Changes in the age and gender composition of agricultural participation in Zambia: implications for economic policy

By

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DECLARATION

I hereby declare that this dissertation which I submit for the degree of MSc Agric (Agricultural Economics) at the University of Pretoria is my own work and it has not been previously submitted by me for a degree at this or any other institution of higher learning.

Signature: …….

Date: ……..

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CHANGES IN THE AGE AND GENDER COMPOSITION OF AGRICULTURAL PARTICIPATION IN ZAMBIA: IMPLICATIONS FOR ECONOMIC POLICY

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ABSTRACT

Young people in the rural areas not wanting to be engaged in farming activities may leave the rural population, hence changing the age structure of rural areas. Because most migrants are men, rural-urban migration may leave a rural population that is dominated by women who engage primarily in agriculture. An old aged and female dominant rural agriculture may have serious implications for the viability of prevailing national agricultural strategies, most of which are still predicated on a smallholder-led development. However, there is little empirical evidence to date on the rate at which young men are leaving rural areas and changing the demographic composition of rural and urban areas or the agricultural labour force in particular. This study considers the changes in the age and gender composition of agricultural participation in Zambia using pooled cross sectional data from the Living Conditions Monitoring Survey (LCMS) which is conducted every two years by the Central Statistical Office (CSO) in Zambia. The years of LCMS datasets used in this study are 1998, 2004, 2006 and 2010. The LCMS is a nationally representative dataset covering all 72 districts of Zambia. It covers both the rural and the urban areas of Zambia.

Analysis of data using descriptive and econometric methods resulted in certain important findings regarding age and gender composition in agriculture. Results showed that over the years covered in the study, the mean age has remained roughly constant in both rural and urban areas for both men and women. The mean age has been around 34 years and 31 years for the rural and urban population respectively. Results further showed that the rural farming

population is indeed aging over time with the mean age rising from 36.5 years in 1998 to 40.4 years in 2010 for a man primarily engaged in farming. The mean age of a woman primarily engaged in farming has also increased over time.

Plausible reasons for this could be that young people are moving out of agriculture because of lack of interest in it or because the older people are moving out of farming at a slow pace hence young people are forced to look for alternative sources of livelihood. From this, it can also be concluded that the young people who might be moving out from agriculture are not all going to the urban areas but might be staying in the rural areas and maybe working in non-agricultural activities.

However, the rural farming population is not becoming female dominated. More males are now participating in agriculture with an increase in the share of males from 47 percent in 1998 to 53 percent in 2010 possibly due to retrenchment of miners and public sector employees during the structural adjustment period. Young people are less likely to stay in the rural areas and are also less likely to be engaged in agricultural activities compared to older persons. Men were 4.6 percent more likely than women to be located in the rural areas. Men were also 3.9 percent more likely than women to be engaged in farming over the years covered by the study. Men had a higher probability of being engaged in wage employment in the urban areas compared to women over the years covered by the study.

Being male compared to being female was found to be positively associated with youth participation in farming while level of education and being engaged in wage employment were negatively associated with youth participation in farming. Young men were 11.6 percent more likely to be engaged in farming than young women over the years covered by the study which is contrary to the conventional wisdom. Being engaged in wage employment reduced the likelihood of youth participation in farming by 25 percent over the years covered by the study. Available farming land and access to credit for agricultural inputs increased the likelihood of female participation in agriculture. This implies that female participation in agriculture can be enhanced by improved access to land and credit.

The implication of an increasing elderly agricultural labour force may need the government to consider the viability of existing agricultural, rural development, and land strategies if the present population trends continue.

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LIST OF ABBREVIATIONS

CAADP	Comprehensive Africa Agriculture Development Programme
CSA	Census Supervisory Areas
CSO	Central statistical office
FISP	Fertilizer Input Support Programme
FRA	Food Reserve Agency
LCMS	Living Conditions Monitoring Survey
SEA	Standard Enumeration Area
SSA	Sub-Saharan Africa

CHAPTER ONE

INTRODUCTION

1.1 Background

Africa is experiencing major demographic change associated with its "youth bulge" (Zille & Benjamin, 2011). Demographic changes profoundly affect the age structure of the population. For example, much of Africa is experiencing declining mortality rates associated with improved health and nutrition, which cause the share of children in a population to increase due to the high survival rates of children (first stage). The lower mortality rates tend to result in lower fertility rates over time, causing an increase in the proportion of working adults compared to the proportion of children and the elderly persons (second stage). Twenty to thirty years after this, the share of the elderly will then start to increase with the proportion of the working adults and the children decreasing (third stage). Asia and Latin America are experiencing the second stage of the demographic transition, while Europe is in the third stage. Africa is only starting its journey into the second stage (United Nations, 2005).

The demographic dividend which is used to describe the second stage of the demographic transition brings with it potential young workers in the population who can take a country towards the goal of economic growth and an increase in the standards of living (United Nations, 2005). It has been projected that in Sub-Saharan Africa (SSA), there will be 330 million young people entering the labour market by 2025 of which 200 million will come from the rural areas (Losch, 2012). Agriculture provides an employment opportunity for the young people as non-farm sectors will clearly not be able to employ all of them (Brooks *et al.*, 2013; Filmer *et al.*, 2014).

Certain demographic trends in the rural areas, such as an aging and female dominated agricultural labour force, may bring some major challenges (Anriquez & Bonomi, 2008), and they may also induce certain changes in farming systems and choice of technology following the 'induced innovation hypothesis' of Hayami and Ruttan (1970). However, anticipating these potential developments must first be based on a solid empirical foundation of demographic trends and shifts in rural Africa.

Mangal (2009) found that in the three islands of Barbados, Grenada and Saint Lucia, the average age of persons involved in farming was over 55 years old. It has been assumed that the primary cause of an aging population involved in agriculture comes from the fact that young rural people migrate from the rural areas to the urban areas (Sumberg, 2014). This may be happening because young people are in search of higher incomes than what they can get from practicing agriculture in the rural areas. A study done by Huang (2012) showed that numbers of young people leaving agriculture to go and work in non-agricultural jobs was also on the rise in China as agriculture is seen as a low paying career.

A female dominated community is also considered a problem for agricultural development (Anriquez & Bonomi, 2008). For example, China is a country that has experienced feminization in agriculture (Huang, 2012). Bezu and Holden (2014) found that farm size was negatively associated with young people choosing a livelihood other than farming while being female, currently studying, and number of years of schooling completed was positively associated with choosing a livelihood other than faming. However, beside the somewhat dated study of Anriquez and Bonomi (2008), there has been a dearth of evidence presented on the demographic shifts over time in Sub-Saharan Africa.

One source of employment for the rural young people is farm establishment which would generate a source of income (Losch, 2012). But young people can face certain constraints such as lack of skills, capital and land availability (Mangal, 2009; Brooks *et al.*, 2013; Filmer *et al.*, 2013).

Available land is one way in which young people can participate in agriculture (Bezu & Holden, 2014). But young people are having difficulties in acquiring land due to old aged farmers moving out of agriculture at a slow pace (Brooks *et al.*, 2003). It was found in Malawi, Tanzania and Uganda that compared to the older people, the young people have lesser of a chance of owning land (Filmer *et al.*, 2014). Therefore, an improved strategy to access land is needed (Jayne *et al.*, 2014).

Agriculture will need to be as attractive as possible to the rural youth as agriculture is more suitable for the youth as they possess the attributes that agriculture needs such as health and physical strength (Brooks *et al.*, 2013).

1.2 Problem statement

Agricultural-led development has long been identified by African governments as fundamental for achieving food security and rural development in Africa (Govereh *et al.*, 2006). The Comprehensive Africa Agriculture Development Programme (CAADP) is one of the initiatives designed to offer agricultural-led development in Africa[1] (Karugia, 2013). Agriculture plays a role in economic development by meeting food demand, a source of capital, foreign exchange and a source of labour for the non-agricultural sector (Johnston & Mellor, 1961). An example of a country where economic development can be attributed to agriculture among others is Japan.

Agricultural growth in Zambia depends not only on smallholder farmers but also medium-scale emergent farmers and the promotion of farming blocks. The activities done by the Ministry of Agriculture and Livestock and the government national policy objectives still implicitly rely on a smallholder development path, not only for achieving national food security but also to reduce poverty. An increase in agricultural productivity by smallholder farmers is what can raise them out of poverty, induce multiplier effects that jump-start structural transformation processes, as it did in much of Asia and Latin America (Filmer *et al.*, 2014).

Expansion in agricultural production is one thing that Zambia has potential in given that the country has vast resources which include land, labour and water. The agricultural sector is seen as a driver for employment and income generation especially that over half of the Zambian population resides in the rural area (MACO, 2004). In order to increase productivity in agriculture there are certain developmental services that are needed (Johnston & Mellor, 1961). That is why one of the agricultural marketing strategies of Zambia is to provide a guaranteed input and output market for the smallholder farmers. For example, the reason for the introduction of the Fertilizer Input Support Programme (FISP) and the introduction of the Food Reserve Agency (FRA) is to help smallholder farmers[2]. Even with such efforts of the introduction of FISP and FRA, there has been a narrative about how young people do not want to be involved in farming and prefer to go to the cities which is causing rural areas to become much older and more female-dominated as young men leave looking for jobs in the

[1] The CAADP goal is to have a 6 percent annual growth rate in agriculture which can be attained by a 10 percent allocation of the national budget to agriculture (Chilonda *et.al.*, 2010).
[2] Zambia recorded a 6 percent growth rate in crop output between 2000 and 2011 because of the introduction of this subsidy program (Chilonda *et.al.*, 2013)

urban areas. If it is true that young rural people are leaving rural areas and do not want to be involved in agriculture, then such demographic changes may have important implications for the viability of agricultural strategies that are still predicated on a smallholder-led development.

In Zambia, anecdotal evidence suggests that agriculture in the rural areas is becoming female dominated and that the average age of agricultural workers and farmers is indeed increasing over time, has not really been tested empirically. This trend if empirically verified could have important implications for agricultural and broader economic development strategies in Zambia.

1.3 Objectives of the study

1.3.1 Overall objective

The overall objective of this study is to determine the likely demographic shifts that may be occurring in Zambia, to proactively anticipate their effects on Zambia's agricultural sector, and to consider the policy implications from these trends.

1.3.2 Specific objectives

i. To determine whether the average age of rural households in agriculture is aging over time, and if so, to determine the factors that are driving such trends.
ii. To determine whether the gender structure in rural agriculture is becoming more female dominated, and if so, to determine the factors that are driving such trends.

1.4 Hypothesis

The youth in the rural areas will always look for better opportunities through rural-urban migration (Zhang & Song, 2003) and will continue even if the levels of urban unemployment are high (Goldsmith et al. 2004). This may leave behind an agricultural population that is old aged and female dominated as the men leave. This study hypothesizes that men are more likely to leave the rural areas, women are more likely to remain in the rural areas and that the young rural people are more likely to migrate from the rural to urban areas.

1.5 Data sources and analysis

This study uses the Living Conditions Monitoring Survey (LCMS) datasets for Zambia for the years 1998, 2004, 2006 and 2010 which is a nationally representative dataset. The LCMS covers both the rural and urban areas of Zambia. Descriptive and econometric analysis was used in the study. Descriptive analysis involved comparing changes over time in the age and gender composition in Zambia. Econometric analysis which used the pooled probit model, was used to estimate the effect of gender and being young on living in the rural area, on farming, on being engaged in wage employment, living in the urban area and on being engaged in wage employment while living in the urban area.

1.6 Importance and benefits of the study

This study will provide knowledge as to what the actual situation on the ground is in terms of the age and gender composition in rural agriculture in Zambia. The results of the study would allow policy makers to have the necessary information on whether the youth are shifting out of agriculture, and whether it may be necessary (or not) to put in place policies so as to make agriculture more attractive and profitable for the rural youth. If agriculture is used as the main drive for development by the government, the youth in the rural areas need to be considered as a priority in agricultural production (Mangal, 2009) especially in this time when SSA is starting to experience the demographic dividend from which great benefits can be reaped from it.

1.7 Organisation of the dissertation

The remainder of this dissertation is organised as follows. Chapter two reviews the relevant literature on agricultural participation and its relation to age and gender composition, structural transformation and employment. Chapter three discusses the methods and procedures which includes the data and data sources, analytical framework and estimation strategy and description of variables used in the model. Chapter four presents the descriptive results pertaining to age and gender composition with the econometric results in chapter five. Conclusion and recommendations are finally presented in chapter six.

CHAPTER TWO

AGRICULTURAL PARTICIPATION AND ITS RELATION TO AGE AND GENDER COMPOSITION, STRUCTURAL TRANSFORMATION AND EMPLOYMENT

2.1 Introduction

An older and female-dominated agricultural system due to young men moving out of agriculture can be linked to the Harris and Todaro model which is a migration model for developing countries. The Harris-Todaro model posits that rural-urban migration will occur when a higher income is expected from working in the urban areas than working in the rural areas (Harris & Todaro, 1970). Using a two-sector model, one of the assumptions that were made was that so long as expected urban real income exceeded the real agricultural product, migration would take place from the rural area to the urban area. Harris and Todaro (1970) concluded that migration would cease only when the expected income differential is zero between the agricultural real wage and the expected urban wage as can be seen in the equation below.

$$W_A = W_u^{\varepsilon}$$

Where W_A is the agricultural real wage and W_u^{ε} is the expected urban wage.

The age and gender composition of agriculture is also well linked to broader structural transformation processes. If the returns to labour in agriculture are low, labour will migrate from farm to non-farm sectors in search of better employment opportunities. Young rural men may be the most likely to migrate because many of them do not yet have their own farms or may be unable to acquire sufficient land and productive assets to obtain reasonably high returns to labour from farming, and they may have relatively high expected earnings in non-farm jobs compared to young women. Their tendency to migrate may leave an agricultural rural population of aged farmers or will be female dominated (Sharma, 2007). Even if the youth move from the rural areas to the urban areas, the urban areas will not be able to absorb all of them (Todaro, 1969; Brooks *et al.*, 2013). Therefore, agriculture is well placed as a sector of opportunity for the youth in SSA if policies and public investments were able to raise the returns to labour in agriculture.

This chapter reviews the literature on agricultural participation and its relationship to age and gender composition, structural transformation and employment. We start section 2.2 with a discussion on age composition and its relation to agricultural participation. This will be followed by a discussion on gender composition and its relation to agricultural participation in section 2.3. Section 2.4 reviews the factors influencing youth participation in agriculture. Land issues and risks and youth participation in agriculture are discussed in detail as they are regarded as one of the most important barriers to youth participation in agriculture. This will be followed by trends in migration in section 2.5. Section 2.6 looks at how structural transformation and employment links to agricultural participation. This chapter closes with a summary in section 2.7.

2.2 Age composition and its relation to agricultural participation

Aging of the farm population can be attributed to two factors 1) the youth in the rural areas do not want to have a career in farming mainly due to the poor income that comes with farming; and 2) The owners of the farms are leaving farming at a very slow pace (Clawson, 1963). Farming is quite often thought to be a job that should be done by people of old age (Sharma, 2007). In the United States, the aging of the farmer population was seen as a problem in the 1960s but now older farmers are seen as well to do (Gale, 2002). According to a study that was done by Gale (2003), young people entering into farming in the United States of America declined during the period of 1978 to 1997. This might be because of young people's choice of not taking up agriculture as a career choice which may leave behind an older farming population (Gale, 2002; Mitchel, 2007).

2.3 Gender composition and its relation to agricultural participation

Feminization of agriculture according to Deere (2005) can be as a result of either an increase in women participating in agriculture or a decrease in men participating in agriculture. In Latin America, rural women's participation in farm and non-farm activities has increased over the years from under 23 percent in 1980 to over 30 percent in 2000 (Katz, 2003). An increase in women participation in agriculture was seen in Peru between 1972 and 1994 from 13.3 percent to 20.3 percent (Deere, 2005). A study that was done in Lianhe village, China in 1995 showed that more women participated in agriculture than did men (Huang, 2012). After 1995 however, less women participated in agriculture compared to men (De Brauw *et al.*, 2008) with aging of agriculture setting in (Huang, 2012).

While migration of men out of rural areas is the main reason impacting on women's participation in agriculture, there are also other factors that affect women's participation in agriculture like fertility, liberalization of the economy and access to land (Katz, 2003) as well as women's rights to land. According to Katz (2003), rural women are having fewer children over time which reduces dependency rates and thereby increases the chances that women will work more outside the home. Declining fertility also has a direct connection to education (Katz, 2003) making it possible for women to have better educational levels. High rates of migration tend to be associated with women taking up roles in agriculture (Katz, 2003). Looking at women participation in agriculture and liberalization of the economy, Preibisch *et al.* (2002) established that liberalization in Mexico came with the removal of agricultural policies such as credit and subsidized agricultural inputs, which reduced the profitability of food production. Participation in non-farm activities increased because agriculture had now become less profitable. Men especially left their farms in search for jobs for a better income. This left women to do most of the work associated with farming, albeit under less profitable circumstances. More women became de facto heads of the household, which in turn affected their participation in the rural areas (Katz, 2003).

Moreover, women face hardships with regards to access to land. Land acts as a source of income if the women want to rent their land out, sell it or use it as collateral when in need of credit. Statistics show that only 11 percent and 27 percent of women own land in Brazil and Paraguay respectively (Deere, 2005). China has a different story where women headed households have more equitable opportunities for accessing land just like men (De Brauw *et al.*, 2008). Institutions and policies thus affect the impacts of male migration on the agricultural sector and the livelihoods of the population remaining in agriculture.

2.4 Factors influencing youth participation in agriculture

Participation by the youth in agriculture can be hindered by factors such as access to land, credit availability and skills (Brooks *et al.*, 2013; Filmer *et al.*, 2013; Mangal, 2009). Adekunle *et al.* (2009) found that participation by young people in agriculture can be hindered by credit, inaccessibility to farm inputs, agricultural insurance, low returns from investments in agriculture and lack of knowledge in basic farming. Agricultural jobs which are seen as low paying jobs with low productivity could add on to the increasing resistance by

the youth in the rural areas not to take part in agriculture but would prefer to migrate in search of better jobs (Vargas-Lundius, 2011). The low income returns from agricultural investment can come from investments by the youth in low value crops such as maize. High value crop production such as horticulture production is one type of investment that can be done to achieve high income returns. But at present, horticulture production in Zambia does not have any institutional set-up like the one found in maize production. Evidence suggests that top tier horticulture farmers earn 10 times more revenue in a hectare then farmers who grow low value crops such as maize or cotton while average horticulture farmers earn 2-3 times more crop value in a hectare compared to average maize or cotton farmers (Chapoto *et al.*, 2012).

Some studies have analyzed factors that would influence the youth to participate in agriculture. Bezu & Holden (2014) found that farm size was positively associated with participation in farming while being female, having brothers and sisters that are engaged in business activities, currently schooling, and number of years of schooling completed was negatively associated with participation in farming. Additionally, a positive relationship was found between the value of production and involvement of youth in agriculture (Sharma, 2007).

Land which is an important asset in agricultural production continues to be a barrier for the youth who want to go into farming (Ahaibwe *et al.*, 2013; Bezu & Holden 2014). If farmers especially the young farmers, are to better their agricultural practices, property rights in land are required (Kirsten *et. al.*, 2009). In many cases, the youth tend to use land that is not theirs which makes it hard for them to use land as collateral in instances when they need more investments in agricultural production. For example, it has been documented in Uganda that 70 percent of the households headed by youths are using land that is under the customary tenure system (Ahaibwe *et al*., 2013). In Zambia, the Land Act of 1995 allows for change of ownership of land form the customary setup to the statutory leasehold title where one can acquire a title deed (Hichaambwa *et al.*, 2014). This would have, as expected, helped to increase rural household productivity in farming but this was not the case. Households with title deeds were less productive in agriculture than those without title deeds. A further analysis showed that the ones without titles were the full-time farmers who were at a disadvantage when it came to getting title deeds. Full-time farmers were unable to handle the costs that come with getting a title deed. Those who managed to acquire a title deed did so

with the help of the off-farm income that they earned. Title deed holders were found to be more educated, had more of a chance to be employed off-farm and hence more likely to migrate. It was found that most of the title deed owners do not even live in these areas. The weak institutional arrangements in place might be the reason why individuals who do not belong to those communities are able to get land on title. Statistics also show that these more educated farmers, mostly living in the urban areas, are the ones acquiring land of 20 to 100 hectares of which most of it is uncultivated (Jayne *et al.*, 2014).

In countries like Japan, Taiwan, South Korea and India which are characterized by land scarcity (Sharma, 2007), youth participation in agriculture remains problematic. For example, in India, it was found that the amount of land that one holds has a relationship to whether the youth will participate in agriculture. Those with large landholdings participated in farming full-time which gave them no need to participate in other forms of employment. But those youths with smaller sizes of land where forced to either increase their land sizes or to move out of agriculture. But in other instances farmers with large land sizes where found to withdraw from farming (Speare, 1974). This was due to the fact that households with large land sizes had a greater chance of going to school which increases the probability that a job elsewhere will be chosen compared to farming.

Risks such as changing weather conditions and thin markets affect agricultural productivity. With changing weather conditions, agricultural insurance could be a solution to an event of loss in agricultural products in a particular season. Adekunle *et al*. (2009) in their study found that lack of agricultural insurance was one of the constraints that the youths in Kwara state, Nigeria faced. But this would be a big challenge for the insurance companies due to moral hazard and adverse selection (Kirsten *et al*., 2009). The right institutions need to be put in place for such a market to be possible. With such risks in agriculture, young rural people would prefer to migrate as it helps with regular cash in their homes even if this would mean very little income for some of them due to lack of education and skills (Sharma, 2007).

2.5 Migration trends

Many factors can cause rural-urban migration. According to a study by Zhao (1999), it was established that being a female worker, age and being married had a significant positive effect on the probability of migration. Number of livestock and farm size was found to be

negatively associated with youth migration while level of education was positively associated with youth migration (Bezu & Holden, 2014). A further analysis, showed that educated youths did only participate in urban salaried employment but also choose to participate in off-farm self employment or off-farm wage employment. Therefore, movements out of agriculture can be attributed to either rural non-farm employment or urban employment (Wu & Yao, 2003). Some countries have recorded an increase in rural non-farm employment (Lanjouw & Lanjouw, 2001). Even though migrating may offer more income than non-farm income in the rural areas, farmers decide to take up non-farm employment because of factors such as costs of transport and housing in urban areas, personal safety and separation from family. The general characteristic has been for the migrant to leave his family behind (Zhao, 1999). Wu and Yao (2003) used a CES production function and proved that migration had a negative relationship to migration costs, urban employment, rural wages and the price of capital. Wages and urban output had a positive relationship with migration.

2.6 Structural transformation, employment and agricultural participation

During the growth of an economy, labour tends to be reallocated from agriculture, to non-farm service and industrial sectors in a process called structural transformation (Duarte & Restuccia, 2010). During the process of structural transformation, the share of hours spent in agriculture decline while the share of hours in non-farm sectors rises. Later in this process, an increasing share of hours spent in the services sector is seen (Duarte & Restuccia, 2010). For example, Spain, just like other countries experienced a reallocation of labour which saw the share of hours spent in agriculture decline from 44 percent to 6 percent while that in services increased from 25 percent to 64 percent during the period 1960 to 2004 (Duarte & Restuccia, 2010). De Vries *et al.,* (2013) using the African sector database found that the employment share in agriculture declined from 72.7 percent in 1960 to 49.8 percent in 2010 while the employment share in industry increased from 9.3 percent to 13.4 percent and services from 18 percent to 36.8 percent. McMillan and Harttgen (2014) also found a decline in employment shares in agriculture with an increase in industry and services over time in a sample of 19 countries. According to McMillan and Harttgen (2014), agricultural productivity growth has had an influence on labour reallocation out of agriculture which is causing the share of those in agricultural employment to decline. Yet in another study by Foster and Rosenzweig (2004) this was found not to be true. An increase in agricultural productivity did not lead to a reduction of the employment share in agriculture by means of reallocation of

labour to the other sectors. However, it has been seen that much of SSA has undergone urbanization without industrialization, in contrast to other countries where industrialization occurred in the process of urbanization (Losch *et al.*, 2012).

In SSA, labour has already started moving out of agriculture, without strong evidence of broad-based increases in agricultural productivity. This rapid urbanization means that migration is taking place from the rural areas to the urban areas without the necessary growth in urban and industrial employment. Private sector investors are therefore needed in SSA in the creation of wage employment (Fox *et al*., 2013) but wage employment in the urban area won't be able to absorb all of the migrants. It is therefore still necessary for agriculture to be considered a viable sector for potential jobs for the many young people in the rural areas (Filmer *et al.*, 2014). We cannot disregard agriculture as a sector creating job opportunities because SSA just like in Asia will experience a large increase in the number of economic active people (15 to 65 years) up until 2050. Asia took advantage of this demographic window of opportunity where in the first instance there was an increase in labour participation in the agriculture sector and later labour moved to industry and services as agricultural productivity grew (Lipton, 2012) leading to economic growth. An increase in agricultural productivity not only leads to economic growth but also more importantly hope for the rural community is not lost (Fox *et al.*, 2013).

2.7 Summary

The review of the literature presented in this chapter has illustrated a number of main points and issues important for this study. The age composition in agriculture is changing as the young men are leaving an older farming population. The gender composition is also changing as men are leaving women to participate in rural agriculture. The hardships such as lack of land and credit facilities for the youth to use for farming coupled with the general unattractiveness of rural agriculture increases the probability that youths will migrate to urban areas in search of better employment opportunities. In contrast, efforts to raise the returns to labour or reduce the drudgery associated with farming may reduce the rate of urban migration, although the broad trend toward urbanization and a declining share of the workforce in agriculture is likely to continue over the long run.

CHAPTER THREE

METHODS AND PROCEDURES

3.1 Introduction

This chapter presents the data and data sources as well as the analytical methods used in the study. The analytical framework and estimation strategy gives an intuitive explanation of the choice of methods that were used in this study to test the hypothesis. A discussion of the variables that were used in the econometric estimation is also done.

3.2 Data and data sources

The main source of data was the LCMS datasets for Zambia. The LCMS are done every two years and the datasets from the years 1998, 2004, 2006 and 2010 were used. The LCMS having a nationwide coverage on a sample basis covers both the rural and urban areas of Zambia and was designed to produce reliable estimates at district, province and national levels. The sampling frame used in the 2010, 2006 and 2004 LCMS was based on the 2000 census of population and housing. The 1998 LCMS sampling frame was based on the 1990 census of population and housing (Central Statistical Office, 2012).

The country is administratively demarcated into nine provinces, which are further divided into 72 districts. The districts are further subdivided into 150 constituencies, which are in turn divided into wards. For the purposes of conducting household based surveys, wards are further divided into Census Supervisory Areas (CSAs), which are further subdivided into Standard Enumeration Areas (SEAs). The SEAs constituted the Primary Sampling Units (PSUs).

A two-stage stratified cluster sample design was employed in each year where in the first stage SEAs nationwide are selected with the probability proportional to estimated size (PPES) where the population figures taken from the frame developed from the 2000 and 1990 Census of Population and Housing was used as the measure of size. During the second stage, households were systematically selected from an enumeration area listing. The households were further stratified into four categories in the rural areas and 3 categories in the urban areas. The categories in the rural areas were classified based on whether the household was

an agricultural or non-agricultural household. For the agricultural households, a further distinction was made into small scale, medium scale and large scale agricultural households on the basis of land under crop cultivation, numbers of livestock and poultry owned. Non-agricultural households are those that live in the rural areas but do not grow any crops or own any livestock or poultry (Central Statistical Office, 2004). Urban areas were categorized based on the proportion of housing structures of low cost, high cost and medium cost (Central Statistical Office, 2012). Circular systematic sampling was then used in both the rural and urban SEAs across all the categories to select households. This resulted in a total of not more than 20,000 households in each year. All the 72 districts in Zambia were covered in the survey on a sample basis. Consumer Price Index (CPI) data from CSO was also used in is study. This study also used the African Sector Database (see De Vries *et al.*, 2013).

3.3 Analytical framework and estimation strategy

Descriptive and econometric analyses were used in this study. Descriptive analysis involved comparing changes over time in the age and gender composition of people who are primarily engaged in farm and non-farm activities. Econometric modeling was used to empirically test the stated hypothesis that men and young people are more likely to leave the rural areas while women and the elderly are more likely to stay behind in the rural areas.

In our empirical analysis, we used the pooled probit model, which is a nonlinear model for binary responses and can be used to analyze decisions of the probability of living in the rural area, being primarily engaged in farming or wage employment and the determinants of youth and gender participation in agriculture. According to Wooldridge (2002, 2009), a pooled probit model can be represented as follows

$$P(Y_{it} = 1|\boldsymbol{X}_{it}) = \boldsymbol{G}(\boldsymbol{X}_{it}\boldsymbol{\beta}) \qquad t = 1, 2, \ldots..T$$

$$Y_{it} = 0{,}1 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Where Y_{it} =1 represents the change in the probability of living in the rural area, the change in the probability of being engaged in farming or wage employment and the determinants of youth and gender participation in agriculture. $\boldsymbol{X}_{it}$ is a vector representing the independent variables such as gender, age categories and other exogenous covariates. $\boldsymbol{G}(.)$ takes only values in the range $0 < G(z) < 1$ for all real numbers z. $\boldsymbol{G}$ which is the standard normal

cumulative distribution function (CDF) in the probit model can be expressed in integral terms as:

$$\boldsymbol{G}(z) = \Phi(z) \equiv \int_{-\infty}^{z} \emptyset\,(v)dv \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(2)}$$

The standard normal density = $\emptyset(z) = \frac{1}{\sqrt{2\pi}} exp\left(\frac{-z^2}{2}\right)$ …….. (3)

A latent variable model can be used to derive probit models as follows. If y_{it}^* is the latent variable where

$$y_{it}^* = \beta_0 + X_{it}\beta + e_{it}, \;\; y_{it} = 1[y_{it}^* > 0] \;\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(4)}$$

1[.] is called the indicator function. Then

$$y_{it} = \begin{cases} 1 \; if \; y_{it}^* > 0 \\ 0 \; if \; y_{it}^* \leq 0 \end{cases}$$

To derive the response probability from equation (4) for the probability of y_{it}

$$\begin{aligned} P(\,y_{it} = 1|\boldsymbol{X}_{it}) &= P(y_{it}^* > 0|\boldsymbol{X}_{it}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(5)} \\ &= P[e_{it} > -(\beta_0 + \boldsymbol{X}_{it}\boldsymbol{\beta})|\,\boldsymbol{X}_{it}] \\ &= 1 - G[-\beta_0 + \boldsymbol{X}_{it}\boldsymbol{\beta}] \\ &= G(\beta_0 + \boldsymbol{X}_{it}\boldsymbol{\beta}) \\ &= G(\boldsymbol{X}_{it}\boldsymbol{\beta}) \end{aligned}$$

Which is the same as equation (1).

3.4 Description of variables used in the model

In analyzing the likelihood of females and young people to live in rural areas, the study used the dependent binary variable living in the rural area (1=living in the rural area, 0=otherwise). Also analyzed was the probability of females and young people being engaged in farming (1=engaged in farming, 0=otherwise), being engaged in wage employment (1=engaged in wage employment, 0=otherwise) and being engaged in wage employment while living in the urban area (1=engaged in wage employment and living in urban area, 0=otherwise). Youth[3] and female participation in agriculture was also used as a dependent variable.

A collection of age group dummy variables were used in the analysis which included adults between 15-24, 25-34, 35-44, 45-54, 55-64 and those over 65 years. The over 65 years age category was used as the reference group. This is what is meant by the age composition. The

[3] For the purpose of this study a youth was described as an individual between the age of 15 to 35 years (Republic of Zambia, 2015)

gender dummy variable (1=male, 0=otherwise) was included to capture the gender composition.

Operational farm size which was used as a proxy for total land holding size was measured in hectares. Land size has been found to have a positive association with participation in farming (Bezu & Holden, 2014). The highest level of education for the household head was also used as an independent variable. Education has been found to have a positive effect on the likelihood of moving out of agriculture (Bezu & Holden, 2014). Distance to the nearest police station in kilometres was used as a proxy for the distance to the nearest urban centre. The distance to the nearest input market measured in kilometres was also used as an independent variable. A dummy variable representing whether the household has access to credit for agricultural inputs was also used.

Population density which is measured by number of persons per square kilometre was used to capture aspects of infrastructure. Dummy variables for whether an individual receives an employment wage (1=wage employment, 0=otherwise), is involved in a business activity (1=involved in business, 0=otherwise), receives remittances, grant or pension (1=receives remittance, grant or pension, 0=otherwise), and whether an individual receives rental income from buildings, houses and non-agricultural land (1=rental income, 0=otherwise) were used.

Value added per person in agriculture, industry and services were also included in the econometric estimation (see De Vries *et al.*, 2013). To capture spatial effects, district dummy variables were used. Table 3.1 below presents all the variables that were used in the analysis.

Table 3.1: Definition of variables used in the study

Variable	Variable Description	Year	Mean	Percentile			
				25th	50th	75th	90th
Dependent variables							
Youth participation in agriculture(1=yes)	Dummy variable youth primarily involved in farming in the rural area (1=yes)	1998	0.50				
		2004	0.47				
		2006	0.30				
		2010	0.23				
Female participation in agriculture(1=yes)	Dummy variable female primarily involved in farming in the rural area (1=yes)	1998	0.49				
		2004	0.47				
		2006	0.28				
		2010	0.24				
living in the rural area (1=yes)	Dummy variable living in the rural area (1=yes)	1998	0.50				
		2004	0.54				
		2006	0.50				
		2010	0.44				
Engaged in farming (1=yes)	Dummy variable engaged in farming (1=yes)	1998	0.39				
		2004	0.45				
		2006	0.41				
		2010	0.36				
Engaged in wage employment (1=yes)	Dummy variable engaged in wage employment (1=yes)	1998	0.36				
		2004	0.16				
		2006	0.34				
		2010	0.38				
Engaged in wage employment while living in the urban area	Dummy variable engaged in wage employment while living in the urban area	1998	0.30				
		2004	0.13				
		2006	0.28				
		2010	0.31				
Independent variables							
Age 15-24	Age group dummy for those between 15 and 24	1998	0.67				
		2004	0.65				
		2006	0.65				
		2010	0.66				

Variable	Variable Description	Year	Mean	Percentile			
				25th	50th	75th	90th
Table 3.1 cont'd							
Age 25-34	Age group dummy for those between 25 and 34	1998	0.57				
		2004	0.57				
		2006	0.58				
		2010	0.58				
Age 35-44	Age group dummy for those between 35 and 44	1998	0.38				
		2004	0.38				
		2006	0.39				
		2010	0.40				
Age 45-54	Age group dummy for those between 45 and 54	1998	0.23				
		2004	0.24				
		2006	0.23				
		2010	0.25				
Age 55-64	Age group dummy for those between 55 and 64	1998	0.13				
		2004	0.14				
		2006	0.13				
		2010	0.14				
Household Size	Total number of household members	1998	5.52	3	5	7	10
		2004	5.33	3	5	7	9
		2006	5.26	3	5	7	9
		2010	5.31	3	5	7	9
Level of Education of household head	Highest level of education for the household head	1998	8.35	6	9	12	13
		2004	8.57	7	9	12	14
		2006	8.90	7	9	12	14
		2010	9.45	7	9	12	15
Distance to the nearest police station (km)	Distance to the nearest police station in kilometres	1998	13.45	0	3	17	46
		2004	12.57	0	2	14	39
		2006	12.76	0	2	12	40
		2010	13.07	0	2	9	48

Variable	Variable Description	Year	Mean	Percentile			
				25th	50th	75th	90th
Table 3.1 cont'd							
Distance to the nearest input market (km)	Distance to the nearest input market I kilometres	1998	18.74	1	6	25	64
		2004	15.72	1	5	18	50
		2006	17.69	1	3	20	70
		2010	15.90	1	3	13	61
Access to agricultural credit (1=yes)	Dummy variable for access to agricultural credit(1=yes)	1998	0.02				
		2004	0.08				
		2006	0.08				
		2010	0.05				
Gender (1=male)	Dummy variable for gender (1=male)	1998	0.77				
		2004	0.78				
		2006	0.77				
		2010	0.77				
Population density (per square Km)	Number of persons per square kilometre	1998	273.80	75.10	125.94	409.23	887.03
		2004	18.97	5.90	8.30	17.15	68.99
		2006	1106.97	273.85	866.93	1,400.56	2,784.51
		2010	260.45	92.65	151.94	283.98	953.90
Operational Farm size (hectare)	Proxy for total landholding size (hectare)	1998	1.48	0.59	1.21	1.74	3.33
		2006	1.25	0.21	0.37	0.77	4.26
		2010	3.85	1.59	2.41	5.31	9.11

Variable	Variable Description	Year	Mean	Percentile			
				25th	50th	75th	90th
Table 3.1 cont'd							
Other income[Remittances, pensions and grants] (1=yes)	Dummy variable for income received from remittances, pensions and grants (1=yes)	1998	0.25				
		2004	0.11				
		2006	0.42				
		2010	0.35				
Renting out [Houses, buildings, land, equipment] (1=yes)	Dummy variable for whether rental income is received from buildings, houses and non-agricultural land (1=yes)	1998	0.04				
		2004	0.04				
		2006	0.05				
		2010	0.05				
Self-employment [Business activity] (1=yes)	Dummy variable for engagement in non-farm business activities (1=yes)	1998	0.41				
		2004	0.14				
		2006	0.40				
		2010	0.41				
Value added per person(Labour productivity) in agriculture	Calculated by dividing the value added in agriculture by workers employed	1998	2,709.06				
		2004	2,498.18				
		2006	2,236.92				
		2010	1,843.30				
Value added per person (Labour productivity) in industry	Calculated by dividing the value added in industry by workers employed	1998	172,526.80				
		2004	209,137.80				
		2006	230,952.40				
		2010	285,156.10				

Variable	Variable Description	Year	Mean	Percentile			
				25th	50th	75th	90th
Table 3.1 cont'd							
Value added per person (labour productivity) in services	Calculated by dividing value added in services by workers employed	1998	136,010.20				
		2004	181,448.30				
		2006	198,209.30				
		2010	239,607.90				

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010
African Sector Database (see Vries et al., 2013)

3.5 Summary

Discussed in this chapter was the type of data that was used and methods to be followed to help in testing of the study hypothesis. This study used four rounds of LCMS datasets for Zambia which is a nationally representative dataset and covers both the rural and urban parts of Zambia. Each round of LCMS interviewed a total of roughly 20,000 households. Descriptive and econometric analyses were used in this study. Descriptive analysis involved comparing changes over time in the age and gender composition. Econometric modeling was used to estimate the determinants of youth and gender participation in agriculture. Econometric modeling was also used to estimate the probability of living in the rural area, farming, being engaged in wage employment, and being engaged in wage employment while living in the urban area. The model that was used in the econometric estimation was the pooled probit model which can be used in the case of having a dependent variable that is binary in nature.

CHAPTER FOUR

CHANGES OVER TIME IN THE AGE AND GENDER COMPOSITION IN ZAMBIAN AGRICULTURE

4.1 Introduction

In this chapter a descriptive analysis is presented which involved comparing changes over time in the age and gender composition of the rural households. To start the descriptive analysis, a look at the population age pyramids for Zambia is done which is followed by a look at the changes in the age composition of individuals' participation in agriculture. This is followed by an analysis of the gender composition of individuals involved in agriculture. The trend over time in participation in rural agriculture for individual females and for female headed households is then looked at. Presented next is a section on how the urban and rural populations have been involved in different economic activities over the years of the study. Finally, the summary closes this chapter.

4.2 Population age pyramids for Zambia

Figure 4.1 presents the population age pyramids for Zambia for the years 1998 and 2010. A higher proportion of the population is in the younger age categories as can be seen from the broader base of the age pyramid in both 1998 and 2010. Therefore, it can be concluded that Zambia had a young population in both 1998 and 2010.

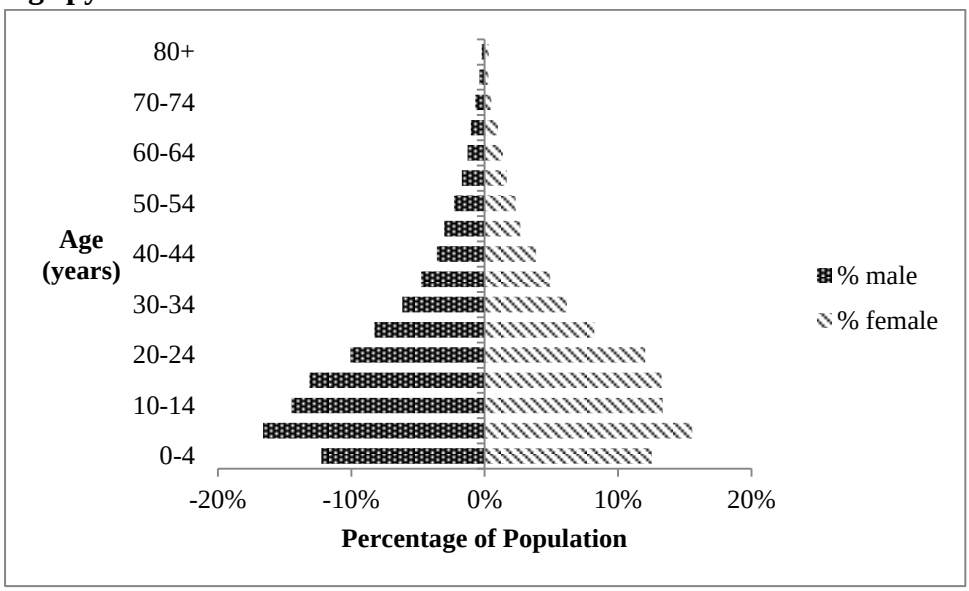
Going a step further, presented in Figure 4.2 are the rural and urban population age pyramids for Zambia. As can be seen from the age pyramids for urban and rural Zambia in 1998, more individuals lived in the rural than the urban areas for persons below 20 years of age. Males between the ages of 20 to 44 years were higher in proportion in the urban areas compared to the rural areas. More females between the ages of 20 and 34 years lived in the urban areas compared to the rural areas.

Comparing the rural and urban age pyramid for 2010, it can be seen that just like in 1998, a higher proportion of males between 20 and 44 years were found in the urban areas compared to the rural areas. Females were found to be in higher proportions in the urban areas than in the rural areas for the 15-19, 20-24 and 35-39 age categories. And just like in 1998, the

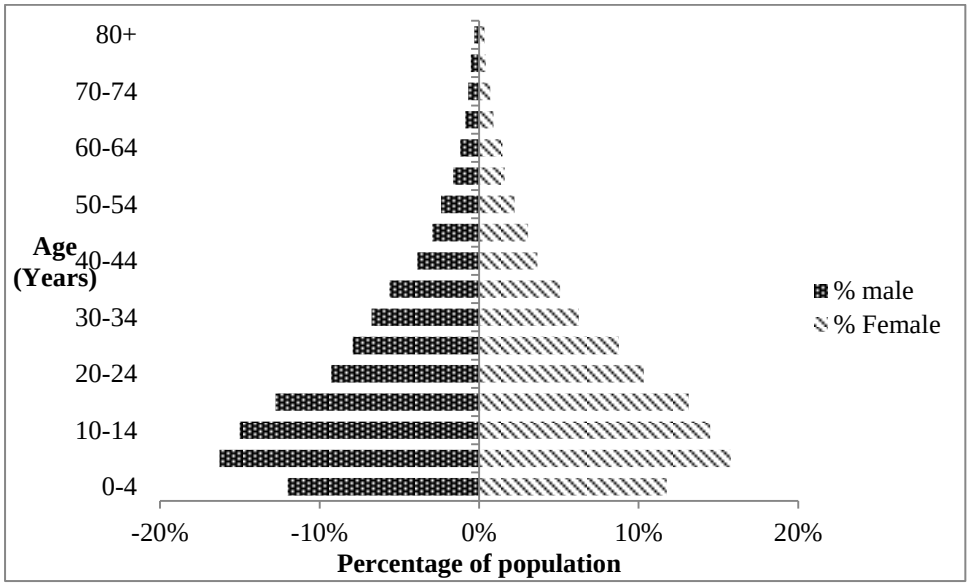
youngest of the population were found in the rural compared to the urban area. The age pyramids have shown that young people are higher in proportion in the urban areas compared to the rural areas which might be an indication that young people are migrating to the urban areas perhaps in search of a better standard of living.

Figure 4.1: Population age pyramid for Zambia

Age pyramid in 1998



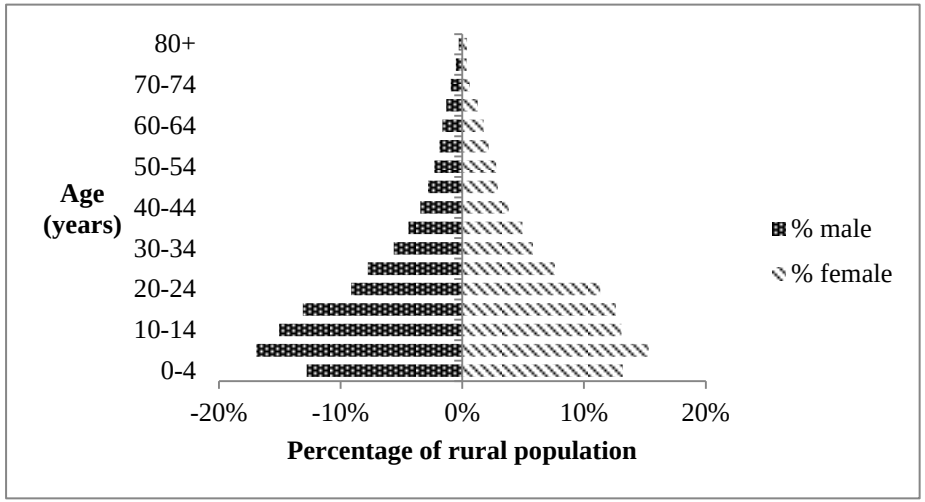
Age pyramid in 2010



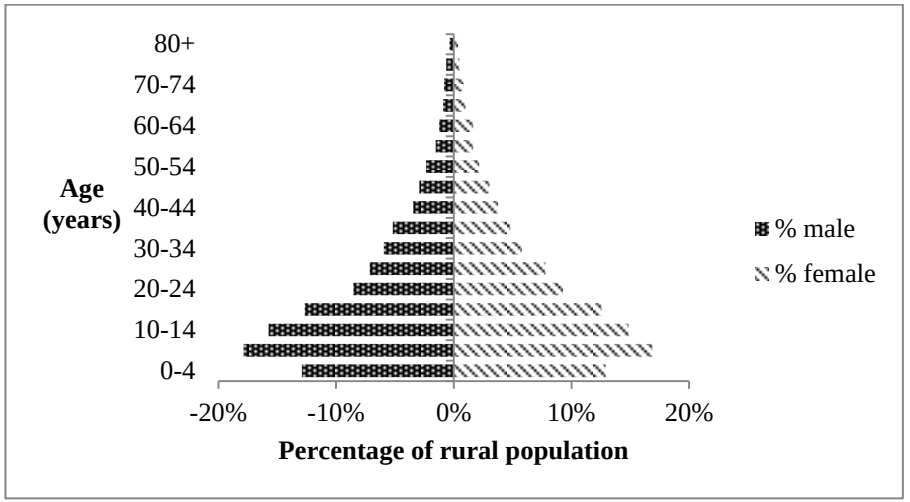
Sources: Living conditions monitoring survey data, 1998, 2010

Figure 4.2: Rural and urban population age pyramid for Zambia by year

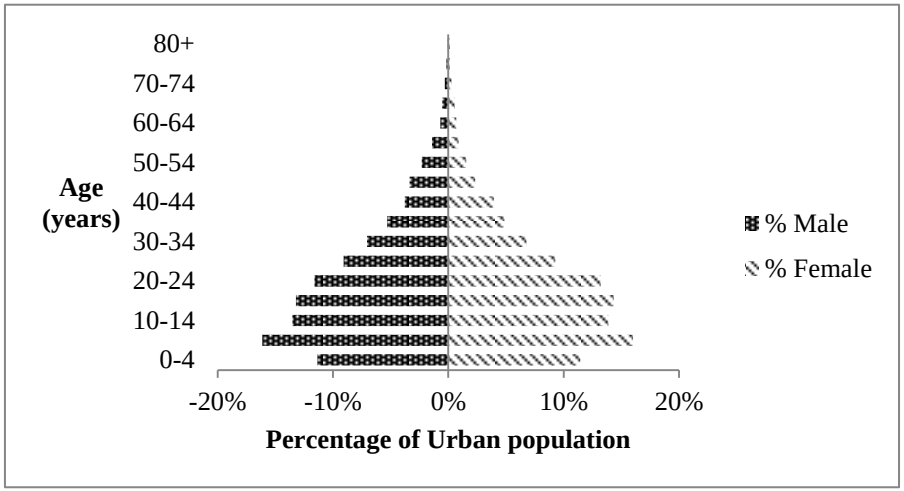
Age Pyramid for rural Zambia in 1998



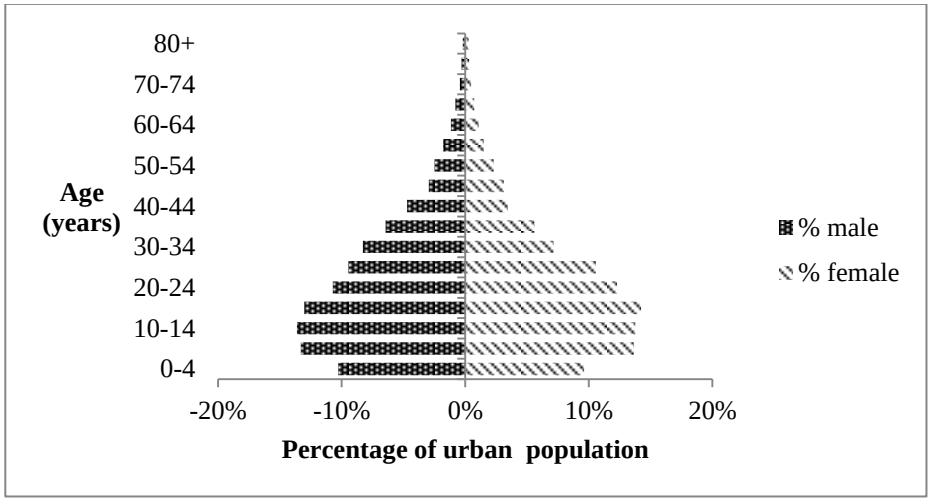
Age pyramid for rural Zambia in 2010



Age Pyramid for Urban Zambia in 1998



Age pyramid for Urban Zambia in 2010



Sources: Living conditions monitoring survey data, 1998, 2010

4.3 Changes in the age composition in agriculture

A comparison in age composition between the rural and urban areas of Zambia is done in Table 4.1. It shows how the age distribution has been changing over the period 1998 to 2010 for individuals above 15 years old. As can be seen from the table, the mean age of individuals living in the urban areas has been lower compared to the rural areas for both men and women. However, over the years covered by the study, the mean age has remained roughly constant in both rural and urban areas for both men and women. The mean age has been around 34 years over the years covered in the study for the rural population for both the women and the men while the mean age has been around 31 years for the urban population for both the women and men. At the 75th percentile, women and men in the urban population have shown a trend of being in their thirties while for the rural population, women and men have shown a trend of being in their forties. Men in the rural population have been much older compared to the urban population over time.

Table 4.1: Population age distribution by gender for those above 15 years in the rural and urban areas, by year

			Percentiles				
	Size of Population	Mean	10th	25th	50th	75th	90th
Rural women (>15 years)							
1998	1,730,107	33.4	18	21	29	42	57
2004	1,715,826	34.2	18	22	30	43	58
2006	2,081,210	33.5	18	21	29	42	58
2010	2,244,238	33.5	18	21	29	42	57
Rural Men (>15 years)							
1998	1,588,026	33.5	18	21	29	42	58
2004	1,647,100	33.8	18	21	30	42	58
2006	1,948,536	33.5	18	21	29	42	56
2010	2,063,410	33.4	18	21	30	41	56
Urban women(>15 years)							
1998	1,039,236	29.5	17	20	26	36	46
2004	1,201,806	30.5	18	21	27	37	48
2006	1,198,201	30.8	18	21	27	37	49
2010	1,368,418	31.3	18	21	28	38	51
Urban Men(>15 years)							
1998	1,022,857	30.9	18	21	28	38	49
2004	1,177,339	31.6	18	21	29	39	50
2006	1,160,166	31.9	18	22	29	39	50
2010	1,297,329	32.2	18	22	29	39	52

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

To get a better understanding as to what is happening to the age composition in rural agriculture, Table 4.2 presents the age distribution of the rural population who are primarily engaged in agriculture and those who are not primarily engaged in agriculture by gender for individuals above 15 years. The average age of a man primarily engaged in farming has been increasing steadily from 36.5 years in 1998 to 40.4 years in 2010. For a man who is not primarily engaged in farming, a decrease in the average age was seen from 28.2 years in 1998 to 26.5 years in 2010. The same is true for the rural women whose average age has increased for those who are primarily engaged in farming and decreased for those who are not engaged in farming. At the 75th percentile the rural population primarily engaged in agriculture are in their forties while those who are not primarily engaged in agriculture are in their thirties.

Table 4.2: Rural population age distribution by gender for those above 15 years, by year

			Percentiles				
	Population Size	Mean	10th	25th	50th	75th	90th
Men Primarily Engaged in farming (>15 years)							
1998	998,727	36.5	19	24	32	46	61
2004	1,000,141	38.4	21	26	35	48	63
2006	1,037,062	39.7	23	28	36	49	64
2010	1,028,896	40.4	24	29	37	49	63
Women Primarily Engaged in farming (>15 years)							
1998	1,118,890	34.9	19	23	31	45	57
2004	1,080,924	36.7	20	24	33	47	60
2006	854,239	38.1	21	26	35	48	61
2010	898,140	38.8	21	26	36	48	61
Men Not Primarily Engaged in farming (>15 years)							
1998	586,103	28.2	16	18	23	34	48
2004	638,998	26.6	16	18	22	30	44
2006	905,460	26.4	16	18	22	30	43
2010	1,034,514	26.5	17	18	22	30	42
Women Not Primarily Engaged in farming (>15 years)							
1998	604,544	30.6	17	19	25	37	56
2004	626,983	29.8	16	19	24	35	53
2006	1,219,346	30.2	17	20	25	36	51
2010	1,346,098	30.0	17	19	25	35	51

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

This trend shows that the average age of persons involved in agriculture is increasing over time. Plausible reasons for this could be that young people are moving out of agriculture because of lack of interest in it or because the older people are moving out of farming at a slow pace hence the young people are forced to look for alternative sources of livelihood.

Table 4.2 also shows major changes in growth rates of both men and women in farming vs. non-farming activities. The number of men primarily engaged in farming is increasing very slowly, from just below 1,000,000 in 1998 to just over 1,000,000 in 2010. That of women has been decreasing very slowly as well, from just above 1,100,000 in 1998 to around 900,000 in 2010. Men not primarily engaged in farming but living in the rural area have been increasing over time as with women but women have been increasing in numbers at a faster rate compared to men.

Looking at both Tables 4.1 and 4.2, it can be concluded that the young people who might be moving out from agriculture are not all going to the urban areas but might be staying in the rural areas and may be engaged in non-agricultural activities.

4.4 Changes in the gender composition in Agriculture

Table 4.3 shows the trends in the percentage of the rural population that are involved in farming and living in the rural area. Column 2 shows the trend for the total population in Zambia that is above 15 years old from 1998 to 2010 with column 3 showing only the total rural population above 15 years. Column 4 shows the percentage of the total population above 15 years living in the rural areas. Column 5 goes a step further to show the number of those living in the rural areas who are actually involved in farming as the main source of employment with percentage shares in column 6. The last two columns show the proportion of females and males that were involved in farming. Participation in farming by individuals over 15 years in the rural areas has decreased over the years from about 64 percent in 1998 to about 45 percent in 2010. Initially there were more females participating in farming compared to males up until 2004. Then after 2006, fewer females compared to males participated in agriculture. Female participation in agriculture reduced from 53 percent in 1998 to 47 percent in 2010 while male participation increased from 47 percent in 1998 to 53 percent in 2010. This might have been possibly due to retrenchment of miners and public sector employees during the structural adjustment period.

Table 4.3: Trends in the number of persons in the rural areas above 15 years, by gender whose primary source of employment is farming

						Percentage in farming and living in the rural area	
Year	Total population above 15 years	Rural population above 15 years	Percentage of the total population above 15 years living in the rural area	Rural population above 15 years that are farming	Percentage of rural population above 15 years that are farming	Male	Female
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1998	5,387,195	3,324,156	61.7	2,119,571	63.8	47.2	52.8
2004	5,742,577	3,363,162	58.6	2,081,064	61.8	48.1	51.9
2006	6,390,425	4,029,745	63.1	1,891,301	46.9	54.8	45.2
2010	6,973,395	4,307,647	61.8	1,927,036	44.7	53.4	46.6

Sources: Living conditions monitoring survey data, 1998, 2004, 2006[4], 2010

A further analysis was done on the trend in female participation in rural agriculture. Table 4.4 shows rural females whose primary source of employment has been farming over the years categorized in different age categories. The most active participation in agriculture over the years has been females in the age categories of 15-24 and 25-34. Even though the 15-24 age category shows one of the highest rates of female participation in agriculture, it has shown a significant decline in the proportion of female participation in agriculture from 34 percent in 1998 to 20 percent in 2010. The percentage of female participation for the 25-34 age category has been constant over time together with the over 65 year old category. The 35-44 and 45-54 age categories have had an increase in the share of female participation in agriculture over time. Therefore, it is the young women who are primarily leaving farming in the rural areas.

Table 4.4: Female rural population by different age categories whose primary source of employment is farming, by year

Age category of female	Percentage of females whose primary source of employment is farming			
	1998	2004	2006	2010
15-24	34	27	22	20
25-34	25	27	28	26
35-44	17	19	21	22
45-54	12	13	14	16
55-64	8	9	10	11
65-over	4	6	6	6
Total female population	1,142,503	1,083,694	850,531	894,822

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

[4] The weights for 2006 were recalculated based on the reduced sample size from the original dataset.

Table 4.5 presents female headed household participation in agriculture by different age categories. A higher proportion of female headed households in the 35-44 and 45-54 age categories were engaged in farming and showed little decline over time. The highest increase in participation in farming of female headed households was of the over 65 years from 11 percent in 1998 to 14 percent in 2010. The female headed households in the 45-54 age category showed the highest reduction in participation in farming from 24 percent in 1998 to 21 percent in 2010.

Table 4.5: Female headed household population by different age categories, whose primary source of employment is farming, by year

Age category of female head	Percentage of female-headed households in rural areas engaged in farming			
	1998	2004	2006	2010
15-24	6	5	4	4
25-34	16	16	20	18
35-44	23	23	22	23
45-54	24	23	21	21
55-64	20	19	19	20
65-over	11	15	14	14
Total population of female-headed households	226,299	234,833	280,495	276,682

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

4.5 Urban and rural involvement in different economic activities

This section looks at the rural and urban proportion of individuals involved in different economic activities for the working age group between 15 and 65 years. The economic activities that were looked at include farming, wage employment, self-employment and the unemployed or economically inactive. Table 4.6 presents the proportion of individuals involved in different economic activities in the rural areas while Table 4.7 presents the proportion of individuals involved in the different economic activities in the urban areas of Zambia. Further, information on the actual number of individuals that have been involved in the different economic activities over the years is also given.

Table 4.6 shows that farming constitutes the largest proportion of what individuals have been involved in over the years in the rural areas. But looking at the trends in the proportion of those engaged in farming it can be seen that there has been a decline from 61.9 percent in 1998 to 40.4 percent in 2010. The proportion of individuals involved in wage employment has been under 6 percent over the years of the study. Self-employment in non-farm business

activities declined over the years from about 5.7 percent in 1998 to 4.4 percent in 2010. The economically inactive or unemployed in the rural areas increased from 28 percent in 1998 to 49.4 percent in 2010.

Table 4.7 shows a lesser proportion of the urban population that is involved in farming compared to the rural population. Farming in the urban area has been under 8 percent over the years covered by the study. Wage employment involved about 23 percent of the urban population in 1998 which slightly reduced to about 22.3 percent in 2010. Self-employment in non-farm business activities has had a constant trend of around 15 percent participation rate in both 1998 and 2010. Over the years covered by the study, the majority of the urban working age population was not involved in any of the economic activities (just below 60 percent).

Table 4.6: Rural working age population between 15 and 65 years categorized by different Economic activities, in 2010 Zambian kwacha ('000ZMK), by year

		Rural								
					Percentiles					
Economic activity	Year	Rural population between 15 and 65 years	Rural population involved in Economic activity	Percentage involved in Economic activity	Mean	10th	25th	50th	75th	90th
Farming	1998	3,317,433	2,054,337	61.9						
	2004	3,319,409	1,901,202	57.3						
	2006	4,036,477	1,714,668	42.3						
	2010	4,349,584	1,758,322	40.4						
Wage employment (ZMK)	1998		146,213	4.4	909	241	435	737	1,103	1,912
	2004		166,704	5.0	1,381	285	394	740	1,477	2,618
	2006		184,866	4.6	969	198	275	687	1,442	2,063
	2010		251,542	5,8	1,261	200	300	670	1,800	2,500
Self-employment [Business activity] (ZMK)	1998		187,910	5.7	548	53	100	267	602	1,337
	2004		104,989	3.2	445	39	79	177	394	984
	2006		166,708	4.1	332	38	76	153	382	763
	2010		190,064	4.4	363	40	80	200	400	800
Not working[unemployed or economically inactive (e.g. in school)]	1998		928,972	28.0						
	2004		1,146,515	34.5						
	2006		1,970,235	48.8						
	2010		2,149,656	49.4						

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

Table 4.7: Urban working age population between 15 and 65 years categorized by different Economic activities, in 2010 Zambian kwacha ('000ZMK), by year

		Urban								
					Percentiles					
Economic activity	Year	Urban population between 15 and 65 years	Urban population involved in Economic activity	Percentage involved in Economic activity	Mean	10th	25th	50th	75th	90th
Farming	1998	2,120,371	82,108	3.9						
	2004	2,432,271	176,231	7.2						
	2006	2,413,801	85,319	3.5						
	2010	2,729,873	92,370	3.4						
Wage employment (ZMK)	1998		488,267	23.0	1,862	401	669	1,119	2,072	4,091
	2004		551,188	22.7	2,172	295	591	1,260	2,426	4,922
	2006		532,634	22.1	1,764	305	488	992	1,984	4,121
	2010		609,030	22.3	1,641	300	500	1,000	2,000	3,800
Self-employment [Business activity] (ZMK)	1998		321,034	15.1	1,753	201	401	903	1,738	4,011
	2004		407,434	16.8	990	100	197	492	984	1,969
	2006		354,369	14.7	894	107	229	458	855	1,831
	2010		406,417	14.9	877	100	200	450	900	2,000
Not working[unemployed or economically inactive (e.g. in school)]	1998		1,228,961	58.0						
	2004		1,297,417	53.3						
	2006		1,441,479	59.7						
	2010		1,622,057	59.4						

Sources: Living conditions monitoring survey data, 1998, 2004, 2006, 2010

4.6 Summary

Over the years covered by the study, the mean age has remained roughly constant in both rural and urban areas for both women and men. The mean age has been around 34 years over the years for the rural population above 15 years of age and around 31 years in the urban population for both women and the men. Individuals in the population above 15 years in the urban area for both women and men have shown a trend of been around the thirties while for the rural area the trend has been around the forties at the 75th percentile. Looking at the changes in the age composition in the rural areas, it can be concluded that those who are primarily engaged in farming compared to those who are not primarily engaged in farming have had a higher mean age. For the men engaged in farming an increase in the mean age was seen from 36.5 years in 1998 to 40.4 years in 2010. For those not engaged in farming but living in the rural area, the average age decreased from 28.2 years in 1998 to 26.5 years in 2010. Form this analysis it can be concluded that the young people who might be moving out from agriculture are not all going to the urban areas but might be staying in the rural areas and maybe working in non-agricultural activities.

Though the majority of the rural population is still engaged in farming, there has been a decline in the percentage of individuals engaged in farming over the years. Participation in farming by individuals over 15 years in the rural areas has decreased over the years from about 64 percent in 1998 to about 45 percent in 2010. The analysis on the gender composition in agriculture shows that initially there were more females participating in farming compared to males up until 2004. Then after 2006, fewer females compared to males participated in agriculture. A look at rural female participation in agriculture at the individual level showed that the highest levels of participation in agriculture has been for those in the 15-24 and 25-34 age categories. Female headed household participation in agriculture by different age categories was also analysed. A higher proportion of female headed households in the 35-44 and 45-54 age categories were engaged in farming though the highest reduction in participation came from the 45-54 age category. Their participation fell from 24 percent in 1998 to 21 percent in 2010.

An analysis of the age pyramids for Zambia in the years 1998 and 2010 has shown that young people are higher in proportion in the urban areas compared to the rural areas which might be caused by young people migrating to the urban areas.

CHAPTER FIVE

THE DETERMINANTS OF YOUTH AND FEMALE PARTICIPATION IN AGRICULTURE

5.1 Introduction

This chapter presents the econometric results from the pooled probit model were the factors that influence men and women's engagement in farming, wage employment and migration to urban areas are determined. The fundamental question is whether the youth in rural Zambia are abandoning agriculture and moving to urban areas for wage employment and the factors influencing that decision.

The hypothesis that men are more likely to leave the rural areas with women more likely to stay in the rural areas was tested. Also tested was the hypothesis that young people are more likely to migrate from the rural areas. Also determined were the factors that influence youth's and female participation in agriculture. Presented next are the factors that affect the probability of living in the rural area, being engaged in farming and being engaged in wage employment. This will be followed by the factors affecting the probability of being engaged in wage employment while living in the urban area. The factors that determine youth and female participation in agriculture are then finally presented. Two models for each of the dependent variables were estimated where in the first model variables such as age dummies, gender, household size, level of education and distance variables are included while the second model included the full set of variables including the district dummies. Interpretation from the full set model was done unless otherwise stated. The chapter closes with a summary.

5.2 Determinants of the decision to live in the rural area

Table 5.1 presents the pooled probit estimates for the factors that affect the decision to live in the rural areas. As shown in Table 5.1, columns 1 and 2 represent the average marginal effects for the factors that affect the probability of living in the rural area with column 2 including the full set of variables. An individual in the age category of 15-24 is less likely to live in the rural area (1.6 percent) compared to an individual greater than 65 years. An

individual in the age category 25-34 is also less likely to stay in the rural areas (2.3 percent) compared to an individual greater than 65 years keeping other variables constant. The same is also true for persons in the age category 35-44. An individual in the age category of 35-44 is less likely to stay in the rural area compared to an individual over the age of 65. As was hypothesized, young people are less likely to stay in the rural areas. But as was not hypothesized, males compared to females have a higher probability of staying in the rural areas by 4.6 percent.

An increase in the size of a household increases the probability of the household to reside in the rural area. Better educated household heads are less likely to reside in the rural area by 1.8 percent. Distance to the input market was positively and significantly associated with residence in the rural area. This shows how inaccessible input markets are for those who are in the rural areas who might be engaged in farming. Distance to the police post which was used as a proxy for urban centres was also positively and significantly associated with residence in the rural area. Population density was negatively and significantly associated with residing in the rural area with operational farm size positively and significantly associated with residing in the rural area. Operational farm size was used as a proxy for landholding size.

Further, the results show that being in wage employment reduces the probability of living in the rural area so does being involved in a business activity. Receiving rent from commercial buildings, houses and any other property including non-agricultural land was negatively and significantly associated with residing in the rural area. The results also show that receiving remittances or pension or grant is positively and significantly associated with living in the rural area. Furthermore, the results showed that value added per person in agriculture and industry is negatively and significantly associated with residing in the rural area.

Table 5.1: Probit average marginal effects of the probability of living in the rural area

	1=living in the rural area, 0=otherwise	
Variables	**Average Marginal effects (Model 1)**	**Average Marginal effects (Model 2)**
	(1)	(2)
Age group (=1)		
Age 15-24	-0.036***	-0.016***
	(0.007)	(0.005)
Age 25-34	-0.065***	-0.023***
	(0.007)	(0.005)
Age 35-44	-0.054***	-0.017***
	(0.007)	(0.005)
Age 45-54	-0.033***	-0.007
	(0.007)	(0.005)
Age 55-64	-0.022**	-0.007
	(0.009)	(0.006)
Gender (male=1, female=0)	0.054***	0.046***
	(0.008)	(0.005)
Household Size	0.008***	0.002**
	(0.001)	(0.001)
Level of Education of household head	-0.042***	-0.018***
	(0.001)	(0.001)
Distance to nearest Input market (km)	0.004***	0.003***
	(0.000)	(0.000)
Distance to nearest Police post (km)	0.007***	0.003***
	(0.000)	(0.000)
Access to credit for agric. inputs, 1=yes		-0.003
		(0.007)
Population density (persons/km2)		-0.000***
		(0.000)
Operating farm size (Ha)		0.002***
		(0.000)
Wage income (=1)		-0.113***
		(0.005)
Remittances, pension and grants (=1)		0.009*
		(0.005)
Rentals (=1)		-0.079***
		(0.016)
Business activity (=1)		-0.074***
		(0.005)
Agriculture value added per person		-0.002***
		(0.000)
Industry value added per person		-0.000***
		(0.000)
Services value added per person		-0.000
		(0.000)
Number of observations	37,246	33,177
Log pseudolikelihood	-1880188.6	-1051029.6
McFadden's Adj R2	0.320	0.542
District dummy variable joint test		3171.95***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.3 Determinants of engagement in farming

Table 5.2 presents the average marginal effects for the probability of being engaged in farming with column 2 representing the full set of variables. Being in the age group 15-24 reduces the probability of farming (1.8 percent) compared to being over 65 years while in the full set of variables model (model 2), this variable was found not to be significant. A negative significant relationship was found between being in the 25-34 age group and farming (2 percent) compared to being over 65 years. A positive significant relationship was also found between being in the 45-54 age group and the probability of farming compared to being over 65 years. Also being in the age group of 55-64 increases the likelihood of being engaged in farming compared to being over 65 years. Males are also more likely to participate in farming (3.9 percent) compared to females.

Larger household sizes are more likely to be engaged in farming activities. Larger households are better placed to farm as labour is readily available. Education was found to be negatively and significantly associated with engagement in farming by (3.7 percent). Distance to the input market was found to be positively and significantly associated with engagement in farming. This shows how inaccessible the input markets for seed, fertilizer and agricultural implements can be for those who are engaged in farming. This acts as a barrier for those who do not have means of transportation to go to the input market. Distance to the urban centre was also found to be positively and significantly associated with engagement in farming. This shows how persons engaged in farming are more likely to be found in remote areas. Population density was negatively and significantly associated with engagement in farming. The reason for this may be due to the non-availability of land. As an area becomes more densely populated, land for farming becomes less readily available.

The results also showed that value added per person in agriculture and industry was negatively and significantly associated with engagement in farming while value added per person in services was positively and significantly associated with engagement in farming.

Table 5.2: Probit average marginal effects of the probability of engagement in farming

Variables	1=Engaged in farming, 0=otherwise Average Marginal effects (Model 1)	Average Marginal effect (Model 2)
	(1)	(2)
Age group (=1)		
Age 15-24	-0.018**	-0.001
	(0.007)	(0.006)
Age 25-34	-0.049***	-0.020***
	(0.007)	(0.007)
Age 35-44	-0.021***	0.004
	(0.007)	(0.006)
Age 45-54	0.012	0.030***
	(0.008)	(0.007)
Age 55-64	0.058***	0.071***
	(0.010)	(0.009)
Gender (male=1, female=0)	0.053***	0.039***
	(0.008)	(0.007)
Household Size	0.009***	0.004***
	(0.001)	(0.001)
Level of Education of household head	-0.052***	-0.037***
	(0.001)	(0.001)
Distance to nearest Input market (km)	0.002***	0.001***
	(0.000)	(0.000)
Distance to nearest Police post (km)	0.004***	0.002***
	(0.000)	(0.000)
Access to credit for agric. inputs, 1=yes		-0.009
		(0.010)
Population density (persons/km2)		-0.000***
		(0.000)
Operating farm size (Ha)		0.000
		(0.000)
Agriculture value added per person		-0.000**
		(0.000)
Industry value added per person		-0.000***
		(0.000)
Services value added per person		0.000***
		(0.000)
Number of observations	37,246	37,246
Log pseudolikelihood	-2136226.5	-1711917.3
McFadden's Adj R2	0.247	0.397
District dummy variable joint test		2337.54***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.5 Determinants of being engaged in wage employment

Table 5.3 shows the average marginal effects for the probability of being engaged in wage employment. A young individual in the age group of 15-24 is more likely to be engaged in wage employment (2.6 percent) compared to an individual over 65 years. A positive significant relationship was also found between being engaged in wage employment and being in the 25-34 or 35-44 age group compared to being over 65 years. Surprisingly, an individual in the 55-64 age group was less likely to be engaged in wage employment compared to an individual over 65 years. Males are more likely to be engaged in wage employment compared to females (1.5 percent).

Household size and level of education for the household head was found to be positively and significantly associated with engagement in wage employment. Those who are educated have a better chance of being employed (Filmer *et al.*, 2014). Distance to input market was found to be negatively and significantly associated with engagement in wage employment. Distance to the urban centres was negatively and significantly associated with engagement in wage employment. This shows how wage employment may be highly concentrated in the urban areas.

Population density was positively and significantly associated with engagement in wage employment. Areas that usually become highly populated are areas that might have many business opportunities available. Value added per person in agriculture, industry and services was positively and significantly associated with being engaged in wage employment.

Table 5.3: Probit average marginal effects of the probability of engagement in wage employment

Variables	1=wage Job, 0=otherwise Average Marginal effects (Model 1)	Average Marginal effects (Model 2)
	(1)	(2)
Age group (=1)		
Age 15-24	0.038***	0.026***
	(0.006)	(0.006)
Age 25-34	0.055***	0.036***
	(0.007)	(0.006)
Age 35-44	0.029***	0.014**
	(0.006)	(0.006)
Age 45-54	0.011	0.006
	(0.007)	(0.007)
Age 55-64	-0.048***	-0.045***
	(0.010)	(0.009)
Gender (male=1, female=0)	0.014**	0.015**
	(0.007)	(0.007)
Household Size	0.001	0.003***
	(0.001)	(0.001)
Level of education of household head	0.045***	0.038***
	(0.001)	(0.001)
Distance to nearest input market (km)	-0.001***	-0.001***
	(0.000)	(0.000)
Distance to nearest police post (km)	-0.003***	-0.001***
	(0.000)	(0.000)
Population density		0.000**
		(0.000)
Operating farm size (Ha)		0.000
		(0.000)
Agriculture value added per person		-0.001***
		(0.000)
Industry value added per person		-0.000***
		(0.000)
Services value added per person		-0.000***
		(0.000)
Number of observations	37,246	37,246
Log pseudolikelihood	-1911576.5	-1692699.9
McFadden's Adj R2	0.203	0.294
District dummy variable joint test		1338.41***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.6 Determinants of the decision to engage in wage employment in the urban areas

Table 5.4 presents the pooled probit average marginal effects model for being engaged in wage employment while living in the urban area. An individual in the 15-24 age category is more likely to be engaged in wage employment while residing in the urban area compared to an individual over 65 years. An individual between 25-34 years old is also more likely to live in the urban area and be in wage employment compared to an individual over 65 years old. This was also found to be the case for an individual between 35-44 years old who is more likely to be employed in wage employment while living in the urban area compared to an individual over 65 years old. Surprisingly, individuals who are in the age category 55-64 are less likely to be engaged in a wage employment while residing in the urban area compared to an individual over 65 years old. It was also found that males are more likely to be involved in wage employment while living in the urban areas compared to females. This shows that men are more likely to live in the urban area only when they are involved in wage employment compared to women.

Household size was positively and significantly associated with engagement in wage employment while residing in the urban area. Level of education for the household head was positively and significantly associated with being engaged in wage employment while residing in the urban area. Distance to the input market and distance to the urban centre was found to be negatively and significantly associated with engagement in wage employment while residing in the urban area.

Population density was found to be positively and significantly associated with being engaged in wage employment while living in the urban area showing that people are attracted to places that have opportunities for employment therefore becomes densely populated. Operational farm size which was used as a proxy for landholding size was positively and significantly associated with engagement in wage employment while residing in the urban area. This shows that urban wage employment may have resulted in buying of farms by these individuals. Value added per person in agriculture and services was negatively and significantly associated with engagement in wage employment while residing in the urban area.

Table 5.4: Probit average marginal effects of the probability of engagement in wage employment in the urban area

Variables	1=Living in the urban area and receiving a wage 0=otherwise Average Marginal effects (Model 1)	Average Marginal effects (Model 2)
	(1)	(2)
Age group (=1)		
Age 15-24	0.031***	0.019***
	(0.005)	(0.004)
Age 25-34	0.054***	0.030***
	(0.005)	(0.004)
Age 35-44	0.036***	0.016***
	(0.005)	(0.004)
Age 45-54	0.013**	0.003
	(0.006)	(0.005)
Age 55-64	-0.028***	-0.029***
	(0.008)	(0.006)
Gender (Male=1, female=0)	0.011*	0.011**
	(0.006)	(0.005)
Household Size	-0.001	0.003***
	(0.001)	(0.001)
Level of education of household head	0.035***	0.027***
	(0.001)	(0.001)
Distance to nearest input market (km)	-0.002***	-0.002***
	(0.000)	(0.000)
Distance to nearest police post (km)	-0.004***	-0.002***
	(0.000)	(0.000)
Population density (persons/sq. km)		0.000***
		(0.000)
Operating farm size (Ha)		0.001**
		(0.000)
Agriculture value added per person		-0.001***
		(0.000)
Industry value added per person		0.000
		(0.000)
Services value added per person		-0.000***
		(0.000)
Number of observations	37,246	36,498
Log Pseudolikelihood	-1577793.3	-1279776.4
McFadden's Adj R2	0.242	0.380
District dummy variable joint test		2710.08***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.7 Determinants of youth participation in agriculture

Presented in Table 5.5 are the pooled probit average marginal effects for the factors that may influence youth participation in rural farming. Young men are 11.6 percent more likely compared to young women to participate in farming which is contrary to the conventional wisdom. This might be due to parents preference to young men compared to young females to take over farming operations. This might force young men to participate in agriculture. Also another possible reason as was established in chapter four was that young people who might be moving out from agriculture were all not going to the urban areas but might be staying in the rural areas and maybe working in non-agricultural activities. Therefore, some young men might be doing both agricultural and non-agricultural activities in the rural area. Level of education was negatively and significantly associated with youth participation in agriculture. A youth who has a higher level of education is 1.3 percent more likely not to participate in farming. This might lead to the young people to think of farming as a career for the uneducated.

Distance to the input market and distance to the urban centres was positively and significantly associated with youth participation in rural farming. Being engaged in wage employment reduces the likelihood of youth participation in farming (25 percent). Young people involved in wage employment might view farming as an unattractive occupation. Being engaged in non-farm business activity was negatively and significantly associated with youth participation in farming (8 percent) so was receiving rental income (17 percent). Value added in services was negatively and significantly associated with youth participation in agriculture.

Table 5.5: Probit average marginal effects of the probability of youth participation in agriculture

	1=Youth involved in farming 0=otherwise	
Variables	**Average Marginal effects (Model 1)**	**Average Marginal effects (Model 2)**
	(1)	(2)
Household size	0.0006	0.001
	(0.001)	(0.001)
Gender (male=1, female=0)	0.121***	0.116***
	(0.009)	(0.009)
Level of Education of household head	-0.035***	-0.013***
	(0.001)	(0.001)
Distance to nearest Input market (km)	0.002***	0.001***
	(0.000)	(0.000)
Distance to nearest Police post (km)	0.003***	0.001***
	(0.000)	(0.000)
Access to credit for agric. inputs, 1=yes		-0.005
		(0.013)
Population density (persons/km2)		0.000
		(0.000)
Operating farm size (Ha)		0.000
		(0.000)
Wage income (=1)		-0.251***
		(0.011)
Remittances, pension and grants (=1)		-0.010
		(0.008)
Rentals (=1)		-0.170***
		(0.028)
Business activity (=1)		-0.080***
		(0.008)
Agriculture value added per person		-0.000
		(0.000)
Industry value added per person		0.000
		(0.000)
Services value added per person		-0.000***
		(0.000)
Number of observations	37,246	33,925
Log pseudolikelihood	-2193499.6	-1770899
McFadden's Adj R2	0.142	0.257
District dummy variable joint test		1189.02***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.8 Determinants of female participation in agriculture

A number of factors affect female participation in farming in the rural areas. As Table 5.6 shows, a female in the 25-34 age category is less likely to participate in farming compared to a female over 65 years old. A female in the 45-54 age category is more likely to participate in agriculture compared to one over 65 years old. Larger households with female household members have a higher probability of females participating in agriculture. This might be due to the fact that the parents might have no choice but to give land to the female household members as they might be the only ones to take over the family farms.

Level of education was negatively and significantly associated with female participation in agriculture. Distance to the input market as well as the distance to the urban centres was positively and significantly associated to female participation in farming. Access to credit for agricultural inputs was positively and significantly associated with female participation in farming (2.6 percent). Population density and farm size was also positively and significantly associated with female participation in agriculture. Wage income was negatively and significantly associated with female participation in agriculture (22.4 percent) as well as being engaged in business activity and receiving rentals. An increase in value added in agriculture and industry increases the likelihood of female participation in agriculture while an increase in value added per person in services reduces the likelihood of female participation in agriculture.

Table 5.6: Probit average marginal effects of the probability of female participation in agriculture

Variables	1=Female involved in farming 0=otherwise Average Marginal effects (Model 1)	Average Marginal effects (Model 2)
	(1)	(2)
Age group(=1)		
Age 15-24	-0.009	0.009
	(0.008)	(0.007)
Age 25-34	-0.045***	-0.016**
	(0.008)	(0.008)
Age 35-44	-0.018**	0.008
	(0.008)	(0.008)
Age 45-54	-0.002	0.020**
	(0.008)	(0.008)
Age 55-64	0.000	0.014
	(0.010)	(0.010)
Household Size	0.015***	0.012***
	(0.001)	(0.001)
Level of education of household head	-0.042***	-0.022***
	(0.001)	(0.001)
Distance to nearest input market (km)	0.002***	0.001***
	(0.000)	(0.000)
Distance to nearest police post (km)	0.003***	0.001***
	(0.000)	(0.000)
Access to credit for agric. inputs, 1=yes		0.026**
		(0.012)
Population density (persons/sq. km)		0.000***
		(0.000)
Operating farm size (Ha)		0.001*
		(0.000)
Wage income (=1)		-0.224***
		(0.011)
Remittances, pension and grants (=1)		-0.001
		(0.008)
Rentals (=1)		-0.125***
		(0.024)
Business activity (=1)		-0.113***
		(0.007)
Agriculture value added per person		0.001***
		(0.000)
Industry value added per person		0.000***
		(0.000)
Services value added per person		-0.000***
		(0.000)
Number of observations	37,246	33,925
Log pseudolikelihood	-2200637.7	-1693757.7
McFadden's Adj R2	0.181	0.314
District dummy variable joint test		1499.07***

Probit model results are based on the Living conditions survey for Zambia, 1998, 2004, 2006, 2010
Robust standard errors in parentheses
**10% significance level, **5% significance level, ***1% significance level*

5.7 Summary

The results from the pooled probit model show that young people are less likely to live in the rural area. As was hypothesized, young people are more likely to leave the rural area. Men compared to women are more likely to stay in the rural area (4.6 percent). This led to the rejection of the hypothesis that men are more likely to leave the rural area and that women are more likely to stay in the rural areas. Also males compared to females are more likely to participate in farming (3.9 percent over the years of the study).

The results also showed that young people are less likely to be engaged in farming activities. An individual in the 15-24 age group is less likely to farm by 1.8 percent over the years of the study compared to being over 65 years while being in the 25-34 age group reduces the probability of farming by 2 percent compared to an individual greater than 65 years. Those household heads that have a higher level of education are less likely to reside in the rural area (1.8 percent). Also, those household heads with higher levels of education are less likely to be engaged in farming. Population density was negatively and significantly associated with engagement in farming. As an area becomes more densely populated, land for farming may become less readily available which may force individuals out of agriculture.

Further, the results showed that those engaged in farming are less likely to be near an input market for fertilizer, seeds and agricultural implements and also those who are engaged in farming are more likely to be located in remote areas. A young person in the age category of 15-24 is more likely to be engaged in wage employment (1.6 percent) compared to an individual over 65 years. Males are more likely to be engaged in wage employment compared to females. Being highly educated increases the likelihood of being involved in wage employment.

An individual in the 15-24 age category is more likely to live in the urban area and be engaged in wage employment compared to an individual over 65 years. It was also found that males are more likely to be involved in wage employment while living in the urban areas compared to females. This shows that men are more likely to live in the urban area only when they are involved in wage employment compared to women. Level of education for the household head was positively associated with engagement in wage employment while residing in the urban area. Operational farm size which was used as a proxy for landholding

size was positively associated with engagement in wage employment while residing in the urban area. This shows that being engaged in urban wage employment may have resulted in households ability to purchase land.

Being male, distance to the input market and distance to the urban centres where found to be positively associated with youth participation in farming while level of education, being engaged in wage employment, receiving rentals, being engaged in business activity and value added per person in services was negatively associated with youth participation in farming. Available farming land and access to credit for agricultural inputs can increase female participation in agriculture. This implies that female participation in agriculture can be enhanced by improved access to land and credit.

CHAPTER SIX

CONCLUSION AND ECONOMIC IMPLICATIONS

6.1 Introduction

The overall objective of this study was to determine the likely demographic shifts that may be occurring in Zambia, to proactively anticipate their effects on Zambia's agricultural sector, and to consider the policy implications from these trends. It was hypothesized that men are more likely to leave the rural area, women are more likely to remain in the rural area and that young rural people are more likely to migrate from the rural to urban area. This chapter presents the conclusion of the study which is based on the study findings which were achieved by use of descriptive statistics and econometric analysis using pooled cross sectional data from the LCMS datasets for Zambia over the years of 1998, 2004, 2006 and 2010. Economic implications and policy recommendations are also presented.

6.2 Summary and Conclusions

6.2.1 Summary of the descriptive results on the age and gender composition in agriculture

Results show that over the years covered in the study, the mean age has remained roughly constant in both rural and urban areas for both men and women. The mean age of both the men and the women in the urban areas has been lower compared to the rural areas. A further analysis that was done on the rural sub population showed an increase in the average age of persons engaged in farming compared to the average age of persons not engaged in farming. The average age of a man primarily engaged in farming has been increasing steadily from 36.5 years in 1998 to 40.4 years in 2010. For a man who is not primarily engaged in farming, a decrease in the average age was seen from 28.2 years in 1998 to 26.5 years in 2010. The same was found to be true for the rural woman whose average age has increased for those who are primarily engaged in farming and decreased for those who are not primarily engaged in farming. This showed that the farming population was aging over time. It also showed that the young people who might be moving out from agriculture are not all going to the urban areas but might be staying in the rural areas and may be working in non-agricultural activities.

Initially there were more females participating in farming compared to males up until 2004. Then after 2006 fewer females compared to males participated in agriculture. Female participation in agriculture reduced from 53 percent in 1998 to 47 percent in 2010 while male participation increased from 47 percent in 1998 to 53 percent in 2010. This showed that the farming population was not becoming female dominated over time. A further analysis done on the trends of female participation in rural agriculture showed that females in the age groups of 15-24 and 25-34 years have been the most actively engaged in rural farming over the years covered in the study. Even though the 15-24 age category showed the highest rates of female participation compared to the other age categories, it showed a significant decline in the proportion of female participation in farming over the years covered in the study. Female headed household participation in agriculture by different age categories was also analysed. Female headed households in the 35-44 and 45-54 age groups recorded the highest participation rates in farming though the highest reduction in participation came from the 45-54 age category. Their participation fell from 24 percent in 1998 to 21 percent in 2010. A significant increase in female headed household participation in farming of those over 60 years was seen from 11 percent in 1998 to 14 percent in 2010.

The population age pyramids for 1998 and 2010 both show that a higher proportion of young people have been living in the urban areas compared to the rural areas of Zambia. This may be an indication that the young people are migrating to the urban areas perhaps in search of a better standard of living.

The study also analysed the main economic activities of the working age population in Zambia and established that in the rural population, the majority of the population was involved in farming over the years covered in the study. Over time, this participation in agriculture has however declined from 61.9 percent in 1998 to 40.4 percent in 2010. Self-employment seems to be a popular economic activity compared to wage employment. This might be due to the fact that not so many wage employment opportunities are available in the rural areas. For the urban population, wage employment was more popular over the years covered in the study compared to farming which is a dominant economic activity for the rural population.

6.2.2 Summary of the econometric results

Results from the pooled probit model showed that young people are less likely to stay in the rural area and have a lesser probability of being engaged in farming compared to persons over the age of 65 years. An individual in the age category of 15-24 years is less likely to live in the rural area (1.6 percent) compared to an individual greater than 65 years and an individual in the age group of 25-34 years is also less likely to stay in the rural areas (2.3 percent) compared to an individual greater than 65 years. Being in the age group of 15-24 years reduces the probability of farming (1.8 percent) compared to being over 65 years. A negative significant relationship was found between being in the 25-34 age group and farming (2 percent) compared to being over 65 years.

Men are more likely to stay in the rural areas (4.6 percent) compared to women and are less likely to stay in the urban areas compared to women. Men are also more likely to be engaged in farming compared to women. Men compared to women are more likely to be engaged in wage employment in the urban areas. This shows that men compared to women are more likely to live in the urban areas only when they are involved in wage employment. Findings also show that larger households are more likely to live in the rural area and also more likely to be engaged in farming. Larger household sizes are better placed to be engaged in agriculture as the source of labour is readily available. Distance from the police post which was used as a proxy for urban centres was positively associated with being engaged in farming while distance from the urban centres was negatively associated with engagement in wage employment. With regards to wage employment, this shows that more job opportunities are available in areas closer to the urban centres compared to areas in remote areas. Distance to input markets for fertilizer, seeds and agricultural implements was positively associated with being engaged in farming. Distance to the nearest input market was negatively associated with residing in the rural area. This shows that the markets that provide agricultural inputs for the farmers are located far from the farmers that need the inputs.

It was also found that those with a larger operational farm size, which was used as a proxy for landholding size, have a higher probability of living in the rural area. Operational farm size was found to be positively associated with engagement in wage employment while residing in the urban area. This shows that urban wage employment may have resulted in buying of farms by these individuals. Population density is negatively associated to engagement in

farming showing that land may become less available as an area becomes more densely populated.

Engagement in wage employment and business activity was negatively associated with residing in the rural area showing that wage employment and business activities are associated with people in the urban areas compared to the rural area. Receiving rent from commercial buildings, houses and any other property including non-agricultural land was negatively associated with living in the rural area. It was also shown that receiving remittances or pension or grant increases the likelihood of residing in the rural area.

The results also show that an increase in the value added per person in agriculture and industry reduces the probability of living in the rural area. Value added per person in agriculture and industry was negatively associated to being engaged in farming while value added per person in services was positively associated to being engaged in farming. As the value added per person in agriculture increases, fewer workers are needed as machinery replaces man-power. Value added per person in agriculture, industry and services reduces the probability of being engaged in wage employment. Value added per person in agriculture and services was negatively associated to engagement in wage employment while residing in the urban area.

As was also seen from the results, those household heads that are better educated have a reduced likelihood of living in the rural area and being engaged in farming. Level of education of the household head was positively associated with engagement in wage employment but this might have a negative effect on farming as farming might be left with less educated persons. Level of education was also positively associated with engagement in wage employment while residing in the urban area.

Now the question is are the rural youth abandoning agriculture in Zambia? Rural youth are abandoning agriculture in Zambia as has been shown from the aging trend of the farming population from the years covered in the study. Being male, distance to the input market and distance to the urban centres was positively associated with youth participation in farming while level of education, being engaged in wage employment, receiving rentals, being engaged in business activity and value added per person in services was negatively associated with youth participation in farming. Young men are 11.6 percent more likely to be engaged in

farming than young women which is contrary to the conventional wisdom. Being engaged in wage employment reduces the likelihood of youth participation in farming by 25 percent. Young people involved in wage employment might view farming as an unattractive occupation. Available farming land and credit can increase female participation in agriculture. This implies that female participation in agriculture can be enhanced by improved access to land and credit.

6.3 Economic implications and policy recommendations

The aging of the farming population that is taking place in rural Zambia calls for serious attention if discussions on rural development are to be realistic more especially that youth employment has become an urgent issue. Therefore, a more attractive and remunerative agriculture could keep more young people productively engaged in agriculture and thereby reduce unemployment and underemployment in urban areas. For agriculture to be more attractive and remunerative to the rural youth, polices that aim at making youths to be more involved in high value, high return agricultural activities is one option. High value, high return agricultural activities such as horticulture production exists in Zambia which should be explored by the youth but they are currently no institutions in horticulture production like the ones found in maize production. Maize production in Zambia enjoys the support of FISP and FRA. The right institutions are not only needed in high value crop production but also in accessing land for agricultural production. The right institutions in land allocation would further help young farmers have access to credit facilities as most credit institutions require collateral. Involvement by the youth in high value, high return agriculture coupled with the use of titled land owned by the youth would further attract microfinancial institutions to penetrate into the rural areas. Making agriculture attractive and remunerative may increase participation of the educated youths especially that as was found in the study, the more educated a youth is the more unlikely the youth will participate in agriculture.

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