted on the topic were from outside SA. They concentrated on analysing the factors influencing labour supply decision to off-farm employment; the study will contribute to the frame of knowledge on household labour allocation decision for on-farm activities.

Barret and Reardon (2000) highlighted that livelihood diversification is a norm and there are very few households which rely on income from one source. Livelihood diversification is a process by which households construct a diverse portfolio of activities and social support capabilities in order to improve their living standards and manage risk (Ersado, 2003). The study will further explore household income diversification (a component of livelihood diversification) in the Shatale region.

1.4 Research objectives

The aim of the study was to investigate the determinants of labour allocation for different household activities in the Shatale region of BLM. The specific objectives were to:

i.   determine socio-economic factors influencing household labour participation in agricultural production in Shatale region of BLM,

ii.   analyze socio-economic factors influencing the amount of time allocated to agricultural production in Shatale region of BLM,

iii.   analyze household income diversification in the Shatale region of BLM.

1.5 Research Hypotheses

i.   There are no socio-economic factors influencing household labour participation in agricultural production in the Shatale region of BLM,

ii.   There are no socio-economic factors influencing the amount of time allocated to agricultural production in the Shatale region of BLM,

iii.   There is no household income diversification in the Shatale region of BLM.

1.6 Justification of the study

Agriculture is considered to be a major contributor to the Gross Domestic Products (GDP) in a number of countries; both the developed and developing countries (DAFF, 2011). Smallholders are a diverse set of households and individuals who face various constraints on their ability to undertake potentially profitable activities in the agricultural sector (Fan *et al.,* 2013). South Africa is one of the developing countries in which agricultural production is important in poverty alleviation.

The research will contribute to literature on household labour supply to rural development policies. Such policies can result in the reduction of the unemployment rate through increased support to agricultural production as in non-agricultural employment creation. The study will further reveal the livelihood diversification practices which household develop and adapt overtime so as to escape the social challenges associated with unemployment and poverty.

Studies on socio-economic factors affecting household participation and the amount of time allocated in agricultural production is scarce in South Africa and have not previously been conducted in the Bushbuckridge Local Municipality (BLM). This study will gather and analyse those factors affecting household participation in agriculture in the region.

1.7 Outline of the study

Chapter one provided background introduction and definitions of basic key concepts of the study. The problem statement, objectives and hypothesis of the study were also discussed in the chapter. Previous studies which are in line with the current study are discussed in chapter two. Chapter three gives a detailed discussion of the study site, research methods and variables used for the study objectives. Justification of the models to the objectives is also explained in chapter three. Descriptive statistics for the variables used are discussed in chapter four and findings of the study using the empirical models are discussed in chapter five. In chapter six, findings are discussed and policy recommendations are presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature relevant to socio-economic factors influencing household labour participation in agricultural production and the amount of time allocated in agricultural production. Most studies (e.g. Matshe and Young, 2004; Baganda *et al.,* 2009; Beyene, 2008; Bedemo *et al.,* 2013) focused on the factors influencing farming household participation in off-farm employment. Hence there is scanty literature which focused on those factors influencing household labour participation in agricultural production and time allocated. The chapter begins with the review of household agricultural participation in Southern Africa and then reviews literature on factors influencing participation in agricultural production.

2.2 Agricultural production challenges in Southern Africa

More than 60 percent of the world's population lives in rural areas. For many, maintaining even a subsistence-level lifestyle is a daily concern (Kgosiemang and Oladele, 2012). Agriculture is a sector which has potential to alleviate rural poverty in the marginalised households. However challenges such as limited access to fertile lands, low mechanization and low levels of irrigation affect agricultural production and output. These challenges are worsened by high fertilizer prices which in sub-Saharan Africa are estimated to be the highest in the world, a situation that lends itself to inadequate fertilizer use resulting in low crop yields (SAT, 2009). Rising energy prices, diversion of grains to biofuels production in response to concerns over global warming and drought in key producing countries also causes food price fluctuation in Southern Africa (Draper *et al.*, 2009).

Coetzee and Machethe (2011), reported that agricultural production is influenced by access to financial services in Southern Africa. Small-scale farmers find it difficult to access formal loans but informal loans are less difficult to access but more expensive. Access to financial services could enable seasonal or longer term investment in productivity and sustainability. Access financial services also reduces

farming risks, therefore it encourages longer term planning and investment (Whiteside, 1998).

Muchopa *et al.,* (2004) found that poor access to inputs, poor communication, land degradation, over-dependence on rain-fed agriculture, underdeveloped marketing systems, and high prevalence of HIV/AIDS and weak legislation and lack of enforcements of law among others are the major problems constraining the performance of agriculture in Southern Africa.

FARA (2006) suggested that to meet the Millennium Development Goals (MDG) of halving poverty by 2015, the sector needs to grow much faster and maintain annual growth rates of about 6.2 percent according to recent estimates. This means that agricultural productivity needs to increase; that is the value of output must increase faster than the value of input. Conversely climate change is posing a daunting risk to growth, development and poverty reduction. As the planets temperature get warmer, rainfall patterns shift and extreme events such as droughts, floods, and forest fires become more frequent (Louw and Ndanga, 2010). These changes in climate make it even harder to attain the MDG.

A study conducted in Zimbabwe, Lesotho and Swaziland which used a household vulnerability index in assessing the livelihood of rural household found that there is a need to improve agriculture skills for farmers to increase agricultural production. There was also a need to establish village knowledge centres to provide skills training and information sharing on product markets, crop information through developed information communication technologies (SAT and IDASA, 2011). The DAFF is one of the departments which can encourage agricultural education system in South Africa (Kgosiemang and Oladele, 2012).

This section highlighted agricultural production challenges in the southern African context. These challenges were financial challenges, infrastructural challenges and environmental challenges. Access to land and irrigation system was an issue to households living in poverty and was worsen by inflating prices of inputs. Underdeveloped marketing systems, HIV/AIDS and weak legislation amongst others were some of the challenges highlighted.

2.3 Household participation in agricultural production in South Africa

South Africa has the most productive agriculture on the continent, yet faces a future of uncertain land reforms; increasing domestic pressure to expand and fierce international competition for everything it produces (Casell, 2012). The Department of Agriculture, Forestry and Fisheries (DAFF) has been involved in improving agricultural production and minimizing the cost of inputs for farmers for decades. The support however changed around the mid-nineties when government reduced funding to the commercial sector in a bid to improve the efficiency and productivity of the sector. In addition, the government supported the small-scale farming sector which continued even at the advent of democracy (DAFF, 2011).

Cousins (2009) proposed two concepts which can be used to understand the differentiated character and diverse trajectories of small-scale farming before intervention of government. These two concepts are 'petty commodity production' and 'accumulation from below'. Households which started farming without any support from government and which benefited substantially can be considered as accumulators from below whereas small-scale farmers are viewed as petty commodity producers because they have land and uses own labour. Essentially this meant that these households are capitalist because they own capital and labour. The former situation which describes households lacking agricultural inputs as accumulators from below is the most prominent situation in South Africa. Cousins (2009) further proposed that in order enhance food security and to reduce inequality, land and agrarian reform should support these households.

Aliber and Hart (2009), conducted a study on subsistence agriculture in South Africa and found that agricultural production contributes to livelihood and income of the households but a greater percentage of income is earned from other sources such as remittances (including social grants and migrant labour contributions), purchase and sale of goods especially consumables such as food, beverages and paraffin, the renting of animals for traction, sale of labour and off-farm full-time and seasonal employment in rural towns or on commercial farms. An increase in income enables these individuals or households to diversify the diet and also to buy more non-foods, and this tends to imply a greater dietary quality (Wenhold *et al.,* 2007).

Van Averbeke and Khosa (2006) found that the food households obtained from various types of dry-land agriculture contained large enough quantities of nutrients to contribute significantly to satisfying the requirements of households. Hendricks (2003), as referenced by (Aliber and Hart, 2009) reported that production for home consumption does not only increase the availability of vegetables and micronutrient intake; income 'savings' derived from home production seems to have more positive influences on the nutritional status of rural populations.

Participation of young people in agricultural production can alleviate poverty in rural communities of South Africa. However, more than 50% of young people aged between 15 and 24 are unemployed in the country (WEF 2014). Brown (2012) noted that young people are not willing to participate in agricultural production activities because of the hard work that is perceived to be part-and-parcel of farming operation (Brown, 2012). Mathivha (2012) reported that in urban areas, youth consider agriculture as an activity that is reserved for elderly and the poor people in rural areas because it provides little opportunity for making money. As a result, South African youth are attracted by the possibilities of well-paid work in the towns and cities rather than farming.

Gilimani (2005) estimated the importance of home production for home consumption and its economic contribution to South African agriculture. The study focused on rural households of two provinces, namely the Eastern Cape and KwaZulu-Natal. Although Home Production for Home consumption (HPHC) is also practised by many households in Limpopo province a decision was taken to focus on KwaZulu-Natal and Eastern Cape since the provinces form the east coast region in the Provincial Decision-Making Enabling (PROVIDE) Project databases. The results revealed that households that are engaged in HPHC are poorer than the non-engaged ones. In Eastern Cape 12 percent of annual income of African households comes from HPHC, whereas 6.7 percent in KwaZulu-Natal African households comes from HPHC.

These studies revealed the importance of agricultural production at household level in South Africa. Agricultural production is important in provision of nutritious food to

the households and in poverty alleviation. Cousins (2009) further emphasize that land and agrarian reform policies in South Africa should support small-scale producers to enable sustainable agricultural production. The reports also highlighted misconceptions (for example; that agriculture is an activity reserved for adult people) which discouraged youth people from participating in agriculture. It is important in this study to consider the level of youth participation in agricultural production.

2.4 Factors influencing household participation in agricultural production

Tologbonse *et al.,* (2013) carried out a study in Nigeria to determine the level of women participation in Women In Agriculture (WIA)[2] programmes and to compare their performance in terms of output and income levels with those of non-participating farmers. The results of the regression analysis they ran showed that education, age and marital status were significantly related to the level of participation. The results also showed a significant difference in the income and output of women farmers who participated in WIA programme and those who did not. Participants had higher output and income than non-participants.

Emerole (2012), examined gender distribution in supply of labour to farms and other employment in rural areas along some key issues in own farms of farming households in Nigeria. The results showed that age and farm size exerted critical effect on men supply of labour to farms. Men above youthful age but within workforce worked in the farms more than younger men; younger men were yet to decide to fully embrace farming but shuttle between jobs. Men with larger size of land spent more time working on their crops. Men labour supply to farms was also affected by leisure hours spent for entertainment attractions. More experienced male farmers managed time well and engaged in farming when it was appropriate. All factors which influenced male supply of labour to off-farm activities influenced women supply of labour with swaps of severity in age, experience and monthly income.

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[2] Women In Agriculture which simply means women in the farming business. This includes cultivation, planting, harvesting, processing farm produce, marketing and livestock keeping (Tologbonse, 2013). It was initiated in 1988 after discovering that in spite of a decade of World Bank's assistance in Nigeria's agricultural sector, women farmers were still receiving minimal assistance and information from extension agents (Yemisi, *et al.,* 2009).

Bilisuma (2012), found that women's labour supply to non-farm activities in Ethiopia was a result of bargaining power processes within the household. Women with more bargaining power were less likely to participate in off-farm self-employment than in wage work. Women tended to increase their labour supply to off-farm self-employment in response to negative agricultural shocks; this implied that female labour serves as one of the mechanisms households use to smooth consumption. Further findings of the same research revealed that women used their bargaining power more intensively during economic hardships.

Van de Walle and Mu (2006) investigated factors affecting work, time allocation and health of women living in a migrant household in rural China. The findings showed that female migration was much lower than male migration and more women than man were left behind, female migrants were on average younger than male migrants. Those self-employed in agriculture were older and least educated workers while those employed in local wage work have the highest levels of education.

Olujenyo (2008), in Nigeria examined the determinants of agricultural production and efficiency of maize production in Akoko North East and South West Local Government areas of Ondo-State. Although this study was specifically looking at the determinants of a specific product, it had shed a light of some of the factors which influences the level of participation in the production of a staple crop. The study revealed an inverse relationship between farm size and gender of the household head. They indicated that the unexpected relationship could be due to poor farm management and poor soil fertility resulting from lack of land improvement. Farming experience was negatively related to the output. This was probably due to the fact that farmers with long years of experience were used to obsolete methods of farming, traditional tools and species which did not encourage high output.

Anim (2011) investigated the socio-economic factors affecting the supply of labour for resource-poor rural household farmers in Limpopo province of South Africa. Three rural communities were selected in Limpopo province for the study namely, Capricorn, Sekhukhune and Mopani. The results revealed farming experience was associated with high number of labour supply with gender inequalities. Educated household members and members with off-farm employment contributed less labour to on-farm. This was because education increased the opportunities of household to

be employed in non-farm (Sekei *et al.,* 2009). Cultivated land size, farm structure and the stock of farm machinery per hectare also had significant positive effects on farm labour supply. Extension services and farm inputs had positive effects on farm labour supply while average distance of the farm from nearest town and had negative effects.

Nel and Davies (1999), examined challenges facing farming and rural development in the Eastern Cape and found that entrenched rural poverty and marginalization appear to be the causes of the destructive practice of stock theft which has restricted farming potential. The other factors influencing agricultural production in the province were drought, access to land, shortages of funds, limited access to external markets and failure to penetrate established markets. These are indeed daunting challenges which need to be addressed in the Eastern Cape Province and beyond.

In this section studies which analysed factors influencing household participation in agricultural production were reviewed. Empirical analysis showed the gender and education of the household head were the most influential factors in agricultural production. When women received support their output and income increased, this is seen in the case of women who participated in Women In Agriculture programme in Nigeria. Women used bargaining power in the household during economic hardship. People above the youth age category participated in agriculture than youth, because youth were still shuttling between jobs which they consider to be paying high wages Emerole (2012). Educated household head supplied labour off-farm than in the farm. Amongst these factors, other factors which significantly influenced participation in agriculture are access to land, farming experience, farm inputs, farm structure and access to extension services. These are some of the variables which were used in questionnaire design of the study.

2.5 Factors affecting the amount of time allocated in agricultural production

Gurven and Kaplan (2004) conducted a study in Peru to examine the relationship between time allocation decisions and life history strategies and to explain time spent in alternative activities by the individuals living in traditional and small-scale societies. The study applied the model of traditional human subsistence patterns. The results showed that males and females focused on low-strength/low-skill tasks

early in life (domestic tasks and several forms of fishing), switched to higher-strength/higher-skill activities in their twenties and thirties (hunting, fishing, and gardening for males; fishing and gardening for females), and shifted focus to high-skill activities late in life (manufacture/repair, food processing).

Adeyonu (2012), examined activities which farmers in Nigeria were engaged in and the amount of time allocated to each activity during dry and wet season. The study provided on average the kind of activities each gender is involved in. Female members participated in collection and transportation of natural edibles and processing of farm produce and other activities such as harvesting and crop grading activities were dominated by males. Males spent more time working in the farm during dry and wet season than women, the reason may be because as the supposed bread winner according to cultural norms men are expected to work more on income earning activities. Both genders spent more time during rainy season because farming is still rain fed in Nigeria.

Cooke (1998) used household data from the middle hills of Nepal and analysed whether households that have higher costs of collecting environmental products devote less time to own-farm agricultural activities. Overall, the results of the study gave little clear support to the claim that households and women in particular, spend less time farming when it becomes more costly to collect environmental products such as fuel wood. These women spend significantly more time collecting environmental products when shadow prices were higher, and most of this time increase came from women. It also appeared that seasonal factors, household landholdings, household composition, and traditional gender roles in agriculture exert more influence on household agricultural labour allocation decisions than does an increase in the cost of collecting environmental products.

Dagsvik and Aaberge (1991), estimated how time allocation and the income distribution were affected from different policy measures in Norway. The specified econometric model was sufficiently general to account for simultaneous decisions on time allocation in large households both across sectors (wage work and self-employment) and across adult family members. The results showed that household heads which participated in off-farm employment and self-employment were more

responsive to wage rate changes. When the males wage rates were increased by 20 per cent, participation and mean hours of work for males in the wage sector increased by 1.6 and 2.7 per cent, respectively. For the self-employment sector, male participation and mean hours of work decrease by 1.2 and 2 per cent, respectively. The female participation and mean hours of work were reduced by 2 and 2.4 per cent in the self-employment sectors as the results of an increase in wage rates. The reason why female labour supply decreased was because of the income effect that stem from the increase in male wage earnings.

The section highlighted that people start to participate in agriculture and food processing activities when they are more than thirty years (30) of age. Men were found to allocate time in farming during dry and wet season. Women participated in collection and transportation of natural edibles and processing of farm produce (Adeyonu, 2012).

2.6 Determinants of household income diversification

Fausat (2012), examined the determinants of income diversification in rural farming households in Nigeria. Multiple regression analysis was used to examine the determinants of income diversification among farming households in Borno State. It was expected that educational level of the household head, ownership of assets and age would a have positive relationship with the dependent variables while access to loan, household size and marital status would have negative outcomes. Household consumption, age and ownership of assets conformed to the expected outcome. On the contrary household size, access to loan and marital status were inconsistent with the theoretical postulations of having a negative relationship with the dependent variable. This was due to unreliability of data collected in the survey period.

The tobit regression model was applied by Adebayo *et al.,* (2012) to identify determinants of the income diversification among farm households in Nigeria. The results showed that non-farm income was a major determinant of farm households' income diversification strategy. The coefficient of education was positive showing that a unit increase in educational level of farm households will raises the autonomous income diversification. The co-efficient of farm size negative showing

that 1 hectare increase in land size reduces income diversification practice. Membership of cooperatives also increases income diversification because it increased access to credits.

Ersado (2003), examined changes and welfare implications of income diversification in Zimbabwe. The Number of Income Sources (NIC) method which is a relatively easy measure of income diversification was used. The weakness of NIC is that it assumes that if there are adult members in the households, the sources of income increases (Babatunde and Qaim, 2009). The study addressed this by using the number of per capita income sources. To calculate the scatteredness of sources income, a herfindahl index of concentration which is mostly used in market concentration studies was used. The findings suggested that households with a more diversified income base were better able to withstand the unfavourable impacts of the policy changes and weather shocks. These households were better-off households; the poorer households had difficulties in living under such economic conditions.

Minot *et al.,* (2006), determined the level of income diversification and its contribution to poverty reduction in Vietnam. Regression analysis using the household survey data suggests that livelihood decisions were strongly affected by family land and labour endowments. Households with many members but small farms were more likely to have multiple income sources, a large share of nonfarm income, a higher crop value per hectare, but a smaller share of output that is marketed. Good market access facilitates larger marketed surplus and more specialization. Electrification appeared to enable households to diversify into non-farm activities. Although ethnic minorities were sometimes viewed as "traditional" and less market-oriented in Vietnam, the analysis suggested that ethnic minorities were no different from others in their livelihood choices, after taking farm size, education, market access, and other factors into account.

MacNamara and Weiss (2005), analysed the relationship between off-farm labour allocation and on-farm enterprise diversification as farm household income stabilization strategies in Austria. Probit model was used to regress census data in Austria. They found that the degree of on-farm diversification, as well as the

probability of off-farm diversification, was significantly related to farm and family characteristics. Larger farms were more diversified, whereas off-farm diversification was found to be less likely. A significant effect on the degree of on and off-farm diversification was also reported for farm operator age and the number of family members living on the farm.

2.7 Summary

The reviewed literature revealed that agriculture plays an important role in alleviation of poverty and increases the availability of vegetables and micro-nutrients in the household. However there are socio-economic challenges and environmental factors which affect output grown in the rural areas and in Southern Africa at large. The literature also showed that male and females do not allocate equal hours in agriculture because of factors which affect them differently. Finally the literature showed that household livelihood diversification increases the income of those households. The study seeks to identify and analyse those factors affecting agriculture and the amount of time used in agriculture. The study also analyses the scattered-ness of the sources of household incomes.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is intended to explain research methods which were used to collect data and analyse variables which were hypothesised to influence household labour allocation to agricultural production and the amount of time allocated to agricultural production. A description of the study area, sampling techniques used and data analysis methods are presented first. The variables used in the study are also explained in this chapter and their relevance to the study.

3.2 Description of the study area

The study was conducted in the Shatale region of the Bushbuckridge Local Municipality (BLM) in Mpumalanga Province. Mpumalanga Province is divided into three district municipalities which are Ehlanzeni District Municipality, Gert Sibande District Municipality and Nkangala District Municipality. Ehlanzeni District Municipality (EDM) comprises of five local municipalities wherein BLM is one of the municipalities. The other four municipalities are Mbombela, Thaba Chweu, Umjindi and Nkomazi Local Municipality. BLM is located in the north-eastern part of the Mpumalanga Province and boarders Kruger National Park in the East, Mbombela Local Municipality in the South and Thaba Chweu Local Municipality in the South West (Bushbuckridge IDP document, 2010).

BLM has 11 regions including Shatale. The other regions are Acornhoek Region, Agincourt Region, Mariti Region, Thulamahashe Region, Lylidale Region, Castel Region, Dwarsloop Region, Maviljan Region, Hluvukani Region and Mkhuhlu Region. Shatale region covers the area of 34 445 hectares, while Bushbuckridge in total covers 1025 078 hectares. The region acquires its name from Shatale Township, which is one of the well-known townships in Bushbuckridge. It is divided into 4 wards; ward 7, ward 8, ward 11 and ward 13. Data was collected from ward 7 and 13. Ward 7 has 10 villages and they are Shatale zone 1, Shatale zone 2,

Shatale MTK RDP, Shatale WR RDP, Shatale Magraskop, Shatale Mandela village, London Sehule, London D Kingston, Thabakgolo and Masakeng and ward 13 has 5 villages and they are Bafaladi, Madjembeni, Revoni, Rainbow and Violet bank C. Figure 1, shows the map of Shatale Region.

Figure 1: Map of Shatale Region in Bushbuckridge Local Municipality
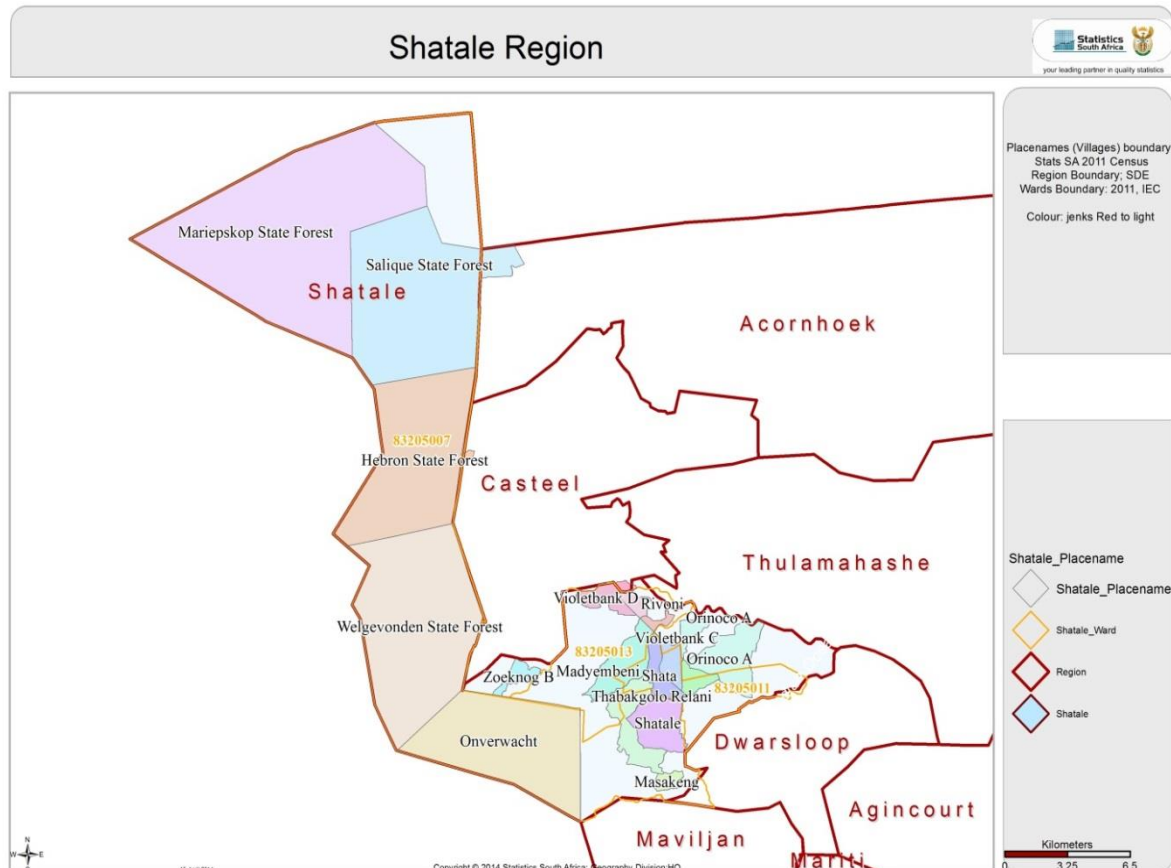
Source: Statistics South Africa, Census Region Boundary 2011a

3.2.1 The people of Bushbuckridge area and Population Statistics

The municipality is characterised and dominated by Mapulana tribe, VaTsonga and to an extent, Swati speaking people as indigenous inhabitants. People speaking different languages dispersed across the Bushbuckridge area for a certain period of time when the Zulu-warrior Shaka-Zulu died in 1823 (Thornton, 2002). Since, then the Mapulana tribe and VaTsonga tribe settled in a complex interplay of agreements and arrangements between people and chiefs, creating ethnically heterogeneous society. An example of this arrangement could be seen in case where there are two

traditional councils in the Bushbuckridge area; these are Nxumalo traditional council and Thabakgolo traditional council.

The population in the BLM was estimated at 541 248 according to the Statistics South Africa 2011 census. A significant proportion of the population is youth aged 34 and below contributing 406,103 to the total population. Females constituted 295,224 (52.1%) while male constituted 246,023 (47.9%) of the entire population (Bushbuckridge IDP document, 2010). BLM is the second highest municipality with high unemployment rate after Nkomazi Municipality in the Ehlanzeni District Municipality. The main employers are government institutions followed by the retail or trade industry (Bushbuckridge IDP document, 2010). About 25% to 50% of the labour force is unemployed and as a result about 75% of the population live below poverty line of R577 per month (Bushbuckridge LED document, 2010).

3.2.2 Climate

The municipal area is located in the Savanna Biome which is the largest biome in southern Africa. The Savanna Biome is well developed over the lowveld and Kalahari region of South Africa and it also the dominant vegetation in Botswana, Namibia and Zimbabwe. This Biome is characterised by grassy ground layer and a distinct layer of woody plants, referred to as Shrubveld, woodland or bushveld (Bushbuckridge SDF document, 2010). A major factor delimiting the biome is lack of sufficient rainfall which prevents the upper tree layer from dominating, coupled with fires and grazing. Most of the savannah vegetation types are used for grazing, mainly by cattle or game, in some areas crops and subtropical fruits are cultivated (Nel and Nel, 2009).

BLM experiences extreme temperatures in summer, most days being around 35-40 ^{O}C. Temperatures can vary between -4C to 45° with an average of 22 ^{O}C. Temperature can be extreme in some of the higher altitudes where snowfalls may occasionally occur. Rainfall in the municipal area is seasonal and is distributed mostly in summer months between November to December and April. The winter season is cool and dry. Altitude in these areas ranges from sea level to 2000 m while annual rainfall varies from 235 to 1000 mm (Bushbuckridge SDF document, 2010).

3.2.3 Agricultural production and other sectors

Tourism is the other sector which has potential of stimulating the economic growth of Bushbuckridge LM considering its close proximity to national parks such as Kruger National Park (KNP), Manyeleti and game reserves such as Mhala-Mhala, Sabie-sabie, Phungwe and others located along the boundary of the KNP (Bushbuckridge IDP document, 2010). There is no large scale mining in the municipality as there no underground resources. The mining practiced is sand mining and stone crushing (Bushbuckridge IDP document, 2010). Most of the province's gold is produced in Barberton, Lydenburg and Pilgrim's Rest areas (Ehlanzeni IDP document, 2012).

Commercial agriculture is characterised by scattered micro enterprise broiler producers who raise less than 500 chickens per week, smallholder vegetable producers, small scale fruit growers, small scale macadamia growers, dry land farmers producing maize and sugar beans with low productivity levels and primarily for subsistence purposes. In addition, farmer practice cattle farming which is not essentially for beef production per se since these small, scattered herds serve primarily as a store of wealth. Agricultural produce are sold primarily to informal markets and to less extent local retail outlets (Bushbuckridge LED document, 2010)

Community services such as Comprehensive Rural Development Programme (CRDP) and Community Work Programme (CWP) initiated by government to alleviation of poverty contributed 41.2% and trade 20.6% to employment in Bushbuckridge LM (Bushbuckridge IDP document, 2010).

3.2.4 Infrastructure in the Bushbuckridge LM

The municipal roads are characterised by poor gravel roads with unclearly defined road network links due to the poor condition of the roads. The major road network comprises routes R40 and a loop road formed by district routes, including the D3930, D4358, R536 and D3974. The main road being described (R40) is mainly tarred except for the portion from Agincourt south and back east towards the R40 (past Mkhuhlu), namely the D3969, D4358 and D3974. R40 is the road which links the municipality to Mbombela and Phalaborwa road (R75) in the south and north respectively. The municipality has 3 hospitals namely Masana hospital, Tintswalo

hospital and Matikwana hospital. There are also 34 clinics and 4 police stations. Educational facilities are in poor conditions and overcrowded. Some colleges are no longer in use and these are Mapulaneng and Hoxani colleges (Bushbuckridge SDF document, 2010).

3.3 Sampling

A combination of multi-stage and random sampling approaches was used in selecting households for the survey. Multi-stage is a type of probability sampling method used in surveys of large geographical areas. Multi-stage cluster sampling involves the repetition of two basic steps; these are listing and sampling. Typically, at each stage, the clusters get progressively smaller in size; and at the last stage element sampling is used (Daniel, 2012).

Stage one involved identifying wards which are under the Shatale region. A visit to the Municipality prior to the survey revealed that the region has four wards (see Table 1 below). Ward 7, 8 and 13 are under Thabakgolo Traditional Council and ward 11 is under Nxumalo Traditional Council.

Stage two involved selection of two wards. Since Ward 11 was under Nxumalo Traditional Council, the focus was on ward 7, 8 and 13 which are under Thabakgolo traditional council. The council also gave a perspective of the farming households in the area. It was explained that ward 7 is characterised of households which have small portion of land largely because it is a township and ward 13 had households who had large land. It was important to study these types of households. Thus the two wards were selected for the study to represent the Shatale region.

Table 1: Population statistics of Shatale Region

Areas	Population
Ward 7	15041
Ward 8	13043
Ward 11	14086
Ward 13	11876
Total	54046

Source: *Statistics South Africa, census 2011b*

Table 2: Sampling frame

Ward	Village	Population
Ward 7 (Strata 1)	1. Shatale zone 1 2. Shatale zone 2 3. Shatale MTK RDP 4. Shatale WR RDP 5. Shatale Magraskop 6. Shatale Mandela village 7. London Sehule 8. London D Kingston 9. Thabakgolo 10. Masakeng	15041
Ward 13 (Strata 2)	1. Bafaladi 2. Madjembeni 3. Revoni 4. Rainbow 5. Violet bank C 6. Bafaladi	11876
Total	16 villages	26917

Source: *Statistics South Africa, census 2011b*

The 2 wards mentioned above (wards 7 and 13) have a total of 16 villages falling under them (see Table 2). From these 16 villages a total of four villages were randomly selected. In each of the selected villages households were randomly selected based on the sampling frame obtained from the village. The targeted sample size was 90 households, although in the end the sample was 86 households. The distribution of the sampled households is shown in table 3.

Table 3: Summary sample

Ward (villages)	Household participating in Agriculture	Non-participating household in agriculture	Respondents
Ward 7	22	19	41
Ward 13	39	6	45
TOTAL	61	25	86

3.4 Data collection and ethical considerations

A structured questionnaire was developed to collect data on the socio-economic characteristics of households which included age, gender, marital status of the household head, household size, highest level of formal education among others, farm size, number of hours spent in farming, amount of income realized from their farming activities and other income generating activities.

The survey was done in September 2013 and took approximately two week. Data were collected in equal proportion in the villages of the two wards. Data was collected by the researcher with two other enumerators who were familiar with the Shatale region and the villages. The enumerators were trained prior to the survey to ensure that they understand the objectives of the study and to familiarise them with the instrument. The survey started in ward 13 in the village called Rainbow. The interview took a maximum of 45 minutes.

The University of Limpopo requires that staff members, students or visiting researchers must adhere to the code of conduct which prescribes standards of responsibilities and ethical conducts. A consent form was presented to the respondents before the interviews started. The respondents were not compelled to participate in the interview and they could terminate the interview at any stage.

3.5 Method used in Data analysis

STATA (2012) was used to analyse socio-economic factors which were hypothesized to influence participation in agricultural production and to analyse factors influencing the amount of time allocate in agricultural production. Descriptive

statistics including mean, frequencies, maximum and minimum were also calculated. The Number of Income Sources (NIS) method was also calculated using STATA (2012).

3.5.1 Double-hurdle model

The double-hurdle model was used to analyze socio-economic factors influencing household labour participation in agricultural production and the amount of time allocated in agricultural production. The double-hurdle model initially formulated by Cragg (1971) is designed to deal with survey data which has many zero observations on a continuous dependent variable (Gao *et al.,* 1995). Zeros could be either corner solutions as in tobit model or abstentions as in the selection (Quattri *et al.,* 2012). The double-hurdle model is similar to the Heckman procedure in that two sets of parameters are obtained in both cases, drawbacks of Heckman's procedure is that it produces a less efficient estimator than the maximum likelihood (ML) tobit estimator and performs poorly when normality assumption is violated (Yen and Huang, 1996).

The double-hurdle model has been widely adopted in consumption literature (Aristei and Pieroni, 2008; Yen and Huang, 1996; Zhang *et al.,* 2006). The model assumes that households make two decisions with regard to purchasing an item, each of which is determined by a different set of explanatory variables. Although it has been used to study off-farm labour decision of rural household in Africa (Matshe and Young, 2004; Bedemo *et al.,* 2013) it has not been used to study socio-economic factor influencing household labour allocation on-farm.

The main feature of the double-hurdle model is that it allows joint modeling of the decision to participate in agricultural production and the amount of time allocated. The first hurdle in the model involves the household decision to participate in agricultural production and the second is the amount of time spent in agricultural production. Essentially the model operates by assuming the existence of two latent variables: Y^{**}_1 associated with the individual's decision to participate in agricultural production, and Y^{**}_2 associated with the decision of how many hours to work off-farm. The first probability of engaging in agricultural production is:

$$Y^{**}_1 = \beta X_1 + U_i \qquad\qquad\qquad\qquad (1)$$

and conditional on clearing the first hurdle the number of hours supplied to agricultural production can be specified as:

$$Y^{**}_2 = \beta X_2 + U_i \qquad\qquad\qquad\qquad (2)$$

Where X represents those variables used to explain the participation decision and those variables explaining hours allocated to farming while U_i is the respective error term and is assumed to be normally distributed. If $Y^*_1 = 1$ is an unobservable variable denoting participation and $Y_1^* = 0$, otherwise, then:

$Y^*_1 = 1$ *if* $Y^{**}_1 > 0$

And

$Y^* = 0$, otherwise

Turning hours to hours allocated to farming equation (Y^{**}_2), is generated as follows:

$Y^*_2 = Y^{**}_2$ if $Y^{**}_2 > 0$

$Y^*_2 = 0$, otherwise

The observed hours of participation in agricultural participation, Y, is determined by the interaction of both hurdles:

$$Y = Y^*_1 Y^*_2 \qquad\qquad\qquad\qquad (3)$$

Thus, if we observe the household participating in agricultural production, it must have decided on a positive level of work time. Zero hours of participation or work can be generated by a 'failure' at either or both of the hurdles. The latent variables have a bivariate normal distribution:

$$(u_1, u_2) \sim \grave{}BVN(0, \Sigma), \Sigma = \begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix}$$

As indicated by Blaylock and Blissard (1992) referenced by (Bedemo *et al.,* 2013),

this general model nests a number of formulations and extensions based on the assumptions made about ρ. For instance, if ρ=1, the model will be reduced to a standard Tobit model; and it will be an independent double hurdle or Cragg model (1971) if ρ=0.

3.5.1.1 First hurdle: Probit model

The first hurdle of double-hurdle model corresponds to a probit model. The Probit model constrains the estimated probabilities to be between 0 and 1, and relaxes the constraint of the effect of independent variables across different predicted values of the dependent variable (Nagler, 2002). The probit model advantage over linear probability models estimated via ordinary least square is that changes in the independent variable is not assumed to have constant change in the dependent variable (Nagler, 2002). Participation in agricultural production takes values of 1, if the household is participating in agricultural production and 0 otherwise. Equation 4 presents the general equation for probit model and equation 5 presents variables used in the first hurdle.

$$Y^* = \beta_0 + \beta_1 X_{1_i} + U_i \ \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

And that: $Y^* = 1$ if $Y^* > 0$

$\qquad$ $Y = 0$ otherwise

The following equation was specified for the probit model (or first hurdle model)

$$Y^{**}_1 = \beta_1 X_1 + \beta_1 X_2 + \beta_1 X_3 + \beta_1 X_4 + \beta_1 X_5 + \beta_1 X_6 + \beta_1 X_7 + \beta_1 X_8 + \beta_1 X_9 + \beta_1 X_{10} + \beta_1 X11 +$$
$$\beta_1 X_{12} + \beta_1 X_{13} + \beta_1 X_{14} + \beta_1 X_{15} + B_1 X_{16} + \beta_1 X_{17} + U \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(5)$$

The explanatory variables used in the first hurdle to analyse the factors influencing the participation decision are presented in

Table 4. The variables were selected based on literature reviewed and observation.

Table 4: Hypothesised influential factors of agricultural production

Variable	Description	Nature	Expected sign
Dependent variable			
Y_1= Participation in agricultural production	1, If the household participates in agricultural production, 0 otherwise	Dummy	
Independent variables			
X_1=Gender of the household head	1, If the household head is male, 0 otherwise	Dummy	+/-
X_2= Age of the household head	1, if the household head is in the middle adulthood (40-60 years) and above, 0 otherwise	Dummy	+
X_3=Marital status of household head	1, if the household head is married, 0 otherwise	Dummy	+
X_4=Adult members in the household	Number of adult members in the household	Continuous	+
X_5= Number of children in the household (3-18 years)	Number of children in the household	Continuous	+
X_6= Number of infants in the household (0-3 years)	Number of infants in the household	Continuous	-
X_7= Education of the head	1, if head has post-matric diploma or certificate and above, 0 otherwise	Dummy	-
X_8= Occupation of the head	1, if head is employed off-farm (including self-employment) , 0 otherwise	Dummy	-
X_9=Land size	Size of arable land	Continuous	+
X_{10}= Access to irrigation water	1, if the household head has access to water for irrigation, 0 otherwise	Dummy	+
X_{11}= Member of agricultural cooperative	1, if the household head is a member of cooperative, 0 otherwise	Dummy	+
X_{12}= Access to extension service	1, if the household has access to extension services, 0 otherwise	Dummy	_
X_{13}=Farming experience	Number of years farming years	Continuous	+
X_{14}= Access to Credit	1, if the farming household has access to credit, 0 otherwise	Dummy	+
X_{15} = Health status	1, if a member of the household was unable to work in previous season due to health problems, 0 otherwise	Dummy	_
X_{16}=Distance to tarmac road	1, if the household head travels more than 4 km, 0 otherwise	Dummy	+
X_{17}= Off-farm income	1, if the household head income is above R4000, 0 otherwise	Dummy	-

3.5.1.2 Second hurdle: Truncated regression model

The second hurdle corresponds to the tobit model developed by James Tobin in 1958. This model is also called censored regression model and it is used when information on regressand is unavailable for some observations (Gujarati and Porter, 2009). The tobit model is designed to estimate linear relationship between variables

when there is either left or right censoring in the dependent variable (also known as censoring from below and above, respectively). Censoring from above takes place when cases with a value at or above some threshold, all take on the value of that threshold, so that the true value might be equal to the threshold, but it might also be higher. In the case of censoring from below, values those that fall at or below some threshold are censored (Parsad and Sanju, 1998). Equation 6 shows the general equation of tobit model; where Y_i is the latent variable and $β$ *is* the estimated parameter.

$$Y^*_i = β_1 + β_2X_i + U_i \tag{6}$$

$$\textit{If } RHS > 0 \qquad = 0, \text{otherwise}$$

The tobit model can also be truncated. Truncation occurs when some observations on both the dependent variable and regressand are lost or missing. Truncation is relevant to the study because some of the household are not participation in agricultural production thus some of the hours are not observed. In the analysis of amount of time allocated the study adopted a truncated regression model because the censored regression model assumes that both the participating decision and the amount of time allocated to agricultural production are determined by the same variables, meaning that a variable that increases the probability of participation also increases the number of hours worked in agriculture (Matshe and Young, 2004). Equation 7 below indicates hypothesised variables used in trucated regression model.

$$Y^{**}_2 = β_2X_1 + β_2X_2 + β_2X_3 + β_2X_6 + β_2X_7 + β_2X_9 + β_1X_{10} + β_2X_{12} + β_2X_{13} + β_2X_{15}$$

$$+ \quad β_2X_{16} + Ui \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \tag{7}$$

The explanatory variables used in the second hurdle to analyse the factors influencing the amount of time allocated to agricultural production are presented in Table 5. These variables were selected based on literature reviewed and observation.

Table 5: Hypothesized socio-economic factors influencing time allocation in agricultural production

Variable	Description	Nature	Expected sign
Dependent variable			
Y_2= on-farm hours	Number of hours allocated to agricultural production by household in a week.	Continous	
Independent variables			
X_1=Gender of the household head	1, If the household head is male, 0 otherwise	Dummy	-
X_2= Age of the household head	1, if the household head is in the middle adulthood (40-60 years) and above, 0 otherwise	Dummy	+
X_3=Marital status of household head	1, if the household head is married, 0 otherwise	Dummy	+
X_6= Number of infants in the household (0-3 years)	Number of infants in the household	Continuous	-
X_7= Education of the head	1, if head has post-matric diploma or certificate and above, 0 otherwise	Dummy	-
X_9=Land size	Size of arable land	Continuous	+
X_{10}= Access to irrigation water	1, if the household head has access to water for irrigation, 0 otherwise	Dummy	+
X_{13}=Farming experience	Number of years farming years	Continuous	+
X_{15} = Health status	1, if a member of the household was unable to work in previous season due to health problems, 0 otherwise	Dummy	_
X_{16}=Distance to tarmac road	1, if the household head travel more than 4 km, 0 otherwise	Dummy	+

3.6 Discussion of the expected signs in the double hurdle model

The expected sign of gender of the head in the first hurdle was uncertain. This is because the literature shows contradicting evidence. Emerole (2012) found more men to participate in agriculture than women when they have land. Adenoyu (2012) also found men work in the farms during dry and wet season than women. These studies related the findings to the fact that according to cultural norms, men are expected to provide food and other household requirements. However other studies reported that in developing countries men have access to productive resources than women and when these women can be supported, they could increase yields on their farms by 20-30 percent (FAO, 2010). A reported complied by Raney *et al.,* (2011) highlighted that women play a big role in to agriculture in all regions of the

world but it is difficult to show exact contribution in terms of quantity and nature. In the second hurdle, the expected sign was negative because male household heads have a comparative advantage of working off-farm compared to female household heads.

Age group of the household head has three categories, these are-early adulthood (18-39), middle adulthood (40-60) and late adulthood (over 60). The likelihood of household head in the last two categories to participate in agricultural production is expected to be positive because the reviewed studies revealed that agriculture is practised by older people. Younger people still shuttle between off-farm employments. The results of the study conducted by Abdulai and Delgado (1999) showed that at younger ages an increase in age increases the probability of labour supply to the nonfarm sector and at older ages, the probability of participating in nonfarm work decreases as age increases. Thus it is expected in this study that older people will likely supply labour in agricultural production compared to young people.

The variable infants in the household (0 to 3 years) was expected to have a negative sign in the first hurdle and second hurdle indicating that the presence of infants reduces the level of participation and the amount of time allocated in farming respectively. The likelihood of female participants to participate in farming may even decline more than of male household members because women are more responsible in child rearing men.

Marital status of the household head was categorized into four categories- married, divorced, widowed and living together. Married household heads were expected to have a positive sign because these household have dependents to support thus their participation in agricultural production plays an important role in provision of subsistence at home. Thus the positive sign was also expected in the second hurdle. The other responses were merged into one.

Education of the household head has three categories; these are-below matric, matric, post-matric diploma, bachelor's degree and post-graduate degree. The expected sign for this variable was negative in both hurdles. The rationale was for the sign was that education increases the likelihood of acquiring employment in off-farm sector. The education level of the household head is important as the

determinant of labour supply as it captures a household's endowment with skills that are important for increasing labour productivity. Considering the current employment requirements in South Africa, it is expected that the likelihood of household with post-matric diploma or certificates to participate in agriculture will be negative significant because education increases the likelihood of this households to work off-farm.

Farming experience increases the marginal value of farm work relative to the marginal value of off-farm work (Beyene, 2008). So a positive sign is expected for this variable to indicate that more years of farming experience increases the likelihood of households to supply household labour into agricultural production. A study by Anim (2011) revealed a positive and significant farming experience at 5 percent which meant that high number of years of farming experience was associated with high farm labour supply.

Location is an important determinant of off-farm labour supply because it determines the opportunities available and the transaction costs in the labour markets (Kamau, 2009). The variable distance to the tarmac road was expected to have a positive sign for households which stay more than 4 kilometres from the tarmac road. This will indicate that these households have limited job opportunities thus the likelihood of participation in agricultural production for this household is expected to be positive. This sign was expected for both hurdles.

The variable irrigation water is a dummy variable representing whether a household has access to irrigation or otherwise. The expected sign for this variable is positive indication that the irrigation increases the likelihood of household participation in agricultural production. It was noted in SAT (2009) report that one of the challenges affecting agricultural production in most part of the world is access to water for irrigating crops. Thus it is important to understand how access to irrigation affects agricultural production in Shatale region.

Toluwase and Apata (2013) revealed that farmer's involvement in agricultural organisation leads to improvement in agricultural productivity and better incomes. These benefits are triggered by exposure to agricultural information and access to capital which becomes easily accessible when farmers formed agricultural cooperatives; as such the variable agricultural cooperative was expected to be

positive indicating that the likelihood of household participation in agricultural production increases when household head is a member of agricultural cooperative. One of the sources off agricultural information is extension agents and therefore the variable access to extension service was expected to have a positive impact on the likelihood of household participation in agricultural production.

The variable health status was a dummy variable assigned to represent whether any member of the household was unable to participate in agricultural production in the previous farming season due to health related reasons. This variable captures those who were unable to work in the farms due to sickness and disability. A hypothesized negative sign for this variable was expected in both hurdles to indicate that to indicate that health condition of the household member's plays a role in labour supply in agriculture. Beyene (2008) also considered this variable when analysing determinates of off-farm participation in agricultural production and found that the effect was negative significant.

The variable access to credit for the purchase of production input was hypothesized to have a positive sign indicating that access to credit increases the likelihood of participation in agricultural production. Households which have access to credit can be able to purchase inputs and expand production.

A negative sign was expected for household heads working off-farm or self-employment to indicate that this occupation decreases the likelihood of household participation in agricultural production. Anim (2011) noted that households which consider the real wage rate of off-farm labour appear to have less farm labour. This confirms that incomes generated in off-farm activities influences household labour participation in agriculture. For the variable off-farm income, it is expected that household which receives more than R 4000 from off-farm activities will concentrate in agricultural production than in agricultural participation because off-farm income is considered to have an influence in agricultural participation.

3.7 Model specification

The double-hurdle model estimates the decision to participate in agricultural production and the number of hours allocated. The reason for separating this model is twofold. First, due to social and psychological drives, the household may prefer not

to supply labour in agricultural production even when the reservation wage is higher than the market wage rate. Second, the household may have potential to participate in agricultural production but for certain level of relevant variables, decide not to work in the farm. One parameter estimation issue in the double-hurdle models concerns the choice of variables for participation and time allocated. As it is known, the choice of the explanatory variables to be included in the two hurdles does not rest on any a priori theory and may be somewhat arbitrary (Aristei and Pieroni, 2008).

3.8 Data analysis and multicollinearity

The nature of independent variables such as gender, age group of the head, marital status of the head, highest education level of the head and occupation head could have also been classified into categories. However when data was analysed with such classification, the problem of the dummy variable trap which results from multicollinearity was experienced. Multicollinearity occurs when two or more predictors in the model are correlated and provide redundant information about the response (Phelan *et al.,* 2010). To address this challenge, the nature of these independent variables was then classified as dummy variables guided by the literature reviewed (see

Table 4 and Table 5).

3.9 Number of Income Sources (NIS)

To measure income diversification in Shatale region a relatively easy index called Number of Income Sources (NIS) method was used. This measure involves accounting for the actual household incomes from various sources. Despite its simplicity in terms of measurement, it has been criticized for its arbitrariness. For instance, it assumes that household with more economically adults will have more income sources (Babatunde and Qaim, 2009). The number of income sources allows studying of income diversification behaviour in urban areas, thus facilitating an urban-rural comparison. To overcome this weakness, Babatunde and Qaim (2009) also used herfindahl index to calculate the scattered-ness of household's income.

Other studies used measures similar to herfindahl index such as Shannon Equability index and Simpson index. The Simpson index is adopted from agronomy and geology studies and is simply the sum of squared levels dived by the squared total. So it is the same as herfindahl index and Shannon index. Shannon Equitability index is used in bio-diversity studies and it was used by Schwarze and Zeller (2005) in measuring income diversification. These measures require continuous income data while NIS uses categorical income data. NIS was used to analyse household income diversification in the third objective because facilitated actual counting of household income sources, to understand the income diversity practice of households in the Shatale region.

3.10 Limitations of the study

Some of the challenges which were encountered in conducting the survey included travelling distance. The villages were scattered, the enumerators had to travel long distance so as to conduct interviews in this villages. Ability to recall information was also encountered with some household head, it happened in most cases where the household head was in the late adulthood.

3.11 Summary

This chapter provided an overview of the study area and the sampling technique used in data collection. Variables and empirical models which were used in the analysis of the results were also discussed. Expected signs from these variables were also explained in terms of the literature reviewed. The model used is called double-hurdle model and consist of probit and truncated regression model. These two models were also explained in details. The Number of Income Sources (NIS) method which was used in calculating income diversification was also explained in these sections. The next chapter, provide results derived from descriptive statistics of the data collected in Shatale region.

CHAPTER 4

CHARACTERISTICS OF SAMPLED HOUSEHOLD PARTICIPATING AND NON-PARTICIPATING IN AGRICULTURAL PRODUCTION

4.1 Introduction

The purpose of this chapter is to provide some insight into the socio-economic characteristics of households interviewed for the purpose of the study in Shatale region of BLM. The results discussed below are based on the data collected as described in chapter 3. Demographic characteristics of households participating in agricultural production as well as of those supplying household labour to off-farm employment are discussed in this chapter. Descriptive statistics including frequencies cross tabulation, standard deviation, mean, minimum and maximum values are used to describe the socio-economic characteristics of the households.

4.2 Sample description

Households in the study consisted of two categories namely; households participating in agriculture and non-participating households in agriculture. A total of 86 households were interviewed of which 70.9 percent of households were participating in agriculture and 29.1 of households were classified in the non-participating households' category. The composition of the sample is shown in Table 6.

Table 6: Composition of the sampled households

Category of households	(Ward 7)	(Ward 13)	Total
Participating household in agriculture	(22) 53.7%	(39) 86.67%	(61)70.9%
Non-participating households in agriculture	(19) 46.3%	(6) 13.33%	(25)29.1%
Total	(41) 100%	(45) 100%	(86) 100%

Source: Survey data (2013)

Table 7 presents the level of household heads' participation in agricultural production and non-participants by gender. From the households interviewed 41 percent of female household head and 59 percent of male household heads participated in agricultural production respectively. Female headed households included females whose husbands had migrated to off-farm employment, were deceased or females who were never married. About 52 percent and 48 percent of male and female household head were non-participants in agricultural production respectively. Table also shows that more households were headed by female heads (55.8%) than male heads (44.2%).

Table 7: Household head participation in agricultural production

Gender	Participants in agricultural production (%) (N=61)	Non-participants in agricultural production (%) (N=25)	Total (N=86)
Male	41	52	44.2
Female	59	48	55.8
Total	100	100	100

Source: Survey data (2013)

The household heads were asked whether farming was their main occupation or they were employed in off-farm employment, off-farm self-employment or unemployed. From the results shown in Table 8, 14 percent of household heads were mainly occupied as farmers while 8.1 percent had non-farm employment, 23.3 percent had off-farm self-employment. According to Emerole (2012) off-farm employment include all non-farm employment plus labour sales to other farms by members of the household. Above half of the respondents (54.7%) in the sample were unemployed. This was not surprising because the rate of unemployment is high in the BLM, about 25-50 percent of people are unemployed (Bushbuckridge LED document, 2010).

Table 8: Household head occupation

Household head occupation	Percentage (%)
Farmer	14
Non-farm employment	8.1
Off-farm self-employment	23.3
Unemployed	54.7
Total	100

Source: Survey data (2013)

4.3 Demographic characteristics

Age of the household head was categorized into early adulthood (18-39), middle adulthood (40-60) and late adulthood (over 60). Table 9 shows that just above half (51.2%) households in the sample were headed by household head in the middle adulthood age group followed by those in the late adulthood age group with 36 percent. The table also revealed that household participating in agricultural production were dominated by household head in the middle adulthood (with 54.1 %) followed by those in the late adulthood (with 41 %) and non-participating households were dominated by household heads in the middle adulthood age group followed by those in the early adulthood age group with 44 percent and 32 percent respectively.

Table 9: Age group of the household head

Age group	Participants in agricultural production (%) (N=61)	Non-participants in agricultural production (%) (N=25)	Total (N=86)
Early adulthood (18-39)	4.9	32	12.8
Middle adulthood (40-60)	54.1	44	51.2
Late adulthood (over 60)	41	24	36.1
Total	100	100	100

Source: Survey data (2013)

Marital status of the household head is important because it can influence the household head decision to participate in either agriculture or off-farm activities

depending on the household size. Marital status of the household heads interviewed is shown in Table 10. Most households' participating in agricultural production were either headed by widowed household head or household heads living together with partners. These household accounted for about 27.9 percent each. About 24.6 percent of married household heads also participated in agricultural production. Just above half (52%) of the non-participating households were also headed by household head living together followed by those who were married.

Table 10: Marital status of the household head

Marital status	Participants in agricultural production (%) (N=61)	Non-participants in agricultural production (%) (N=25)	Total (N=86)
Single	18	16	17.4
Married	24.6	20	23.2
Divorced	1.6	4	2.3
Widowed	27.9	8	22.0
Living together	27.9	52	34.9
Total	100	100	100

Source: Survey data (2013)

Household size plays a significant role as a source of labour to work in the farm or off-farm. From the results shown in Table 11, average household size consisted of 5 members and the minimum size was 2 and the maximum was 14 members. The average number of children less than 3 years of age was 1 and the average number of children between three and eighteen years was 2. Children older than 5 years of age attend school therefore; the household head uses the time when the children have gone to school to work in the farms or off-farm. Labour market recognizes workforce as individuals aged 15 to 64, this means that during weekends or holidays these children can work in the farms. A household had an average of 3 adult members (over 18 years).

Table 11: Household size

Variable	Mean	Standard deviation	Minimum	maximum
Children (0 to 3 years)	1.4	1.39	0	7
Children (3 to 18 years)	1.9	1.51	0	7
Adult (over 18)	2.6	10.8	1	7
Total Household size	5.8	2.64	2	14

Source: Survey data (2013)

The level of education for the household head was divided into five categories; below matric, matric (grade 12 or standard 10), post-matric diploma or certificate, baccalaureate degree and post-graduate degree. In Table 12 only four categories are shown, this is because none of the household head in the sample had post-graduate degree. The table below also shows that 80.3 percent of the households participating in agricultural production were headed by a household head without formal education and 13.1 percent of the participants had matric. In the non-participating households, 60 percent of the household head did not have formal education whilst 28 percent had matric certificate. It is important to notice that 4 percent of the household head had bachelor's degree and were not participating in agriculture. Education was included as a variable to present human capital because it plays an important role in labour time allocation in agricultural households (Matshe and Young, 2004). Education may increase labour supply off-farm if farm employment is considered inferior to off-farm and may also increase labour supply on the farm if education leads to increased farm productivity on-farm (Kamau *et al.,* 2009).

Table 12: Education of the household head

Level of education	Participants in agricultural production (%) (N=61)	Non-participants in agricultural production (%) (N=25)	Total (N=86)
Below matric	80.3	60	74.4
Matric (grade 12 or standard 10)	13.1	28	17.4
Post matric diploma or certificate	6.6	8	7
Bachelor's degree	0	4	1.2
Total	100	100	100

Source: Survey data (2013)

4.4 Farm characteristics and Institutional support

Land size plays an important role in influencing household labour supply to agricultural production. Table 13 shows that the average land size was 3 and the maximum was 12 hectares and the standard deviation was 2.7 this showed that land size of most household's was close to the average mean. The minimum was 0 illustrating that some households did not have land to practice agriculture; most of which were in ward 7. The study site was under custodianship of traditional council and farming households are farming on communal land thus the land cannot be used as collateral for loans.

Farming experience (measured in years) is also important in influencing household decision to participate in agricultural production. Table 13 shows that some of the household heads had never been involved in farming thus the minimum years of farming experience was 0. The maximum years of farming experience was 39. The average was 11 years.

Table 13: Land size of the household

Variable	Mean	Standard deviation	Minimum	Maximum
Land size (in hectares)	3	2.71	0	12
Farming experience (in years)	11.60	9.01	0	39

Source: Survey data (2013)

Farming is contingent on availability of water resource for irrigation. The respondents were asked whether they had access to water for irrigation or not.

Figure 2, shows that access to water for irrigation was different between the two groups. About 72 percent of the non-participating households did not have access to water while 53 percent of the participating household had access to water for irrigation. The figure also shows that 59 percent of the households in the sample did not have access water compared to 41 percent. Sources of water included rivers adjacent to most farms and some households used tap water.

Figure 2: Access to water for irrigation
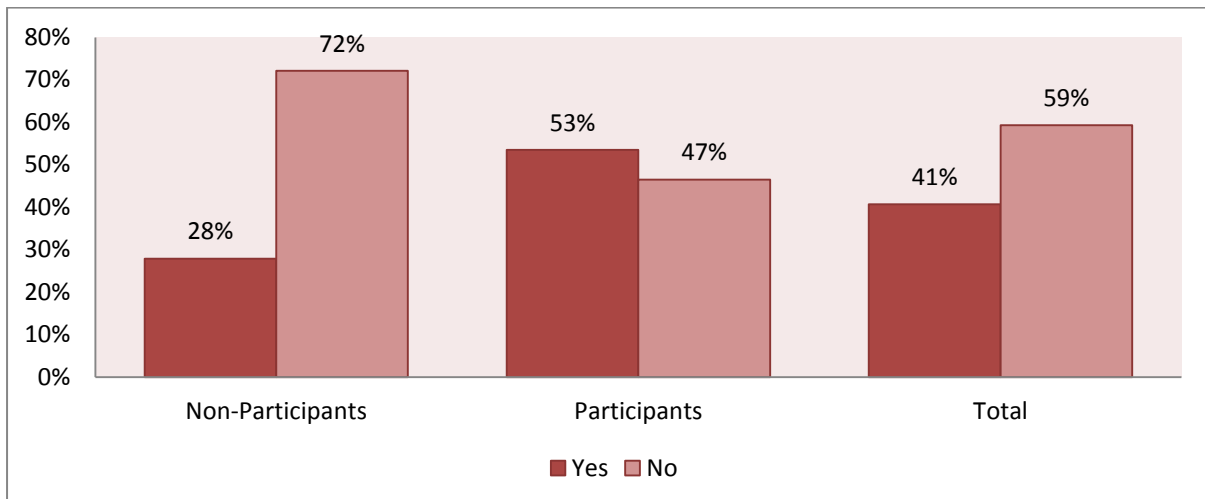
Source: Survey data (2013)

Figure 3 shows assets ownership of the sampled households. The assets owned by the majority of the households were hand hoe, wheel barrow, sledge and bakkie, lorry and truck. There were 86 percent of the households who owned hand hoe and 68 percent owned wheel borrows which can be used in the fields. Those with sledge and vehicle were about 33 percent and 29 percent respectively. In Figure 4

household ownership of these assets are shown for the household participating in agriculture and non-participating households.

Figure 3: Assets ownership
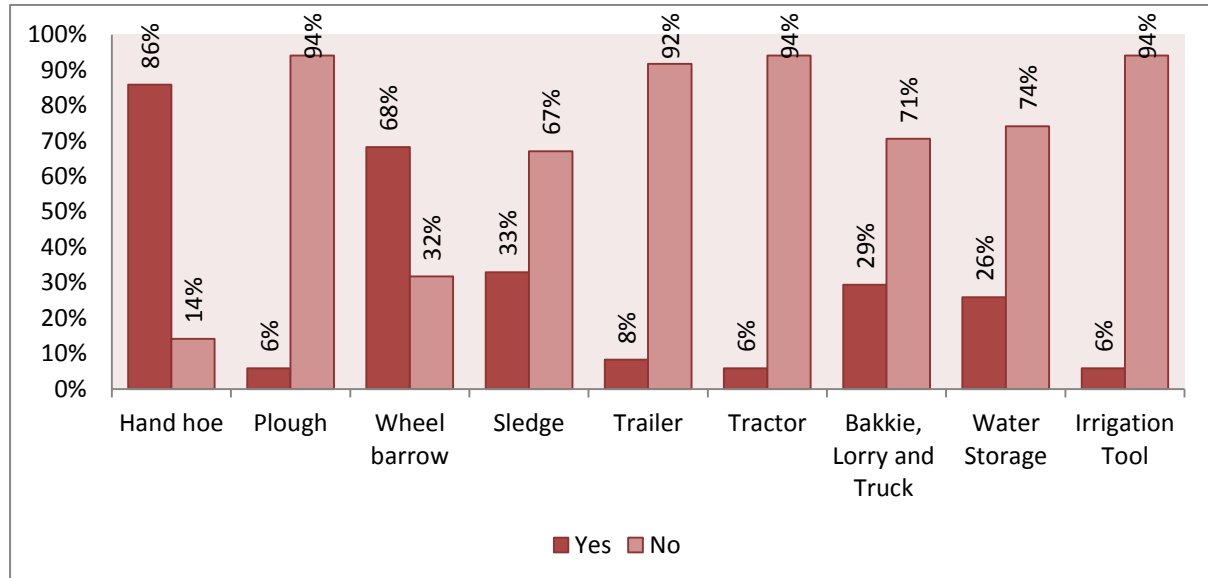
Figure 4 shows that hand hoe and wheel barrow were common tools found in both the household participating in agriculture and non-participating household in agriculture. Almost all the households had these assets. Vehicle such as bakkie and lorry are important mode of transport from of inputs from the household to the farm. Only 32 percent of the participating households had bakkie, lorry and truck while 72% did not have this asset. This might mean that the farming household could be relying on hiring vehicle to move inputs. Sledge was owned by 35 percent and 28 percent of the participating households and non-participating household respectively.

Figure 4: Assets ownership. Participants in agriculture compared to non-participants
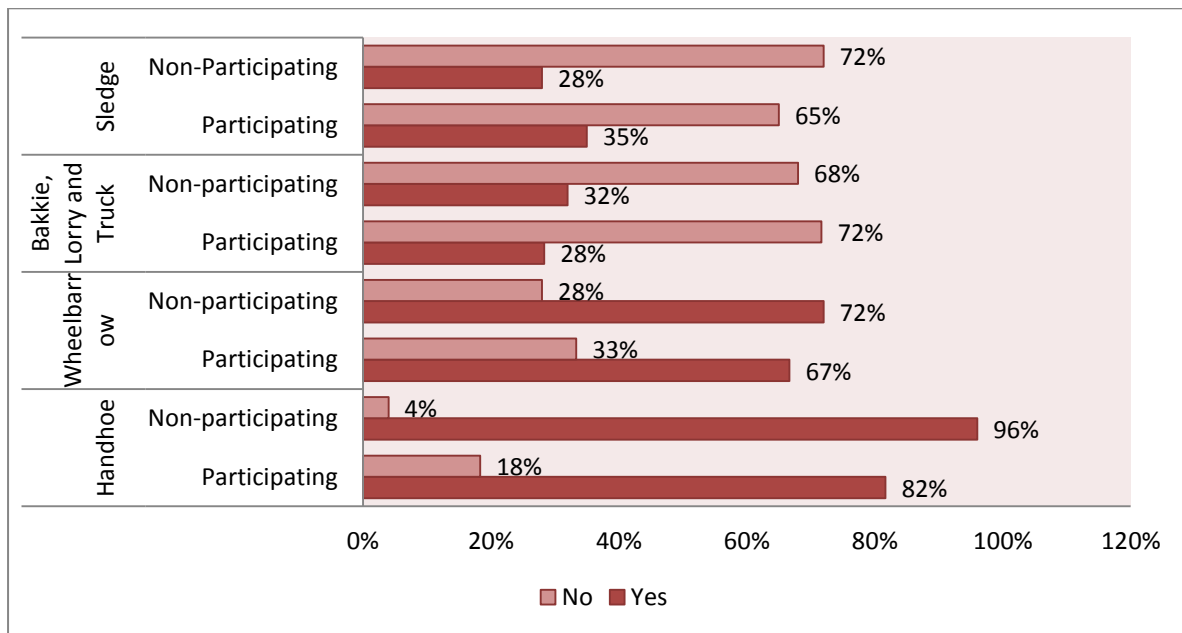
Source: Survey data (2013)

The households participating in agriculture were further asked if they hire labour during the farming season. The results in Figure 5 below showed that only 27.9 percent of the household hired labour and the majority (72.1 %) did not hire farm labour. Plausible explanation could be because most of these households were farming for subsistence purposes and they could not afford to remunerate labour.

Figure 5: Farm labour
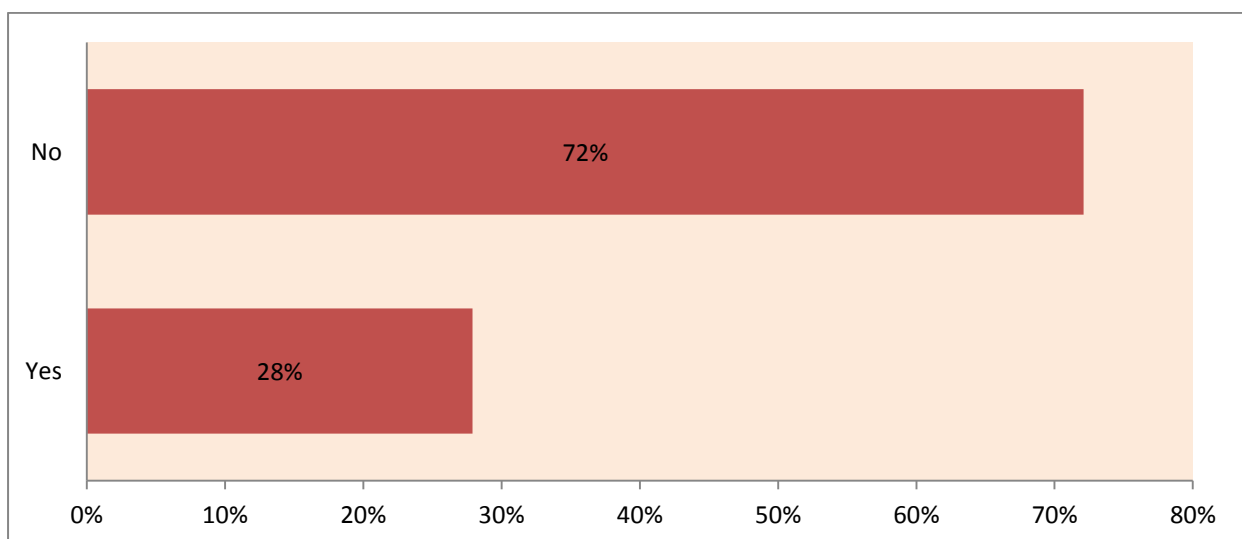
Source: Survey data (2013)

Households were also asked if they had received extension services from local Department of Agriculture. Figure 6 shows that 46 percent of the households farming in a communal land received extension services from Local Department of Agriculture. Households farming on extended home stands or land adjacent to their homes alluded that government officials only visited farmers in the communal land, these households constituted 54% of the households which did not receive extension services. Extension services included provision of seeds and crop production techniques.

Figure 6: Extension services from local Department of Agriculture
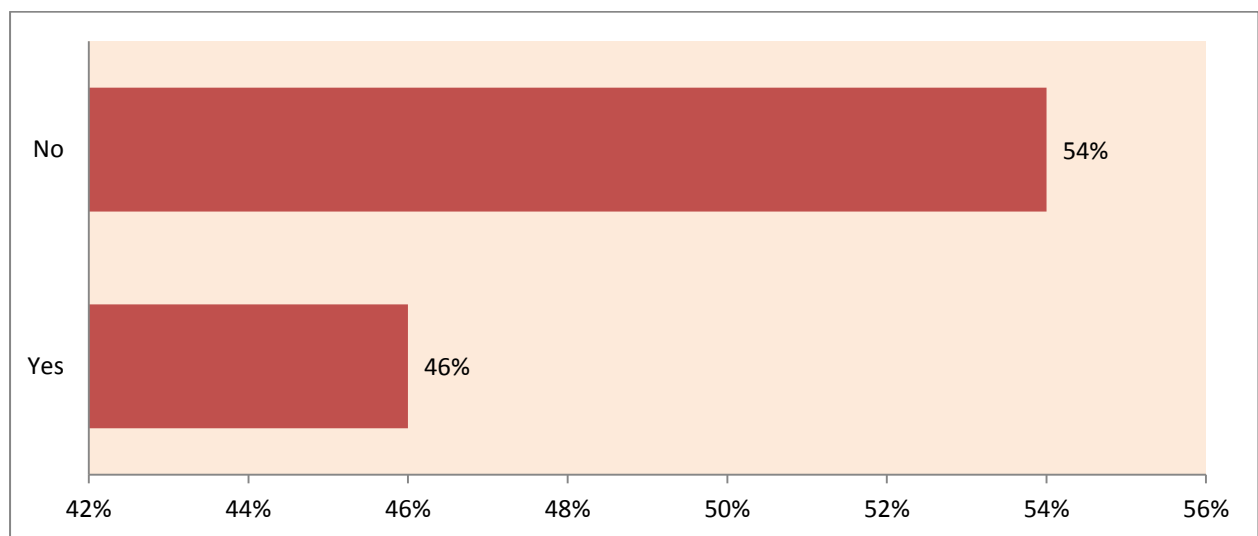
Source: Survey data (2013)

The respondents were asked whether any of the household members working in the farm were unable to work due to health related problems and disability in the last production period. The results showed that 36 percent of household participating in agricultural production had members who were unable to perform farm activities due to health problems in the last season of production while 64 percent did not encounter health problems in the households which affected agricultural production.

Household heads in the study areas were asked to estimate the distance to tarmac road. Households located in remote areas are less likely to supply labour off-farm because of higher time and transport costs, thus off-farm employment opportunities seem inadequate or rationed for them (Kamau *et al.,* 2009). Table 14 shows that 18.6 percent of the respondents resided less than 1 Kilometre from the tarmac road and 29 percent resided between 1km and 2km. About 29.5 percent of the

participating household and 28 percent of the non-participating households stayed between 1 and 2 km from the tarmac road. Some of the households resided more than 4 km from the tarmac road. From the participation households, they contributed 23 percent to the total sample and to non-participation households they contributed 16 percent to the total sample.

Table 14: Distance to tarmac road

Distance (Km)	Participants in agricultural production (%) (N=61)	Non-participants in agricultural production (%) (N= 25)	Total (N=86)
Less than 1Km	18	20	18.6
1Km to 2km	29.5	28	29.1
2Km to 3Km	29.5	36	31.4
More than 4Km	23	16	20.9
Total	100	100	100

Source: Survey data (2013)

4.5 Household sources of income

Table 15 shows that households relied on other sources of income beyond occupation. Occupation was categorised into farmer, non-farm employment and off-farm self-employment. It was important to understand whether the household heads which belonged to the other categories besides farmer (these are-non-farm employment, off-farm employment and unemployed) acquired income from farming or not. Thus other sources of income were categorised into farming, old age grant, child support grant, trading and remittances. Table 15 shows that 44.4 percent of the household head who considered themselves as farmers relied on farming income. Of those who were unemployed, 33 percent of them also relied on farming. Household head who worked non-farm and those who were self-employed also relied on income from farming (about 11 % each). A majority (67.50) of the households who relied on old age grant pension were unemployed and 53.85 percent of the unemployed head also relied on child support grant. Trading was an important source of income for those who were self-employed and unemployed, 30 percent and 50 percent respectively. The sampled household heads who were farmers did not indicate

reliance on remittances. Even the household heads who considered themselves to be unemployed did not indicate reliance on remittances.

Table 15: Household sources of income by occupation

	Occupation of the household head (%)				
	Farmer	Non-farm employment	Off-farm self-employment	Unemployed	Total (%)
Sources of income					
Farming	44.44	11.11	11.11	33.33	100
Old age grant	15	0	17.50	67.50	100
Child support grant	7.69	7.69	30.77	53.85	100
Trading	5	15	30	50	100
Remittances	0	50	50	0	100
Total	13.95	8.14	23.26	54.65	100

Source: Survey data (2013)

The household is a unit that supplies labour to farms and off-farm employment. Statistics of household members working in the farm is shown in Table 16. Households in the study area supplied an average of 0.56, which is practically 1 member to work in the farm and the maximum household members that the household supplied was four. Some members of the household had off-farm employment but due to the prevailing rate of unemployment in the Bushbuckridge local municipality the minimum number of household working off-farm were 0 and the maximum was also 4. An average of 0.91 members of the household had off-farm employment.

Table 16: Number of household members supplied in farm and off-farm activities

Variable	Mean	Standard deviation	Minimum	Maximum
Household members working in the farm	0.56	0.86	0	4
Household members working in the off-farm	0.91	0.92	0	4

Source: Survey data (2013)

Off-farm activities are considered to be an important component of the rural economy of developing countries (Bedemo *et al.,* 2013). Even in Bushbuckridge area of South Africa, households participated in off-farm employment to eradicate poverty at household level. Household heads participated in various types of off-farm self-employment activities (see Table 17 below). About 20.9 percent of household heads were involved in local trade of non-agricultural products. Half (50%) of the household heads did not participate in self-employment activities. Participating households in agriculture diversified livelihood activities by trading agricultural products and non-agricultural products, this was about 14.8 percent and 21.3 percent respectively. The agricultural products sold by this household included those produced in own farms. About 20 percent of the non-participating households participated in trading of non-agricultural products.

Table 17: Household off-farm activities

Self-employment activities	Household participation in agriculture (%) (N=61)	Non-participation in agriculture (%) (N=25)	Total (86)
Building houses	3.3	4	3.5
Selling agricultural products	14.8	12	14
Selling non-agricultural products	21.3	20	20.9
Tailoring (Sewing)	1.6	12	4.7
Traditional healer	1.6	0	1.2
Weaving and handicraft	4.9	8	5.8
None	52.5	44	50
Total	100	100	100

Source: Survey data (2013)

Participants in agricultural production were asked to estimate the number of hours spent in the farms during the farming season and off-farm. Full time farmers could go to the farms in the morning and spent the whole day in the farms. The average hours supplied by households weekly in agricultural production were 23.51 hours and the

maximum was 100 hours. This however was also determined by the size of the household. The standard deviation was 29.4 which imply hours supplied by the households in the sample did not deviate much from the average mean.

In non-farm activities the household allocated an average of 30.76 hours and the maximum was 129 hours weekly. Noticeably the hours allocated to non-farm activities were higher than those allocated to agricultural production implying that the members of the hours spent more time in non-farm activities that in agricultural production.

Table 18: Weekly hours allocated to agricultural production and off-farm employment

Hours allocated to agricultural production per household			
Mean	Standard deviation	Minimum	Maximum
23.51	29.4	0	100
Hours allocated to non-agricultural production per household			
30.76	27.22	0	129

Source: Survey data (2013)

4.6 Summary

This chapter provided descriptive results of the socio-economic factors hypothesised to be influencing household participation and time allocation in agricultural production in Shatale region. From the sample households 70.9 percent were participants in agricultural production and 29.1 were non-participants. Many households in the survey were working in off-farm employment and more than 50 percent were unemployed. From the sample, households headed by female participated in agricultural production frequently than those headed by male, with 59 and 41 respectively. The results also revealed that agricultural production is practised by household heads in the middle adulthood (40-60) and late adulthood (over 60). The percentages of participation by these age groups were 54.1 percent and 41 percent respectively. The average land size of the household in the sample was 3 hectares.

Households participating in agriculture allocated a maximum of 100 hours weekly while in the off-farm a maximum of 129 hours were allocated weekly. Average hours allocated was 23.51 and 30.76 weekly on-farm and off-farm respectively. This meant that households participate in the off-farm sector than on-farm. The next chapter uses the econometric model discussed in chapter 3 to analyse the effect on these hypothesised variable in agricultural production and the amount of time allocated.

CHAPTER 5

DETERMINANTS OF HOUSEHOLD LABOUR ALLOCATION IN AGRICULTURAL PRODUCTION

5.1 Introduction

This chapter presents the results of the empirical analysis. Econometric models discussed in chapter 3 were used to estimate factors affecting the level of household participation in agricultural production and in the analysis of factors influencing the amount of time allocated to agricultural production in the Shatale region of BLM. Some of the variables described in the previous chapter will not be analysed in the second hurdle because the selection of variables for this econometric model is arbitrary. Ghadim *et al.,* (1999) stated that it is important to impose some exclusion restrictions across the two vectors of explanatory variables in order to adequately identify the parameter estimates. The approach which is used is to include in the models all explanatory variables hypothesised to influence the decision to participate in agricultural production and the amount of time allocated.

In the double hurdle model used in the study; factors influencing the level of participation in agricultural production were analysed using the probit model. The factors affecting the amount of time allocated to agricultural production were analysed using truncated regression model. The fitting model features of these empirical models to the data were also discussed.

5.2 Results of the empirical models

5.2.1 First hurdle model: Probit model

Table 19 shows a summary of the results showing seventeen (17) variables which were hypothesised to be influencing the participation decision. Log likelihood is -19.68. Likelihood Ratio (LR) Chi-Square is 64.32 and its respective P- value (LR) is 0.0000. These indicate lower probabilities of making mistakes in rejecting the null hypothesis; that is the explanatory variables have a significant effect on household

participation in agricultural production. The Pseudo R-Squared is 62.04 percent and it is also an acceptable level, implying that the model's estimates fit the data.

Only 8 out of 17 variables significantly influenced household participation in agricultural production and these were-gender of the household head, age of the household head, highest level of education, occupation of the household head, land size, irrigation water, extension service and farming experience statistically influence household participation in agricultural production. Gender of the household head, highest educational level, irrigation water, extension service and farming experience road were found to negatively influence participation in agricultural production while age of the household head, occupation and land size were positively significant.

Table 19: Probit regression estimates of socio-economic factors influencing households' participation in agricultural production

Independent variable	Coefficient	Standard error	P-value	Marginal effect
Gender of the household head	-1.462*	0.789	0.064	-0.057
Age of the household head	2.471**	1.279	0.053	0.406
Marital status of household head	-0.679	0.730	0.352	-0.026
Adult members in the household	0.250	0.407	0.54	0.006
Number of children in the household (3 to 18 years)	-0.064	0.198	0.746	-0.001
Number of infants in the household (0 to 3 years)	0.310	0.243	0.203	0.007
Education of the head	-3,401*	1.810	0.06	-0.766
Occupation of the head	-1.156*	0.703	0.10	-0,053
Land size	0,309**	0.155	0.046	0.007
Access to irrigation water	-4,767**	1.926	0.013	-0.329
Member of agricultural cooperative	0,730	0.914	0.424	0.035
Access to extension service	-1,364*	0.784	0.082	-0.029
Farming experience	-0,084**	0.040	0.034	-0.002
Access to Credit	0,903	1.191	0.448	0.056
Health status	-1.023	0.681	0.133	-0.020
Distance to tarmac road	1.007	0.958	0.293	0.014
Access to off-farm income	-2.408	1.896	0.204	-0.427
Constant	3.487	3.052	0.253	-
Number of observation:				86
Log likelihood:				-19.68
Likelihood Ratio (LR) Chi-Square:				64.32
Probability (LR statistic):				0.0000
Pseudo R-Squared:				62.04%

Note: ***, **, * represent 1%, 5% and 10% significant levels respectively

5.2.1.1 Socio-economic factors influencing household participation in agricultural production

Gender of the household head

Gender of the household head had a negative sign and was significant at 10 percent level. The expected sign for this variable was uncertain. This shows that the likelihood of household participation in agricultural production decreases by 5.7 percent if the household head is male. A plausible explanation is that male household head have employment in the off-farm sector than female head and this decreases their participation in agricultural production. Beyene (2008), investigated the determinants of off-farm work participation decisions of farm households in Ethiopia and found that women were less likely to participate in off-farm activities because of the influence of the head and cultural factors that females are naturally assigned to household activities. Thus provision of resources to female farmers to improve agricultural production which was raised by Raney *et al.,* (2011) and FAO (2010) should be acknowledged and supported.

Age of the household head

The nature of this variable was classified into dummy, representing whether the household heads are over 40 years of age or below 40 years of age. The coefficient of this variable was statistically significant at 5 percent level showing that household participation in agricultural production is dependent on age of the household head. The sign of this variable was as expected. This result indicates that the likelihood of households to participate in agricultural production increases when the household heads are over 40 years of age. The marginal effect of age is 0.406 it indicates that participation in agricultural production increases by 40.6 percent when household head reaches the middle adulthood group.

Highest educational level of household head

The coefficient of education of the household head had a negative but significant effect in agricultural production. It was significant at 10 percent level and implies that participation in agricultural production decreases if the household head has post matric diploma or certificate. This was the expected sign and the results are

consistent with the findings of Sekei *et al.,* (2009) who found that education signals employers about workers' potential productivity increasing the chances of their being hired into attractive non-farm activities thus reducing labour allocation to the less remunerative farming sector. Thus the likelihood of educated household head to be participating in agricultural production decreases.

The marginal effect of education was 0.766 indicating that the likelihood of participation decreases by 76.6 percent. Household heads below matric level of education are more likely to participate in agricultural production than household head beyond matric level because of the statement discussed above. The majority of the household heads were farming for subsistence purposes thus education could be beneficial to those households who are producing for markets. This is because education enables farmers to understand basics farm and financial management knowledge and to have access to information.

Occupation of the household head

Occupation of the household head was found to be negative and significantly at 10 percent level. The marginal effect was 0.053. This indicates that the likelihood of household heads which are employed in off-farm decreases household participation in agricultural production by 5.3 percent. Participation in off-farm employment leads to a decline in agricultural production because of changes in labour supply in the households.

 Land size

The coefficient of land size had an expected positive sign and it was statistically significant at 5 percent level. This indicted that when households have land participation in agriculture increases. This finding was supported by Anim (2011), who also found that available land and the presence of other resources increase activities on the farm and consequently farm labour supply also increase.

Access to water for irrigation

The coefficient of water for irrigation was negative significant at 10 percent level and this sign was unexpected. This illustrated that the likelihood of household to participate in agricultural production could decreases when households have access

to tap water for irrigation. Although this cannot be necessary be true, the explanation for this is related to the characteristics of the study area. Farming households mostly farm on wetlands (most are in ward 13) and depend on rain fed agriculture. Livestock are lead to drink water in the nearest rivers.

Access to extension service

Access to extension service from local department of agriculture was found to have a negative sign but significant at 10 percent to the participation of household labour in agricultural production. The implication of these results is that participants in agricultural production are disadvantaged because they do not have access to information. The marginal effect was 0.029. This means that the likelihood of household participation in agricultural production decreases 2.9 percent in the absence of extension services.

Farming experience of the head

The coefficient of farming experience of the household head was negative and significant at 5 percent level. This indicates that farming experience decreases the level of household participation in agriculture. Weir (1999) also found a negative relationship between farming experience and agricultural production. It was highlighted that older farmers with many years of farming experience are not able to produce as much as young household heads. This discourages older household heads with many years of farming experience to practice agriculture and thus they rely on social transfers.

5.2.2 Second hurdle model: Truncated regression model

The estimated results of truncated regression model are in Table 20. Wald chi-squared and wald statistics (probability) is 23.47 and 0.0092 respectively. These figures prove that the selected variables are associated with the amount of time allocated by household weekly in agricultural production.

Only five out of ten socio-economic variables hypothesized to be influencing the amount to time allocated in agricultural production were found to be statistically significant and these are-marital status of the household head, infants in the

household (0 to 3 years), Land size, irrigation water and farming experience. Marital status of household head and land size were negative and significant to the amount of time allocated by the household in agricultural production. The amount of time allocated in agricultural production was measured in weekly hours.

Table 20: Truncated regression estimates of socio-economic factors influencing time allocated in agricultural production

Independent variable	Coefficient	Standard error	P-value
Gender of the household head	-0.485	5.483	0.929
Age of the household head	-12.604	9.947	0.205
Marital status of household head	-10.203*	6.443	0.103
Number of infants in the household (0 to 3 years)	-2.498*	1.706	0.104
Education of the head	-3.788	10.196	0.710
Land size	1.815***	0.723	0.012
Irrigation water	-12.913**	5.434	0.017
Farming experience	0.658**	0.297	0.027
Health status	-3.279	5.402	0.544
Distance to tarmac road	1.949	5.860	0.739
Constant	42.538	12.114	0.000
Number of observation:			61
Log likelihood:			249.86
Wald Chi-squared:			23.47
Probability (Wald statistic):			0.0092

Note: ***,** , * represent 1%, 5% and 10% significant levels respectively.

5.2.2.1 Socio-economic factors influencing the amount of time allocated in agricultural production

Marital status of the household head

The coefficient of household head was found to be negative and significant at 10 percent level. This indicates that the amount of time allocated to agricultural production decreases for married household head. The sign of the coefficient was unexpected. These results were inconsistent with the finding of other researchers. Babatunde and Qaim (2010a) discovered that while husbands migrated to off-farm employment, women allocate time to household duties and agriculture to maintain minimum subsistence level. Tijani *et al.,* (2010) also found that married household member's supply larger portion of their workdays to the farm activities to provide

household food needs. The explanation for this is that households in the Shatale region consider non-farm activities to be superior to agricultural production.

Number of children between 0 and 3

The coefficient of the number of children between 0 and 3 years was negative and significant at 10 percent level. This sign was expected and this could mean that the amount of time allocated to agricultural production by the household decreases when there are infants in the household. This is explained by the facts that child rearing requires the parents or guardians to compromise time of participating in other activities including agriculture and concentrate in upbringing of a child (Ilahi, 2000).

Land size

Land size of the household measured in hectares was found to be positive and significant at 5 percent level. The sign of the coefficient was expected and it indicates that an increase in land size by 1 hectare increases the amount of hours allocated by household in agricultural production. This indicates when households have access to land both decision of participating in agricultural production and the amount of time allocated increases.

Access to water for irrigation

Water for irrigation and land are complementary resources in agriculture. Access to water for irrigation was found to be negative and significant at 1 percent level of significance. This indicates that access to water for irrigation decreases the amount of time allocated to agricultural production. This was plausible because the farming household in Shatale region participates in farming during rainy season. Some of the household head mostly in ward 13 were farming at the adjacent of rivers. However households in ward 7 had access to tap water than those living in ward 13 but were not participating in agriculture as household in ward 13. This means that households who have access to water from rivers spent more time in farming than households with tap water.

Farming experience of the household head

Coefficient of farming experience of the household head was positive and statistically significant at 5 percent level. This indicates that when farming experience increases

by 1 year, the amount of time allocated to agricultural production increases for households which decide to participate in agricultural production. This was in line with a priori expectations.

5.3 Household income diversification in Shatale region

Chapter 4 provided an insight of the household sources of income. Households in Shatale region do not focus on occupational income completely they diversify activities into non-farm or farm activities. Pursuit of more than one income source may arise from the need to reduce income risk emanating; for instance from macroeconomic policies that result in job losses due to public-sector employment (Ersado, 2003). In this section the number of income sources (NIS) method was used to measure income diversification in Shatale region. NIS is a relatively easy measure to measure income diversification and it has been used by Babatunde (2009) and Ersado (2003). Table 21 below shows the distribution of households by the NIS.

Table 21: Distribution of household by the Number of Income Sources

Number of Income Sources (NIS)	Households (%)	Cumulative Percentage (%)
1	3.5	3.5
2	9.3	12.8
3	19.8	32.6
4	48.8	81.4
5	18.6	100

Source: Survey data (2013)

In Table 21 it is shown that 48.8 percent of the households diversified income into four sources of income and 18.6 percent where diversified into on five sources on incomes which included farming, old age pension, child support grant, trading and remittances. About 4 percent of the household relied only on one source of income.

Table 22 shows the distribution of NIS per capita. The first column represents the number of household members in the sample. In comparison with other households, households with highest number of members did not diversify income. This could be because the household members are children below the 15 years of age (school going age). His households also had a lowest NIS per capita. As expected, households which relied on 4 or 5 sources of income had the highest NIS per capita.

Table 22: Distribution of household by Number of Income Sources per capita

Number of household members	Number of Income Sources (NIS)	Per capita NIS
2	2	1.0
3	4	1.3
4	5	1.3
5	4	0.8
6	4	0.7
7	3	0.4
8	2	0.3
9	3	0.3
10	2	0.2
11	1	0.1
12	3	0.3
13	1	0.1
14	1	0.1
TOTAL		

Source: Survey data (2013)

Income diversification measured using NIS in the Shatale region revealed that some households with more members relied on one source of income whilst household with few members could have more than one source of income. Consequently, there seems to be no clear relationship between the number of household members and the number of income sources in the household. A plausible explanation for these findings is that there are numerous factors which can influence sources of household income. For instance children who are deserving child support grant may not be receiving the grant as the guardians lacked information on where and how to register the children for grants. In addition, some households could have more means to earn an income than others regardless of the amount of labour available.

5.4 Summary

This chapter focused on empirical analysis of socio-economic factors influencing household participation and the amount of time allocated in agricultural production and on households diversification in the Shatale region. Double-hurdle model used and NIS reject the hypotheses which were stated. Gender of the household head, age of the household head, highest educational level of the head, occupation of the head, land size and access to irrigation water, access to extension services and farming experience were found to be significant factors influencing household labour participation in agricultural production. The second hypothesis which stated that there are no factors influencing the amount of time allocated in agricultural production was also rejected. Marital status of the head, number of children between 0 and 3 years, land size, access to water for irrigation and farming experience of the head were found to be significant factors influencing household participation in agricultural production. The third objective was also rejected because the use of NIS proved that majority of the household's diversified income into four sources.

Double hurdle model unlike standard tobit model has proven that household participation in agricultural production and the amount of time allocated are not influenced by the same socio-economic factors. Tobit model assumes that participation and the amount of time allocated are influenced by the same factors (Bedemo *et al.*, 2013). Number of Income Sources (NIS) was also appropriate in the analysis of income diversification however the available data could not be used to calculate the variation of incomes in the households.

CHAPTER 6

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter summarises the research findings and concludes based on empirical results. The chapter further discusses how the objectives and hypothesis stated at the beginning of the research were addressed. Recommendations based on the outcome of the research are also discussed in this chapter.

6.2 Summary

The aim of the research was to investigate factors affecting household participation in agricultural production. The study had three objectives. The first objective was to determine socio-economic factors influencing household labour participation in agricultural production. The second objective was to analyse socio-economic factors influencing the amount of time allocated to agricultural production and the third objective was to analyse household income diversification in the Shatale region of BLM. To achieve these objectives double-hurdle model which comprise of a probit and truncated regression model was used in the first two objectives. In the third objective, the Number of Income Sources (NIS) approach was used.

The research was conducted in Shatale region located in Bushbuckridge Local Municipality of Mpumalanga province. Total area of Bushbuckridge is 1025 078 ha and Shatale region covers the area of 34 445 ha. The region is divided into 4 wards; ward 7, ward 8, ward 11 and ward 13. A combination of multi-stage and random sampling was used to sample 86 households in ward 7 and ward 13. A structured questionnaire was used to elicit household characteristics, assets ownership and employment information.

A Statistical package called STATA (version 12) was used to analyse objective 1 and 2. Objective 3 was analysed using descriptive statistics since it is a one dimensional measure involving counting the number of income sources (Zhao and Barry. 2013). Three hypotheses were made in the study, the first hypothesis stated that there are no socio-economic factors influencing household labour allocation in agricultural

production, the second hypothesis stated that there are no socio-economic factors influencing the amount of time allocation in agricultural production and the third hypothesis stated that there is no household income diversification in the Shatale region.

Descriptive statistics revealed that household heads in the early adulthood age group participated in agriculture than those in the middle adulthood and late adulthood age group. The plausible reason for these disparities in age groups was that those in the early adulthood still shuttle between jobs. Farming experience also played an important role because household in the early adulthood have little experience in agricultural production. A majority of households involved in agriculture were leaving together or married signifying that they have many mouths to feed. The descriptive results also showed that the sampled households possess an average of 3 hectares of land. Thus scarcity of arable land is a barrier for some households to get involved in agricultural production.

From the first hurdle 8 out of 17 variables were significant. Variables which were significant and had a positive coefficient were age of the household head and land size. Variables which were significant and had a negative coefficient were gender of the household head, highest educational level of the head, occupation of the household head, access to irrigation water, access to extension services and farming experience. The signs of the coefficient of these variables were consistence with the existing literature. The likelihood of household's to participate in agricultural production increased by 40.6 percent for households in the middle adulthood and late adulthood age group. Land size of the households increased the likelihood of household to participate in agricultural production. Negative sign of farming experience was inconsistence with literature. The plausible explanation is that older farmers with many years of farming experience are not able to produce as much as young household heads. . Results from this hurdle also showed that the likelihood of household's participation in agricultural production decreases for households with post metric diploma or certificate. Shortage of water resources also decreases household participation in farming.

The second hurdle showed that 5 out of 10 variables which were selected were significant. Variable which were significant and had a positive coefficient were land

size and farming experience. Variable which were significant and had a negative coefficient were marital status of the household head, irrigation water and children between 0 and 3 years. An increase in land size by 1 hectare increases the amount of time allocated to agricultural production. An increase in farming experience also increases the amount of time allocated to agricultural production. Being married decreases the amount of time allocated to agricultural production. Number of children between 0 and 3 years also decreased the amount of time allocated to farming. A majority of households (48.8%) diversified income into four sources in the region. About 3.5 percent of the households did not diversify income and only relied on one source of income.

6.3 Conclusion

In conclusion, the study intended to address three hypotheses. The first hypothesis stated that there are no socio-economic factors influencing household participation in agricultural production in the Shatale region of BLM. Analysis using the double hurdle model showed that agricultural production is influenced by gender of household head, age of household head, education of the household head, occupation of the head, land size, irrigation water and farming experience. Thus this hypothesis was rejected.

Double hurdle model also revealed that marital status of the household head, children between 0 and 3 years, land size, irrigation water and farming experience influenced the amount of time allocated in agricultural production. Based on this, the second hypothesis which stated that there are no socio-economic factors influencing the amount of time allocated to agricultural production in the Shatale region of BLM was also rejected.

These findings show that indeed there are socio-economic factors influencing agricultural production and time allocation at household level. Assets such as land size were positive significant in both the first hurdle and second hurdle. The implications of this finding were that access to land increases the amount of time allocated to agricultural production by the households which decide to supply labour in agriculture. It was also discovered that participation of female in agricultural production in the Shatale region can be enhanced through provision of inputs; this is

because male household heads have comparative advantage in off-farm activities than female. It is possible that these findings about gender dimensions in labour supply between off-farm employment and farm employment may also be found in other areas beyond the areas of BLM. The age group which participated frequently in agriculture was in the middle-adulthood age-group and late adulthood age-group, those in the early adulthood participated in frequently in off-farm.

The last hypothesis which stated that there is no household income diversification in the Shatale region of BLM was also rejected. NIS showed that a majority (48.8%) of the households relied on more than one source of income except about 3.5 percent of households which relied on one sources of income. The household's sources of income included farming, child support, grants, old age pension, trading and remittances. The implications of this finding are that household's livelihood activities increases so as to avoid risk emanating from reliance on one source of income.

6.4 Recommendations

The research revealed that households in Shatale region diversify livelihood activities into agricultural and non-agricultural activities and in the process, there are factors affecting the level of participation in agricultural production and the amount of time allocated in agriculture. Based on the findings of this research the following recommendations are made.

- **Encourage participation in agriculture for households in early adulthood age group**

Evidence from this study showed that participants in agricultural production were mostly in the middle and late adulthood age group and household head in the early adulthood age group participated least in agricultural production. To encourage agricultural development, government through its programmes need to targets this group of households. One way which government can influence this household to have an interest in agriculture is by supporting participants in the middle and late adulthood so that those in the early adulthood can realise value in agriculture and start participating.

- **Supporting women participation in agriculture**

Gender of the household head was found to be negative significant. This illustrated that participation in farming decreases if the household heads are male. This was

understandable since male household heads have comparative advantage of finding employment off-farm over female household head. To achieve economic development, the study recommends that women involved in agricultural production must be supported through existing projects from Department of Agriculture, Rural Development and Land Administration such as Masibuyele Emasimini. This is because when women are left behind when husbands migrate to off-farm employment they can perform other household's activities while also participating in agriculture.

- **Provision of land**

Agricultural land size plays an important role in a household's decision to participate in agricultural production. It was revealed land endowment in Shatale region increases the likelihood of participation and the amount of time allocated in agricultural production. A Majority of the households also added that they can expand production if they can have more land and some reported that they are willing to participate but they do not have land. Land must be distributed to those household which are farming on small portions of land these households will be able to expand production and increase hiring. The unemployed community members can also benefit from such support.

- **Capacitate farming households**

Programmes that are aimed at improving small-scale agriculture such as land reform policies and Comprehensive Agricultural Support Programme (CASP) should be directed at helping farming households which do not have other resources except land. Farming households are discourages to participate in agriculture because they lack resources such as seeds. By doing so, households which have shown an interest in farming will be supported. Hall (2009) as quoted by Cousins (2009) also suggested that rural development must support both food production by the poor and promote rural entrepreneurs who engage in 'accumulation form below'. These are smallholder farmers who engage in farming without prior support which comes from government programmes.

- **Infrastructure development**

Distance to the tarmac road was one of the factors which positively influenced agricultural production because farming households were located in rural areas

where there were no proper roads. Government policies should concentrate on improving road conditions in rural areas because this challenge is experienced by many farming households not only in Shatale region. Transportation of crops to markets will be made simple and this can encourage farmers to expand production.

- **Increasing access of extension service**

Extension service is one of the variables which were negative significant to household participation in agricultural production. The local department of agriculture must ensure that farming household are supported with crop production knowledge to expand production. Their support will encourage household participation and reduce poverty in the region.

- **Increasing access of water resource for irrigation.**

Access to water for irrigation had a negative and significant coefficient meaning that shortage of this resource decreases the level of participation in agricultural production. To support agricultural production in the Shatale region, government should create canal network which will distribute water to household farming in the communal land. Water to flow in the canals can be sourced from the rivers in the area and the surrounding.

6.5 Areas for further research

The study focused on analysis of factors influencing two decisions at household level, these are factors influencing participation and the amount of time in agricultural production. This study used a sampled on 86 households from two wards which were randomly selected, the same study can be conducted with larger sample size. To list a few, other studies can be conducted which look at the agricultural productivity of households farming in communal land in the region for certain crops. The NIS method which was used to measure income diversification has not accounted for variation in incomes received from different sources. In addition to NIS method, other studies can used the inverse of herfindahl index, Shannon diversity index and Simpson index to account for variation in incomes received from different sources.

REFERENCES

Abdulai, A. and Delgado, C. (1999) 'Determinants of nonfarm earnings of farm-
based husbands and wives in northern Ghana', *American Journal of Agricultural Economics*, pp.1-16.

Altman, M, Hart, T, and Jacops, P. (2009) 'Household food security status in South
Africa', *Agrekon*, 48 (4), pp. 346-361.

Adenoyu, A.G. (2012) 'Gender dimensions of time allocation of rural farming
household in southwest Nigeria' *Current Research Journal of Social Sciences,*
4 (4), pp. 269-276.

Adebayo, C.O, Akogwu, G.O and Yisa, E.S. (2012) 'Determinants of income
diversification among farm households in Kaduna State: Application of Tobit
regression model'. *Production Agriculture and technology journal*, 8 (2), pp.1-
10

Aliber, M. and Hart, T.G.B. (2009) 'Should subsistence agriculture be supported as
strategy to address rural food insecurity?.' *Agrekon*, 48 (4), pp. 434-458.

Aliber, M., Baiphethi, M., and Jacobs, P (2009) 'Agricultural employment scenarios'.
In: Hall, R. eds. Another countryside?. Cape Town. Institute for Poverty, Land
and Agrarian Studies.

Anderson, A.S. (2002) 'The effect of cash cropping, credit, and household
composition on household food security in southern Malawi'. *African studies
quarterly*, 6 (1 &2), pp. 175-201.

Anim, F.D.K. (2011) 'Factors affecting Rural Household Farm labour supply in
farming communities of South Africa', *Journal of Human Ecology*, 34 (1), pp.
23-28.

Aristei, P. and Pieroni, L. (2008), 'A double-hurdle approach to modelling tobacco consumption in Italy', *Applied Economics*, 40.pp. 2463-2476

Babatunde, R.O. and Qaim, M. (2010a) 'Impact of off-farm income on food security and Nutrition in Nigeria: Food security in Nigeria' '. Cape Town, 19-23 September. South Africa: Agricultural Association of Agricultural Economist, pp. 1-30.

Babatunde, R.O. and Qaim, M. (2009) 'Patterns of income diversification in rural Nigeria: Determinants and impacts', *Quarterly Journal of International Agriculture*, 4, pp. 305-320.

Babatunde, R.O. and Qaim, M. (2010b) 'Off-farm labor market participation in rural Nigeria: Driving forces and household access'. 5th IZA/World bank conference. Cape Town, 03-04 May. South Africa, pp. 1-28.

Baganda, F, Burger, K. and Kuyvahoen, A. (2009) Determinant of smallholder farmer labour allocation decisions in Uganda. *European Association of Agricultural Economist.* Uganda, January 2007: IFPRI. pp. 1-32.

Barrett, C. B, Reardon, T., and Webb, P. (2001) 'Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications'. *Food policy*, *26*(4), pp. 315-331.

Bedemo, A, Getnet, K, Kassa, B. and Chaurasia, S.P.R. (2013) 'Off-farm labor supply decision of adults in rural Ethiopia: Double hurdle approach', *Journal of Agricultural Economics and Development.* 2 (4), pp. 154-165.

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

Bilisuma, B.D. (2012) 'Intra household labour supply, Agricultural shocks and Women's bargaining power in Rural Ethiopia' DIAL development conference: Shocks in developing countries. Paris, 30 June -1 July. Paris, pp.1-39.

Brown, L. (2012) 'Facilitating the participation of young people in rural development through agriculture: the case of asparagus production**,** Unpublished brief.

Bushbuckridge IDP document. (2010) *Integrated Development Plan 2011-2016.*

Bushbuckridge LED document. (2010) *Local economic development strategy 2010-2014.*

Bushbuckridge SDF document. (2010) *Spatial Development Framework 2010-2011*

Bureau for Food and Agricultural Policy (2012) *Farm sectoral determination: An analysis of agricultural wages in South Africa.* Pretoria: Bureau for Food and Agricultural, Food and Rural Development.

Cassell, M. (2012) 'Africa agriculture review'. *African Agriculture review*, 1 (4), pp. 1-29.

Coetzee, G. and Machethe, C. (2011) 'The status of agricultural and rural finance in Southern Africa'. Pretoria: Centre for Inclusive Banking in Africa.

Cooke, P.A. (1998) 'The effect of environmental good scarcity on own-farm labor allocation: the case of agricultural households in rural Nepal'. *Environmental and Developmental Economics*, 3, pp. 443-469.

Cousins, B. (2009) 'Class-analytic perspectives on small-scale farming and agrarian reform in South Africa'. *Working paper*. Poverty, Land and Agrarian Studies.

Cragg, J. G. (1971) 'Some Statistical Models for Limited Dependent Variables with

Application to the Demand for Durable Goods'. *Econometrica,* 39(5), pp. 829-844.

Crush, J. Hovorka, A and Tevera, D. (2010 'Urban food production and household food security in Southern African Cities." Urban Food Security Series 4. Kingston and Cape Town. Queen's University and AFSUN

Dagsvik, J and Aaberge R (1991) 'Household production, consumption and time allocation in Peru' Discussion paper. Noway: Central Bereau of Statistics

Daniel, J. (2012) *Sampling essentials: Practical Guideline for Making Sampling Choices.* London (UK): SAGE Publication

Department of Agriculture, Forestry and Fisheries. (2011a) *Agricultural productivity in South Africa, literature review.* Agricultural Production Unit, National Government, South Africa.

Department of Provincial and Local Government (2005) *'Bushbuckridge nodal economic development profile'.* Bushbuckridge Business Trust. Available at: http://www.btrust.org.za/library/assets/uploads/documents/1_CIPPN_Bushbuckridge%20profile.PDF

Department of Agriculture. (2008) 'Policy reform and off-farm labor supply by operators in the Delta Region: A semiparametric approach'. USA: Economic Research Service. Available at: http://ideas.repec.org/p/ags/saeaed/6725.html

Department of Higher Education and Training (2010) 'Sector Analysis agriculture'.

South Africa : AgriSETA. Available at:

http://www.agriseta.co.za/downloads/news/AGRISETA_Sector_Analysis_290610-version_2.pdf (Accessed 13 April 2014)

Draper, P, Kiratu, S and Hichert, T. (2009) 'How might agriculture develop in

Southern Africa'. International Institute for sustainable Development (IISD).

Du Plessis, M. (2010) 'Agriculture: facts and trends South Africa'. World Wild Fund-

South Africa (WWF-SA).

Ehlanzeni IDP document. (2012) Integrated Development strategy 2012-2016

Emerole, C.O. (2012) 'Gender issues in gaps of household labour supplied to farms

and labour market in rural Abia state, Nigeria'. *Journal of agriculture and
social Research*, 12 (1), pp. 39-47.

Ersado, L. (2003) 'Income diversification in Zimbabwe: Welfare implications from

urban and rural areas'. FCN Discussion paper 152. Washington, DC:
International Food Policy Research Institute.

Fan, S, Brzeska, J, Keyzer, M and Halsema, A. (2013) 'From Subsistence to profit:
Transforming smallholder farms. International Food Policy Research Institute
(IFPRI)

Fausat, A.F. (2012) Income diversification determinants among farming household in

Konduga, Borno state, Nigeria. *Academic Research International.* 2(1), pp.
555-561.

Food and Agriculture Organization (2010) *The state of food and agriculture 2010-2011: Women in Agriculture.* Food and Agriculture Organization.

Forum for Agricultural Research in Africa (2006) *Framework for African Agricultural Productivity*. Ghana: Forum for Agricultural Research in Africa.

Gao, X.M, Wailes, E.J. and Cramer, G.L. (1995) 'Double hurdle model with bavariate normal errors: An application to U.S rice demand'. *Southern Agricultural Economics Association,* 27 (2),pp. 363-376.

Ghadim, A.A, Burton, M. and Pannel, D. (1999) More empirical evidence on the adoption of chick peas in Western Australia or Different ways of thinking about nothing, *43rd Annual Conference of the Australian Agricultural and Resource Economics Society*, Christchurch, New Zealand, 20-22 January 1999

Gilimani, B.M. (2005) 'The economic contribution of home production for home consumption in South African agriculture'. Unpublished master's thesis. University of Stellenbosch.

Gujarati, D.N and Porter, D.C (2009) Basic econometrics 5th international edition. Singapore: McGraw-Hill Higher Education.

Gurven, M. and Kaplan, H. (2004) 'Determinants of time allocation across the lifespan', *Human Nature*, 17 (1), pp. 1-49.

Hall, R. (2009) 'Dynamics in the commercial farming sector'. In: Hall, R. eds. Another country side?. Cape Town. Institute for Poverty, Land and Agrarian Studies.

Hendriks, S. (2003). 'The potential for nutritional benefits from increased agricultural

production in rural KwaZulu-Natal'. *South African Journal of Agricultural Extension,* 32, pp. 28-44.

Ilahi, N (2000) 'The Intra-household allocation of time and tasks: What have we learnet from the empirical literature?'. Working Paper Series No. 13. World bank: Gender and development.

Kamau, M.W, Burger, K, Giller K, and kuyvenhoven, A (2009) 'Labour markets and labour allocative efficiency among farm households in western Kenya'. *African Journal of Resource Economics,*3 (2). pp.144-158.

Kgosiemang, D.T and Oladele, O.I. (2012) 'Factors affecting farmers' participation in agricultural projects in Mkhondo Municipality of Mpumalanga Province, South Africa'. *Journal of Human Ecology*, 37 (1), pp.19-27.

Louw, A. and Ndanga, L.Z.B. (2010) 'Importance of sustainability on agriculture in southern Africa'. 3rd African Association of Agricultural Economists (AAAE) and 48th Agricultural Economists of South Africa (AEASA) conference. Cape Town, 19-23 September.

Machethe, C.L. (2004) 'Agriculture and poverty in South Africa: can agriculture reduce poverty?', Overcoming Underdevelopment Conference, 28-29 October. pp. 1-14.

MacNamara, K.T and Weiss, C. (2005) 'Farm household income and on-and off-farm diversification'. *Journal of Agricultural economics*, 37 (1), pp. 37-48

Mathivha, O. (2012) 'Current and Emerging Youth Policies and Initiatives with a Special Focus on Links to Agriculture. South African Case Study Draft Report': Food Agriculture and Natural Resources Policy Analysis Network (FANRPAN)

Matshe, I. and Young, T. (2004) 'Off-farm labour allocation decisions in small-scale

rural households in Zimbabwe'. *Agricultural Economic Journal*, 30, pp. 175-186.

McCarthy, N and Sun, Y (2009) 'Participation by Men and Women in Off-Farm Activities: An Empirical Analysis in Rural Northern Ghana'. IFPRI Discussion Paper 00852. International food policy institute. Washington, DC.

Minot, N, Epprecht, M, Anh,T.T.T and Trung,L.Q. (2006) 'Income diversification and poverty in the northern unplands of Vietman. Research report 145. International Food Policy Research Institute (IFPRI). Washington, DC.

Muchopa C, Manyong, V and Sibanda, L. (2004) 'Agricultural policy priorities for improving rural livelihoods in Southern Africa. Harare': Food Agriculture Natural Resources Policy Analysis Network (FANRPAN).

Nagler, J. (2002) 'Interpreting Probit Analysis'. New York University. Webpage: http://www.nyu.edu/classes/nagler/quant1/probit1_post.pdf. Accessed 17 July, 2012.

Nel, E.L and Davies, J. (1999) 'Farming against the odds: Facing farming and rural development in the Eastern Cape province of South Africa'. *Applied Geography*, 19 (3), pp. 253-274.

Nel, G.P. and Nel, E.J. (2009) *Description of the natural environment and biodiversity impact assessment of the planned Vele colliery. Dubel:* Integrated environment services

Olujenyo, F.O. (2008) The determinants of agricultural production and profitability in Akoko land, Ondo-State, Nigeria. *Journal of Social Sciences.*4 (1). pp. 37-41.

Quattri, M, Ozanee, A, and Tamru, S (2012) 'The brokerage institution and the development of agricultural markets: New evidence from Ethopia'. *Working paper* 36. International Food Policy Research Institute (IFPRI) and Ethiopian Development Research Institute (EDRI).

Parsad, R and Sanju P.S (1998) *Data Analysis in Social sciences research using SAS*. Available at: http://www.iasri.res.in/sscnars/content_social.htm [Downloaded: 12 November 2014]

Phelan,W, Ware, T and Shek, H (2010) 'PayNet AbsolutePD Model'. PayNet Incorporation

Raney, T, Anri`quez, G, Croppenstedt, A, Genora, S, Lowder, S, Matuscke, I, Skoet J and Doss, C. (2011) 'The role of women in agriculture'. Food and Agriculture Organization, ESA working paper No. 11-02

Schwarze, S and Zeller, M. (2005) 'Income diversification of rural households in Central Sulawesi, Indonesia'. *Quarterly Journal of international agriculture*, 44 (1), pp. 61-73

Sekei, G., Odhiambo, M.O. and Olwande, J. (2009) 'Labour allocation patterns of rural households to agriculture and forest activities in Kakamega district, Western Kenya'. In-*international Association of Agricultural Economists conference*. Beijing, Thursday 16th to Wednesday 22th august 2009. China. pp. 1-18.

Southern Africa Trust (2009) 'How boosting smallholder farming can ease hunger and reduce poverty at the household level in Southern Africa. South Africa Trust.

South Africa Trust and IDASA. (2011) 'Can smallholder farmers address hunger in the region? Public Dialogue report'. South Africa Trust and IDASA

Statistics South Africa. (2011a) Census Regional Boundary. Geographical Information Systems. Pretoria, South Africa

Statistics South Africa. (2011b) South African National Census. Pretoria, South Africa

Thornton, R. (2002) 'Environment and Land in Bushbuckridge, South Africa'. University of the Witwatersrand. Unpublished project

Tijani, B.A, Benisheik, K.M, Mustapha, A.B. and Danaladima, W. (2010) 'Analysis of factors influencing labour supplied to non-farm sub-sector by households in mubi North Local Government area of Adamawa state, Nigeria'. *Nigerian Journal of Basic and Applied Science*, 18 (1). pp. 35-43.

Tologbonse, E.B, Jibrin M.M, Auta, S.J and Damisa, M.A. (2013) 'Factors influencing women participation in Women In Agriculture (WIA) Programme of Kaduna State Agricultural Development Project, Nigeria. *International Journal of Agricultural Economics and Extension*. 1 (7), pp. 47-54

Toluwase, S.O.W. and Apata, O.M. (2013) 'Impacts of farmers' cooperative on agricultural productivity in Ekiti state, Nigeria'. *Greener Journal of Agricultural Sciences*. 3 (1). pp. 63-67.

Van Averbeke, W. and Khosa, T.B. (2006) 'The contribution of smallholder agriculture to the nutrition of rural households in a semi-arid environment in South Africa'. University of Pretoria, 19-20 September. South Africa, pp. 413-418.

Van de Walle, D and Mu, R (2006). 'Left behind to farm? Women's labour re-allocation in rural allocation in rural china'. World Bank: Washington, DC.

Weir, S. (1999) 'The Effects of Education on Farmer Productivity in Rural Ethiopia'. Report no. WPS99-7. Centre for the Study of African Economies, Oxford University.

Wenhold, F, Faber, M, Averbeke, W, Oelefse, A, Jaarsveld, P, Rensburg, W.S.J, Heerden, I. and Slabbert, R. (2007) 'Linking smallholder agriculture and water to household food security and nutrition'. *Water SA,* 33 (3), pp. 327-336.

Whiteside, M. (1998). *Encouraging sustainable smallholder agriculture in southern Africa in the context of agricultural services reform*. Overseas Development Institute

World Economic Forum (2014) 'Global risks, Ninth edition' 2014'.Cologny/Geneva. World Economic Forum (WEF).

Wyne Group Handbook. (2007) 'Rural households livelihood and well-being: Statistics on rural development and agriculture household income'. United Nations, New York and Geneva

Yemisi, I.O. and Makhtar, A.A. (2009) 'Gender Issues in Agriculture and Rural Development in Nigeria: The role of Women'. *Humanity and Social Sciences Journal*, 4(1), pp. 19-30.

Yen, S.T. and Huang, C.L. (1996) 'Household demand for finfish: A generalized double hurdle model'. *Journal of agricultural and resource economics*, 21 (2), pp. 220-234.

Zhang, F, Chung, L.H. and Lin, B. (2006) '*Modelling fresh organic produce consumption: A generalized double-hurdle model approach'*, Ph.D. student. University of Georgia: Unpublished group project.

Zhao, J. and Barry, P.J. (2013) 'Implications of different income diversification indexes: the case of rural China', *Economics and Business letters*, 2(3),pp.13-20

APPEDICES

Appendices 1: Questionnaire

HOUSEHOLD STRUCTURED QUESTIONNAIRE

DETERMINANTS OF HOUSEHOLD PARTICIPATION IN AGRICULTURAL PRODUCTION IN SHATALE REGION OF THE BUSHBUCKRIDGE LOCAL MUNICIPALITY. MPUMALANGA PROVINCE

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INTERVIEWER INSTRUCTIONS

- Household head of the farming household will be interviewed

- If the household head is a member of the cooperative. all the members of that cooperative can be interviewed separately.

PURPOSE OF THE SURVEY

The purpose of the questionnaire is to elicit necessary information in the households which will be used in the analysis of determinants of household labour participation in agricultural production and the amount of time allocated to agricultural production. The information will also be used in understanding household income diversification in the Shatale Region.

CONFIDENTIALITY

Herewith it is guaranteed that any information obtained from this survey will be treated with strict confidentiality. The data will be used for research purposes only.

Name of the respondent	
Date of the interviews	
Ward number	
Name of the village	

A. Individual and Household Characteristics

A.1 Gender of the household head?

Female		0	Male		1

A.2 Age group of the household head?

Early adulthood (18-39)	Middle adulthood (40-60)	Late adulthood (over 60)
0	1	2

A.3 Marital status of the household head?

Single	Married	Divorced	Widowed	Living together
0	1	2	3	4

A.4 Number of household members:

Infants(Birth to 3 years)	Children (3 to 18 years)	Adult (over 18)	**Total number**

A.5 Highest educational level attained by the household head:

Below metric	Metric (Grade 12 or Standard 10)	Post-Metric Diploma or certificate	Baccalaureate Degree(s)	Post- Graduate Degree(s)
0	1	2	3	4

A.6 Highest educational level of other members in the household:

Level of education	Below metric	Metric (Grade 12 or	Post-Metric Diploma or	Baccalaureate Degree(s)	Post- Graduate Degree(s)

		Standard 10)	certificate		
Female					
Male					

A.7 Occupation of the household head:

Farmer	Non-farm employment	off-farm self-employment	Unemployed
0	1	3	4

B. **FARM CHARACTERISTICS. OFF-FARM EMPLOYMENT AND INSTITUTIONAL SUPPORT**

B.1 Do you have access to land for farming?

Yes	1	No	2

B.2 If "yes" how many plots and how many hectares is each plot?

Number of plots	Size of each plot (hectares)					**Total (ha)**

B.3 What are using the land for?

Cropping	Livestock grazing	Lease	Other (Specify)

B.4 Do you own the following productive assets used in farming?

Asset		Quantity/Number
1. Hand hoe	0	

2. Plough	1	
3. Wheelbarrow	2	
4. Sledge	3	
5. Trailer/cart	4	
6. Tractor	5	
7. Bakkie, lorry and truck	6	
8. Water storage	7	
9. Irrigation equipment	8	
10. None	9	
11. Other (specify)	10	

B.5 Are you a member of an agricultural co-operation?

Yes		No	

B.6 How many hours do you spend weekly working in the farm?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	**Total hours**

B.7 How long have you been involved in farming? _____ (years)

B.8 How many hours do you spend weekly in your occupation (A.7)?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	**Total hours**

B.9 How many members in the household work in the farm?

Female		Male		**Total members**	

B.10 How many hours do they spend weekly in the farm?

Gender	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Female							
Male							

B.11 Did any of the household members fail to work in the farm last season due to health problems?

Yes		No	

B.12 If "yes" to B.11. how many members?

Female		Male		**Total members**	

B.13 Do you hire farm labour?

Yes		No	

B.14 If "yes" to B.13 how many labour?

Female		Male		**Total members**	

B.15 Do you have access to water for irrigation?

Yes		No	

B. 16 Do you receive extension service from the local department of agriculture?

Yes		No	

B.17 Do you have access of information from any of the following information sources?

Extension officers	Newspapers	Internet	Radio	Other (specify)	No
0	1	2	3	4	5

B.18 Do you have access to credit?

Yes		No	

B. 19 How many members in the household having off-farm employment?

Female		Male		**Total members**	

B.20 How many hours do they spend in off-farm employment?

Gender	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total hours
Male								
Female								

B.21 How many members in the household who are attending school?

Primary school	Secondary or high school	college	other	**Total members**

B. 22Do you have access to good quality road and bridges?

Yes	1	No	2

B. 23 How many kilometres do you travel to the tarmac road?

Less than 1Km	1Km to 2Km	2Km to 3Km	More than 4Km
0	1	2	3

C. HOUSEHOLD INCOME SOURCES

C.1 How much is the monthly salary from the occupation in A.7?

R 100-1000	Above R1000-R 2000	Above 2000-3000	Above R 3000-4000	Above R 4000
0	1	2	3	4

C.2 Sources of income

Farming	Pension	Child support grant	Remittances	Trading	Other (Specify)
0	1	2	3	4	5

C.3 How much is the monthly income from sources above?

R 100-1000	Above R1000-R 2000	Above 2000-3000	Above R 3000-4000	Above R 4000
0	1	2	3	4

C.4 Which of the following self-employment activities are you participating in?

Building Houses	Selling Agricultural products	Selling non-agricultural Products	Garde ning	Recycli ng	Tradition al healer	Sewing	Other	Not partici pating
0	1	2	3	4	5	6	7	8

Thank you for your cooperation…………May the Almighty richly blesses you!