Economics of Land Reform Models used in Mashonaland Central Province of Zimbabwe.

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DECLARATION

I, Lovemore Musemwa, hereby declare that the work contained in this thesis is my own and that other scholars' works referred to here have been duly acknowledged. I also declare that this thesis is original and has not been submitted elsewhere for a degree.

Musemwa Lovemore Date

ABSTRACT

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The land reform that has unfolded in Zimbabwe since 1980 used different models and had diverse consequences. Since the implementation of the fast tract land reform programme in 2000, Zimbabwe experienced heavy reduction in yield and output at farm level that led to a 70% shortfall in production to meet annual food requirements (Richardson, 2005). The economic crisis in Zimbabwe has been characterized by worsening food insecurity especially in the rural areas where harvests continue to be poor. In the beef sector, Zimbabwe has failed to meet its export quota to the EU. The shortfall in production to meet annual food requirements shows a very grim situation but do not tell us about the performance of resettled farmers who now occupy much of the productive land.

The broad objective of the study was to determine and compare the production efficiency of resettled farmers in Zimbabwe across land reform models. In addition, the study determined land use intensity. The study was conducted in the Mashonaland Central Province of Zimbabwe mainly because a wide variety of field crops were grown by resettled farmers. The respondents were stratified into three groups. These were: beneficiaries of land reform before 2000 (resettle scheme), fast track A1 model and fast

track A2 model. The three models differ on how they were implemented and supported and this might result in different efficiencies of the models. A total of 245 copies structured questionnaire were administered on the resettled farmers from June to September 2010.

Descriptive statistics was applied to the basic characteristics of the sampled households. The effect of model of land reform, gender of the household head, marital status, age of the household head, education, household size, religion, dependence ratio, whether the farmer was fulltime or part-time in farming, experience of the farmers in farming at that environment, total land size owned by the farmers and soil type on revenue per hectare and land use rate were determined using the GLM procedure of SAS (2003). Significance differences between least-square group means were compared using the PDIFF test of SAS (2003). The relationship between Revenue and land utilization was examined using the Pearson's correlations analysis. Dependance between response variables that had an effect on either revenue per hectare or land utilization with all the other response variables was tested using the Chi-square test for dependance. To find the effect of arable land used and herd size on revenue per hectare and land use the RSREG Procedure of SAS (2003) was used. Input oriented DEA model under the assumption of constant return to scale was used to estimate efficiency in this study. To identify factors that influence efficiency, a Tobit model censored at zero was selected.

The mean land use rate varied significantly ($p<0.05$) with the land reform model with A2 having highest land use rate of 67%. The A1 and old resettlement households had land use rates of 53% and 46%, respectively. Sex, marital status, age of the household head, education and household size significantly affected land use ($P<0.05$). Revenue per hectare was not affected by any the factors that were inputted in the model. Results from the DEA approach showed that A2 farmers (large land owners) had an average technical efficiency score of 0.839, while the lowest ranking model (A1) had an average score of 0.618. Small land holders (A1 and the old resettled farmers) are on average less cost-efficient than large land owners, with a score of 0.29 for the former compared with 0.45 for the latter.

From the factors that were entered in the Tobit model, age of household head, excellent production knowledge and farmer status affected technical efficiency whereas allocative efficiency was only affected by good production knowledge, farm size, arable land owned and area under cultivation. Factors which affected economic efficiency of the resettled farmers are secondary education, household size, farm size, cultivated area and arable land owned. None of the included socio-economic variables has significant effects on the allocative and economic efficiency of the resettled farmers. Thus, the allocative and economic inefficiencies of the farmers might be accounted for by other natural and environmental factors which were not captured in the model.

Keywords: Data Envelope Analyses, Land Reform, Land Use, Tobit model, Revenue

DEDICATION

To my dear mother, S Chataika and daughter, Nicole

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LIST OF ABBREVIATIONS

ADB	African Development Bank
AE	Allocative Efficiency
AIDS	Acquired Immunodeficiency Syndrome
ARDA	Agricultural Rural Development Authority
BSAC	British South African Company
CE	Cost Efficiency
CFU	Commercial Farmers Union
CRS	Constant Returns to Scale
DDF	District Development Fund
DEA	Data Envelope Analysis
DLA	Department of Land Affairs
EE	Economic Efficiency
EIRR	Economic Internal Rate of Return
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GLM	General Linear Model
GNU	Government of National Unity
GoZ	Government of Zimbabwe
Ha	Hectare
HIV	Human Immunodeficiency Virus
IFRC	International Federation of Red Cross

IMF	International Monetary Fund
Km	Kilometers
LSC	Large Scale Commercial
LU	Livestock Unit
MDC	Movement for Democratic Change
MDG	Millennium Development Goals
mm	Millimetres
NECF	National Economic Consultative Forum
NGOs	Non-Governmental Organizations
NRs	Natural Regions
OLS	Ordinary Least Square
RCS	Red Crescent Societies
RE	Revenue Efficiency
SACAU	Southern African Confederation of Agricultural Unions
SAS	Statistical Analysis System
SPSS	Statistical Package for Social Scientists
TE	Technical Efficiency
USDA	United States Department of Agriculture
US$	United States Dollar
VRS	Variable Returns to Scale
ZANU PF	Zimbabwe African National Union – Patriotic Front
ZimVac	Zimbabwe Vulnerability Assessment Committee

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CHAPTER 1

INTRODUCTION

1.1 Background

In a predominantly agricultural country like Zimbabwe, the problem of land reform has naturally been one of the most important subjects of political campaign and economic turmoil (Shaw, 2003; Sachikonye, 2005). Zimbabwe's land distribution was racially highly skewed towards whites before land invasion and the status quo was not politically, socially or economically sustainable (Sibanda, 2001; Utete, 2003). This has been the state of affairs since the British invasion of 1890. It is this inequitable distribution of land that prompted the black people to take up arms and fight for independence (Government of Zimbabwe, 2000; Moyo, 2004).

To address the imbalances in land access while alleviating population pressure in the communal areas, extend and improve the base for productive agriculture in the smallholder farming sector, the Government of Zimbabwe in 1980, adopted land reform and a resettlement program premised on land acquisition and redistribution (Kinsey, 1999; Lahiff and Cousins, 2001). After the implementation of the fast track land reform programme in 2000, the majority of the land is in the hands of the small holder black farmers (Utete, 2003). Using agriculture as the basis for economic growth requires a productivity revolution in smallholder farming. However, after the fast track land redistribution programme, Zimbabwe experienced heavy reduction in yield and output at farm level that led to a 70% shortfall in production to meet annual food requirements

(Richardson, 2005). The economic crisis in Zimbabwe has been characterized by worsening food insecurity especially in the rural areas where harvests continue to be poor. Recurring droughts coupled with input (seed and fertilizer) shortages and overpricing, and a resultant lack of timely planting, led to very poor harvests in 2008 and 2009. According to a Zimbabwe Vulnerability Assessment Committee (ZimVAC) Report (2009), the number of households consuming three meals a day declined from 54 % in 2006 to 23 % in 2009, and many households had to sell their assets, including livestock, to purchase food. Lower food production and failure of agriculture led to dependency on food aid. It is also reported that the food aid is not being systematically distributed to all the poor and needy in the country (ZimVAC, 2009). Several macroeconomic and other factors have caused considerable damage to the agricultural sector and made agricultural production uncertain. Lower production leading to higher prices when coupled with inflation (before the formation of the Government of National Unity (GNU) in 2009) made it harder for families to buy food.

To increase agricultural productivity after the formation of GNU in Zimbabwe, the value of output must increase faster than the value of inputs. Gains in overall agricultural productivity can therefore come from changes in the physical productivity level through change in technology employed in the production process, which results in more output per unit of input such as land (yields) or labour, or from changes in production and market costs and hence increased profitability of farmers.

The land reform that has unfolded in Zimbabwe since 1980 has had diverse consequences. Up till today, policy makers are grappling with the question of ‘what is the best model of land reform?’ How can a new agrarian structure be supported, and a vibrant rural economy be developed? Yet such discussions are often taking place in a vacuum, with limited empirical data from the ground and eclipsed by racial misperceptions and inappropriate political assumptions (Mashava and Dzingirai, 2010). These mixed stories regarding land reform stem from the fact that land reform is a package whose substance and implementation differ across models of land reform, and thus will have a heterogeneous impact. This necessitates a need for empirical analyses of efficiency of land reform beneficiaries across different models of land reform.

1.2 Statement of the problem

The measurement of farm efficiency is an important area of research both in the developed and developing world (Tadesse and Krishnamoorthy, 1997). As the world population continues to grow geometrically, great pressure is being placed on arable land, water, energy, and biological resources to provide an adequate supply of food while maintaining the integrity of our ecosystem (Pimentel *et al*., 1995). Reports from the Food and Agricultural Organization of the United Nations, numerous other international organizations, and scientific research also confirm the existence of this serious food problem. For example, the per capita availability of world grain, which makes up 80 per cent of the world's food, has been declining for the past 15 years (Kendall and Pimentel, 1994). Certainly with a quarter million people being added to the world population each day, the demand for grain and all other food will reach unprecedented levels. In addition to population growth, fertile cropland is being lost at an alarming rate. For instance, nearly one-third of the world's cropland (1.5 billion hectares) has been abandoned during the past 40 years because erosion has made it unproductive (Pimentel *et al*., 1995). The only way that food production can be increased is by increasing farm efficiency. This suggests that policy interventions of which land reform is one, should always be linked to increased farm efficiency.

According to Kinsey (1999), the main long standing objectives of the land reform program have been to address the imbalances in land access while alleviating population pressure in the communal areas, extend and improve the base for productive agriculture in the smallholder farming sector, and bring idle or under-utilized land into full production. However, this was never achieved in Zimbabwe. Since 2000, Zimbabwe's national crop production has been affected badly (World Bank, 2007). Areas under cultivation have decreased substantially between 1999/2000 and 2007/2008. Maize plantations reduced from 850.000ha to 500.000 ha, soya plantations from 220.000 ha to 60.000 ha and tobacco from 180.000 to 60.000ha (World Bank, 2007). In the beef sector, Zimbabwe has failed to meet its export quota to the EU for a number of years (Richardson, 2005).

These macro-economic figures suggest a very grim situation but do not tell us about the performance of resettled farmers who now occupy much of the productive land. Are these reductions in land area cultivated and yield a result of lack of efficiency on the part of resettled farmers? Most land reform beneficiaries are failing to feed themselves. Jill

(2005) even stated that the present land reform programme had, in several cases, negative effects on poverty alleviation. This, therefore, implies that the Zimbabwean land reform programme has not lived up to its objectives to transform land-holding, combat poverty and revitalize the rural economy. If land reform is to meet its wider objectives, efficiency has to increase amongst the beneficiaries of land reform. Although, the land reform process, especially the Fast track programme in Zimbabwe is still young, it seems that now is the time to start evaluating the efficiency of these resettled farmers.

1.3 Objectives

The broad objective of the study is to determine and to compare the production efficiency of resettled farmers in Zimbabwe across the three land reform models used by the Government. In addition the study will also determine the level of land utilisation intensity by these resettled farmers.

Specific objectives include:

1. Determining and comparing the efficiency level of resettled farmers in Zimbabwe across models of land reform.
2. Assessing the intensity with which land is being used by the beneficiaries of land reform.
3. Investigation of the factors affecting efficiency of resettled farmers.
4. Based on the research findings, recommend strategies for improving the efficiency of resettled farmers.

1.4 Hypotheses of the study[1]

1. Large land holders (A2 farmers) are more efficient than small land holders (A1 and the old resettled farmers).
2. Land reform beneficiaries cultivate all their land.
3. Household characteristics, information accessibility, experience of farmer, model of land reform, farming knowledge, education, soil type, main source of income, availability of extension services and land size affect efficiency of resettled farmers.

1.5 Justification of the study

After gaining independence from Britain on 18 April 1980, Zimbabwe adopted land reform programmes. There has been a widespread criticism of some of the programmes implemented to redistribute land in Zimbabwe. However, after the implementation of the Fast Track Land Reform Programme, Zimbabwe has experienced grain shortages. Critics of land reform give the blame of grain shortages to the low productivity of the resettled farmers. Policy makers might consider two issues in addressing grain shortage in Zimbabwe: firstly, how to enhance agricultural productivity and secondly, how to encourage farmers to adopt new technology. Many studies have been conducted on the slow rate of technical change, but most ignore efficiency aspects of farm households (Cornia, 1985; Feder, 1985; Moyo, 2004). This thesis is concerned with the efficient utilization of the resources allocated to land reform beneficiaries in Zimbabwe.

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[1] Hypotheses are stated as null hypotheses

Considering that the possibility to boost farm production by bringing land into cultivation has reduced to an insignificant level, soaring and sustained rates of agricultural growth largely driven by productivity growth are necessary if Zimbabwe is to accelerate national economic recovery. This is because agricultural growth has powerful leverage effects on the rest of the economy, especially in the early stages of development and economic transformation, when agriculture accounts for large shares of national income, employment, and foreign trade. Measuring efficiency and productivity is important in Zimbabwe for several reasons. Firstly, the performance of farm households is evaluated by efficiency and productivity which are performance measures and success indicators. Secondly, the determinants of productivity differentials can be hypothesized by estimating efficiency and productivity, and isolating their effects from the effects of the environment in which production occurs.

The identification of sources of inefficiencies could assist in the formulation of land reform policies and models as well as institutional reforms that can improve the performance of resettled farmers. The information gathered in this study will be used as a basis for the expansion of the land reform programme in other areas of Zimbabwe which are yet to benefit from the land reform programme. The study would also be of great benefit to developing countries which are yet to undertake the land reform programme. Apart from supplying information for improving productivity of the resettled farmers, this study would contribute to literature on technical, allocative and economic efficiencies that are rare for farm businesses of the resettled farmers (Bojnec and Latruffe, 2008).

1.6 Limitations of the study

The memory recall process by which farmers remember series of production related data and information was, among other limitations, the most serious shortcoming of the survey method that was witnessed. In addition, time, budgetary constraints and ignorance of the some household heads are the other problems which made data collection a tiresome and difficult process. Farmers were unable to grasp the idea of research and sometimes refused to give information due to fear of paying taxes and of their farms being repossessed by the Government due to underutilisation as explained in Section 6.3. Poor road networks and political instability in some of the communities in Shamva District resulted in the research not being conducted in some of the randomly selected communities that benefited from land reform. The unit of measure for output varied significantly from farmer to farmer, for instance one farmer would say I produced 7 gallons of sugar beans and sold each gallon for US$30 whilst the other farmer would say I produced 4 bags of sugar beans last season and sold each bag for US$180. This made using the actual quantities of output (kilogrammes) in the analysis not feasible hence the total market value of production was adopted.

CHAPTER 2

AGRARIAN AND LIVELIHOOD CHANGES IN ZIMBABWE: FROM COLONIZATION TO THE FORMATION OF GOVERNMENT OF NATIONAL UNITY[2]

2.1 Introduction

Land is an important and sensitive issue amongst all Zimbabweans. According to Jill (2005), land is a scarce resource, a corner stone for reconstruction and development. The life of people living in rural areas mostly depends on land availability and use. Rugege (2004) stressed that the interests of the majority have been damaged by the interests of the few who control this limited resource. Past land policies were a major cause of insecurity, landless citizens and poverty in Zimbabwe (Moyo, 1986). This has severely restricted effective resource utilization and development. In 1965, Rhodesia upon independence from Britain, white Rhodesians[3] seized control of the majority of fertile land within the country and forced blacks to use the poorer, arid, and unproductive ground. The white, large-scale commercial farmers (less than 1 % of the population) occupied 45 % of all agricultural land, of which 75 % was found in the most agriculturally productive areas (Shaw, 2003).

After minority rule ended in 1980, Zimbabwe inherited a thriving agro-based economy. However, after gaining independence from Britain in 1980, the Zimbabwean Government also adopted the land reform programme targeted at addressing the

[2] This chapter has been published in the following Journal:
Musemwa, L and Mushunje, A. 2011. Agrarian and life style change in Zimbabwe: From colonization to the formation of government of national unity. African Journal of Agricultural Research 6 (21) : 4824-4832

[3] Zimbabweans before independence (18 April 1980)

imbalances in land access while alleviating population pressure in the communal areas (Kinsey, 1999). The land reform that has unfolded in Zimbabwe since 1980 has had diverse consequences. For many years hailed as southern Africa's bread basket, Zimbabwe's agriculture has been on a steady decline, shrinking by 50 per cent in seven years, triggering a wave of food shortages and pushing up the prices of food stuffs (Richardson, 2006). Since 2000, the agricultural sector in Zimbabwe has been in disarray. Small-scale farming families have got more land since the land reform, but government support has disappeared almost completely (Richardson, 2006). External inputs are very difficult to get, and when available, out of reach for most farmers.

In addition, successive droughts, poor investment in production, equipment and inputs, lack of know-how and shortage of labour have taken a toll on Zimbabwe's agricultural sector, which is failing to feed its hungry population or supply raw material to its agriculture-based industries (Richardson, 2007). The collapse of the agricultural sector has brought huge food shortages. One in every 3 Zimbabweans, or about 4 million people, depends on food aid (FAO, 2001). To add on to this, the ecological degradation is enormous, exacerbating poverty even further. Although the agricultural sector declined dramatically in the early 21st century, it is still an important productive sector of the country’s economy. It regularly generates about 15 % of the gross domestic product (GDP). More than one-half of the total labour force is engaged directly in agricultural activities (Chitiga and Mabugu, 2008). This chapter therefore provides the untold story of Zimbabwean agrarian change from colonial times to the present. It clearly explains how land rights of both the whites and the black Zimbabweans were damaged by the government of Rhodesia and later by the government of Zimbabwe.

2.2 Zimbabwe land question

Colonialist, moved into Zimbabwe in 1890 with the hope of prospecting minerals but it emerged the area did not match the Second Rand (now South Africa). The settlers turned their attention to the land for agricultural purpose, and the herds of cattle possessed by the native population (Moyo, 1999). The Rudd concession which was fraudulently obtained from the Ndebele King Lobengula in 1898 gave the settlers mineral rights (Mukanya, 1991). According to Martin and Johnson (1981), the first group of settlers was granted 3 000 acres of the prime land without compensation given to the black population. Each member of the company police force was granted 4 500 acres of the best agricultural land in Mashonaland. To force the black Zimbabweans off the prime land the company introduced laws.

In 1898, the Native Reserve Order in Council was established. This created areas where blacks would live away from the whites (Gundani, 2002). The areas designated for indigenous people became known as the Native Reserves. This was followed by a systematic massive expropriation of about one sixth of the total farming land in the country. According to Utete (2003), the native population was removed from high potential agro-ecological regions I, II, and III and then forced to crowd into poor regions IV and V. Historical records of the period 1896 to 1897 depict a sorry picture of a systematic violation of the rights and dignity of the indigenous people under white domination which resulted in the indigenous people waging a war of liberation known as *Chimurenga/Imfazwe* during this period (Gundani, 2003). The war was basically a struggle to recover lost land and dignity.

In 1914, the settler population increased to about 28 000. This increase in population exacerbated the conditions of the indigenous population; they had to make way for the increasing population of the settlers. Seven hundred and fifty two thousand Africans occupied 24 million acres, while 23 730 settlers owned 19 million acres of the best farming land by 1914 (Utete, 2003). In 1915, the British South African Company (BSAC) expropriated some high potential land that was adjacent to the Native Reserves and created the Reserve Purchase areas. For the African to procure land within this area one had to hold a master farmer's certificate. But the settlers who farmed within the large scale farms did not need a master farmer's certificate or any paper, yet they could own and manage farms; being white was enough (Utete, 2003). The year 1923 marked the end of the company rule and ushered in a new dispensation of the government of the Responsible Authority. In this scenario Southern Rhodesia became a self-governing colony subject to the British government with regard to a few constitutional provisions.

In 1930, the Land Apportionment was instituted and this legitimately divided the country between the races (Mukanya, 1991). Under the Land Apportionment Act, 51 per cent of land was reserved for white settlers (who numbered about 50,000), 30 per cent for African reserve areas (for about 1 million blacks), and the remainder for commercial companies and the colonial government (Palmer, 1977). The whites reserved for themselves the more fertile land with high rainfall and Africans were forcibly removed from some previously demarcated native reserves, whose conditions were considered good for settler use and crowded in some reserves whose rainfall and soil were poorer (Utete, 2003). The arid soils and sparse rainfall could not guarantee adequate food for the ever growing African population. Faced with food shortages and malnutrition due to a restrictive agricultural system in terms of land, the black farmers left farming to work for wages in mines and commercial farms (Mukanya, 1991). To further weaken the indigenous people agricultural income base, restrictive acts such as the Maize Control Act and the Cattle Levy Act were put in place (Mukanya, 1991; Gundani, 2002). The Maize Control Act made sure that the blacks had limited marketing outlets and the Cattle Levy Act basically reduced numbers of cattle owned by a black farmer, as they would attract a higher tax amount (Moyana and Sibanda, 1989). The elected Responsible Authority did not address or redress the uneven distribution of land in Zimbabwe; in actual fact it worsened the conditions of the native population (Gundani, 2003).

The period that followed the end of the Second World War ushered another new dispensation in the struggle for land in Zimbabwe. There was a marked influx of immigrants from Britain into Zimbabwe. About 150 000 postwar émigrés were received in the country from Britain (Gundani, 2003). In 1945 the Land Acquisition scheme was established in order to facilitate the handing out of farms to the World War II veterans as payment or grant. To create room for the Second World War veterans, the colonial government forcibly removed about 10 000 Africans from the land that was earmarked for the settlers by the Land Apportionment Act of 1930 (Mukanya, 1991). In order to fine-tune the racist policies of the colonial government, the Land Apportionment Act of 1930 was amended many times. As the number of whites increased in the country the land loss to blacks also increased. Africans were crowded in the Native Reserves where they were exposed to poverty, malnutrition, as well as to disease and death. Overcrowding led to severe land degradation of the native areas.

The amendment of 1951, which became known as the Land Husbandry Act, gave the settler farmers a green light to use forced labour (*Chibharo in Shona*) (Mukanya, 1991). It sanctioned the compulsory destocking of the African herd, and limited African families to five herds of cattle and eight acres of land. Every family had to comply or face the confiscation of the total herd. The condition was exacerbated by the introduction of taxation that was supposed to be paid in cash. They had no choice but to go and work in farms and mines. The final amendment of the Land Apportionment Act of 1930 came in 1961. Its purpose was to institutionalize the racial segregation further. Under this amendment more and more land was allocated to the settler community as shown in Figure 2.1. Statistically according to Gundani (2002), European Areas stood at 49 149 000 acres, Native Areas remained static at 21 600 000 acres. Native Purchase Area was 7 465 000 acres; this was land that could be bought by some natives that had the money to do so. Unassigned Land 17 193 000; this was land which was not allocated to any particular group of people. Forest Land was 591 000 acres; this was the land that was allowed to remain as forest. Undetermined Land stood at 88 000 acres.

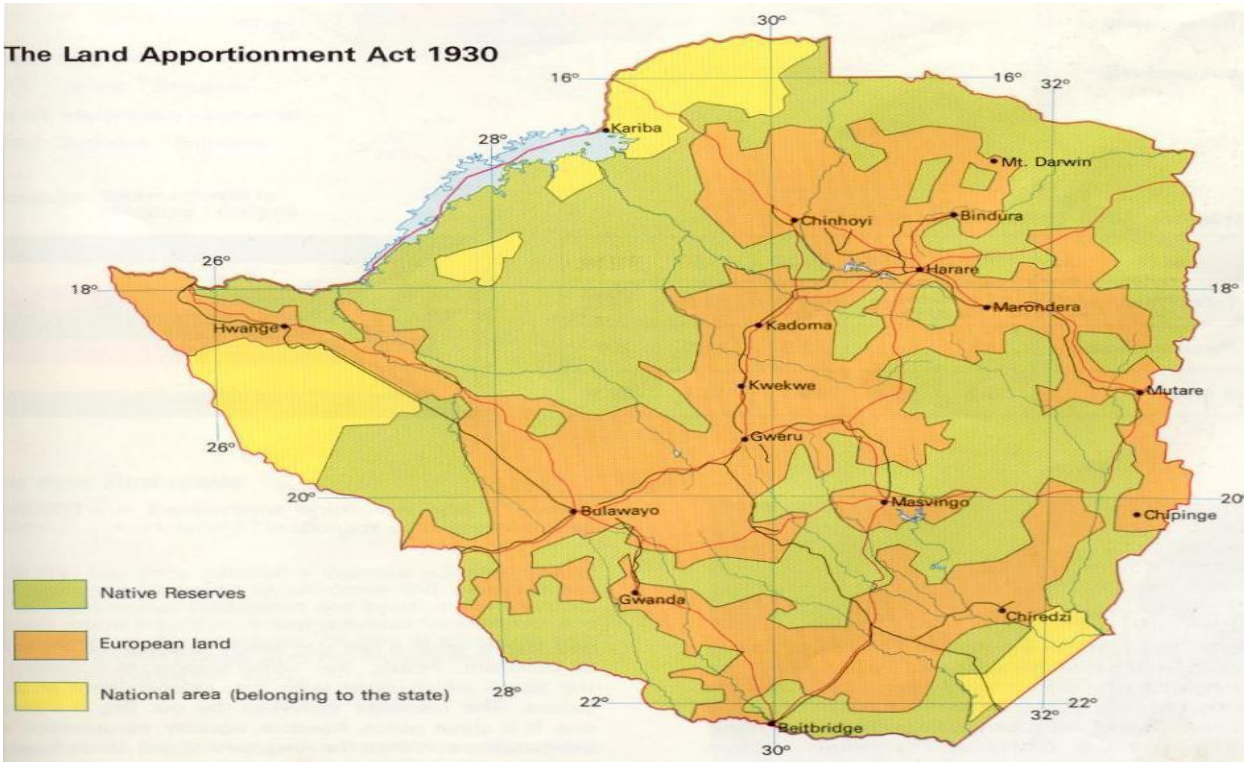

Figure 2.1: Demarcations of the Land Apportionment Act of 1930 (Source: Gora, 2008)

In spite of the high birth rate and the terrible conditions in the African areas the land apportioned to the indigenous people remained static. From 1923, which introduced the Responsible Authority, down to the end of Winston Field's rule in 1963, nothing was done to address or redress the land question, so as to wipe out the racial nature of the distribution of land in Zimbabwe. Ian Smith came to power in 1965 through a coup that was conducted against Winston Field. Ian Smith's government managed to removed 88 000 blacks from the so called European Lands (Mukanya, 1991).

In 1969 the Land Tenure Act was introduced. Many more black Zimbabweans were evicted to create space for more white immigrants. While half of the country belonged to the whites who constituted about a quarter of a million, the poorer and dryer half belonged to the majority black population which stood at about 5,5 million (Figure 2.2). With the horrible life that the indigenous people experienced in the reserves the possibility of an uprising was inevitable.

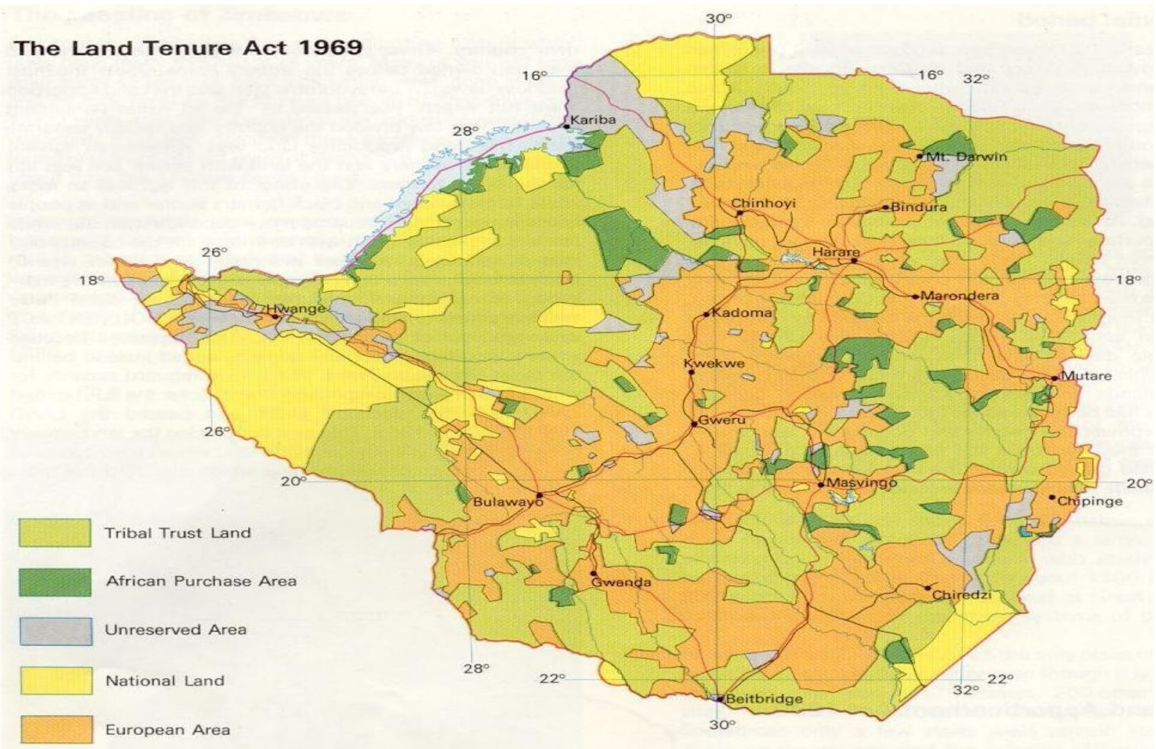

Figure 2.2: Demarcations made by the Land Tenure Act of 1969 (Source: Gora, 2008)

Another war known as the Second *Chimurenga* whose main objective was to regain the lost land and have the land redistributed to poor and landless blacks was fought from July 1964 to 1979 (Utete, 2003). The war and its subsequent settlement ultimately led to the implementation of universal suffrage. The freedom fighters had promised the masses that land would be distributed to the native population as soon as the war came to an end; that all the farms that belonged to the whites were going to be redistributed to the native population, who according to the doctrine of the war were the original and real owners of the land (Sachikonye, 2005a). With this understanding in their minds the Africans supported the war to its end. On the 18th of April the Second *Chimurenga* came to an end, and Zimbabwe was declared independent from British colonial rule. At independence, 6 000 white farmers owned 15.5 million hectares; 8 500 black farmers operating on a small scale held about 1.4 million hectares; and approximately 4.5 million communal farmers held 16.4 million hectares (Gundani, 2003). Most of the communal land was located in the periphery and margins of the country prone to droughts, where the soil fertility was very poor and where rainfall was very low (Utete, 2003).

2.3 Land reform and the resettlement programme

Zimbabwe inherited a thriving agro-based economy upon independence in 1980 characterized by duality and a racially skewed land ownership pattern. This unequal access to use land forced the government of Zimbabwe to adopt land reform and a resettlement program premised on land acquisition and redistribution. According to Kinsey (1999), the main long standing objectives of this program have been to address the imbalances in land access while alleviating population pressure in the communal areas, extend and improve the base for productive agriculture in the smallholder farming sector, and bring idle or under-utilized land into full production.

Despite the new government's commitment to land reform, it was highly constrained by the constitutional provisions of the Lancaster House agreement signed in 1979. The limitations on compulsory acquisition through the "willing seller/willing buyer" approach, with full compensation in foreign exchange, meant that any resettlement was going to be slow and expensive for the new government taking over from a war economy to get fertile land that was owned by the whites (Mukanya, 1991). Many rural people supported the liberation struggle seriously on the understanding that they will get back their lost land from the colonialists (Utete, 2003).

2.3.1 The first phase of land reform (1980 to 1998)

The first phase of land resettlement programmes was launched by the Zimbabwean government in September 1980. According to Utete (2003), the objectives of this first phase of land reform were as follows:

- to reduce civil conflict by transferring land from Whites to Blacks,
- to provide opportunities for war victims and the landless,
- to relieve population pressure in the Communal Lands,
- to expand production and raise welfare nationwide, and
- to achieve all of the above without impairing agricultural productivity

Under the Lancaster House Constitutional provisions, no meaningful land reform programme could take place. The Constitution obligated Government to acquire land on the willing buyer willing seller principle during the first ten years of independence. When land was offered to the Government, in most cases it was expensive, marginal and occurred in pockets around the country, making it difficult to implement a systematic and managed land reform. Moreover, land supply failed to match the demand for land for resettlement. Added to the complicating factors was the absence of the international support to fund land acquisition. In a bid to speed up the process of land acquisition and resettlement, Government passed the Land Acquisition Act of 1992, following the introduction in 1990 of Constitutional Amendment Number 11.

These legal instruments had the effect of freeing Government from the willing seller willing buyer phrase. The process however remained slow, cumbersome and expensive largely because of the commercial farmers' resistance. For example, when the government designated 1471 farms for compulsory acquisition in December 1997 a total of 1393 objections were received of which 510 were upheld. The British conservative Government under John Major had agreed to assist with further funding for land reform, in 1996. However with the coming to power of Tony Blair's Labour Government in 1997 the agreement changed. The labour Government refused to advance the process of land reform effect revoking Britons obligations as per the Lancaster House understanding. This stance by the labour Government marked the beginning of worsening relations between the two Governments. No further funds were made available for Zimbabwe Land Reform Programme.

The Government of Zimbabwe acquired 3 498 444 hectares of land and resettled 71000 families under this first phase of land reform programme in the period between 1980 and 1998 as shown in Table 2.1. The programme provided crop packs and tillage services for half a hectare to each family in the first year of settlement. Commendable progress was achieved in providing infrastructure for the settlers in the early stages of resettlement. The majority of settler families experienced real increases in incomes, which exceeded those of their counterparts in communal areas (Utete, 2003).

Table 2.1: Phase 1 land acquisition with settler emplacement

Year	Area(ha)	No. of Settlers
1979/80	176 671	1 971
1980/81	326 972	8 848
1981/82	819 155	14 179
1982/83	807 573	7 959
1983/84	173 848	3 659
1984/85	74 848	4 719
1985/86	86 187	1 250
1986/87	133 516	6 142
1987/88	80 554	2 687
1988/89	69 361	2 574
1989/90	52 739	2 530
1990/91	35 091	2 167
1991/92	26 418	2 320
1992/93	43 106	575
1993/94	24 027	1 260
1994/95	42 449	3 160
1995/96	192 885	4 000
1996/97	186 525	550*
1997/98	146 519	450*
Total	3 498 444	71 000

(Source: People first, 2001)

* The relatively low Figures for settler emplacement in the last two years reflect the time lag between the acquisition, planning and demarcation stages and the actual emplacement of settlers on the properties concerned.

Some settler families invested in substantial land improvements, permanent housing and production and transport equipment such as tractors and scotch carts. In addition some families diversified into specialized crops like tobacco, paprika and cotton. Phase 1 of the Resettlement Programme achieved an ex-post economic internal rate of return (EIRR) of 21 %, well above the 14 % at its planning stage (Zimbizi, 2001). Afforestation programmes were implemented in most of the schemes by the Forestry Commission, which provided extension services in schemes that enhanced natural woodland management. Conservation measures were employed on arable land to prevent soil erosion and water loss. Sustainable wildlife utilization was enhanced through the CAMPFIRE Programme in appropriate agro-ecological regions.

During the First Phase Resettlement Programme, the major donors were the British Government, the European Community, the African Bank and the Kuwait Government. Apart from the British, no other donors funded land acquisition. The Government of Zimbabwe paid market prices for land. Land Tenure in Resettlement areas was based on permit system for arable, grazing and residential land, in terms of permits issued under the Rural Land Act. According to Utete (2003), the Government of Zimbabwe learnt the following lessons from the first phase of land reform:

- Land redistribution can have better and higher financial and economic returns
- Environmental losses can be mitigated through Afforestation projects and following good farming methods.

- The pace of land acquisition needs to be enhanced for the sake of social stability, poverty alleviation, peace and justice
- There is need to support fully the resettled families in order to optimize agricultural production

2.3.2 The second phase of the land reform programme

The Government of Zimbabwe and all land reform stakeholders who include ,farmer organizations (including CFU) industrial and financial organizations, the Land Task Force of the National Economic Consultative Forum (NECF) and civic organizations based on the lessons of the first phase launched the second Phase of the land reform and Resettlement Programme in September 1998 which whose main objective was to redress the inequities in land resource allocations and providing a more efficient and rational structure for land through:

- Ensuring greater security of tenure to land users
- Promotion of investment in land through capital outlays and infrastructure
- Promotion of environmentally sustainable utilization of land
- Retention of a core efficient large-scale commercial agricultural producers
- Transfer of not less than 60 % of land from the commercial farming sector to the rest of the population.

Phase II of the Land Reform and Resettlement Programme commenced in October 1998 with a two year inception phase where farms covering 2.1 million hectares were to be acquired for resettlement. Infrastructure and farmer support services were to be provided using Government of Zimbabwe and Donor Community resources. The white commercial farmers contested acquisition of most of the identified farms.

Table 2.2: Farms acquired (Inception Phase)

Province	Number of Farms	Extent
Masvingo	5	5 487.7433
Manicaland	20	16 449.9434
Midlands	7	14 449.3840
Matabeleland North	2	33 749.1669
Matabeleland South	9	27 655.4582
Mashonaland East	14	18 480.7100
Mashonaland West	21	52 216.3934
Mashonaland Central	7	9 980 445
TOTAL	85	168 263.808

(Source: People first, 2001)

The donors who had pledged to financially support the programme failed to deliver on their promises. The Government of Zimbabwe using limited resources, was only able to acquire 168 263,808 hectares and to resettle 4 697 families between October 1998 and June 2000. Table 2.2 shows the provincial distribution of farms acquired during the inception Phase.

2.3.3 The fast track land reform programme in Zimbabwe

Disappointed with the slow pace of land redistribution, the people of Zimbabwe responded, bringing pressure to bear on Government by resorting to the vigorous protests and land occupations. In an unprecedented move, villagers in Svosve communal areas in June 1998 occupied Igava Farm vowing to stay on until Government had made a written undertaking to resettle them. The villagers cited poor soils and overcrowding as causes that had forced them to occupy white farms next to their villages. Similar and extensive occupations of white commercial farms followed at Nyamandhlovu in Matabeleland, Nyamaguru in Manicaland and Nemamwa in Masvingo. The villagers unwillingly acted in accordance with the Government orders for pulling out from the occupied farms. The first bombardment by a land hungry and increasingly impatient peasantry had however been fired up.

In February 2000, a Referendum was held on a Draft Constitution that could have formed the basis for a lasting solution of the land issue. The Movement for Democratic Change (MDC), which was composed of landowners and others in opposition to the referendum, defeated the government driven proposal. The MDC, along with Western governments that disagreed with President Mugabe’s land-reform policies, insisted his economic solutions namely, the seizure of property worked in the short term but did not create a more sustainable economy for the long term. It seemed that President Robert Mugabe’s long struggle to redistribute land had been defeated for good. However, a few weeks after the referendum, a combination of war veterans, unemployed youths and other members of ZANU PF began a series of violent land occupations throughout the country without support of the law. The farm invasions had a devastating effect on the white commercial sector, the main producer of food in the country. The farm invasions increased as the country was nearing the crucial General Elections in June 2000.

Initially, the government told the international world that the land invasions were as a result of land-hungry peasants denied access to land by the white commercial farmers. However, it became quite obvious that the government was using land as its last trump card to win the hearts and minds of voters for the elections. The land discourse increasingly became radicalized. The land invasions led to deaths of many black citizens and some white farmers. The violations included assaults, property damage, detention, abduction, death threats and displacement from home areas.[4] Against the background of the land occupations by the impatient landless people: absence of international support for land reform notwithstanding Government desire to engage the former colonial power and the international community, the rejection of the 2000 Draft Constitution, partly as a result of the British influenced political opposition and the continued legal challenges by the white commercial farmers, Government embarked on the Fast Track Land Reform Programme.

Having lost two years with little activity between October 1998 and June 2000, Government of Zimbabwe resolved to implement the second Phase of the Resettlement Programme, kick-starting the Phase II Resettlement with an accelerated pace, code-named “Fast Track”. This “Fast Track” is an accelerated phase where activities, which

[4] Human Rights NGO Forum (2001). *Who was Responsible? Alleged perpetrators and their crimes during the 2000 Parliamentary Election Period*.

can be done quickly, shall be done in an accelerated manner. This phase expected to cover the period July 2000 to December 2001. The objectives of the “Fast Track” Phase are as follows:

- The immediate identification for compulsory acquisition of not less than 5 million hectares for Phase II of the Resettlement Programme, for the benefit of the landless peasant households.
- The planning, demarcation and settler emplacement on all acquired farms.
- Provision of limited basic infrastructure (such as boreholes, dip tanks and schemes roads) and farmer support services (such as tillage and crop packs).

It was envisaged that secondary infrastructure like schools, clinics, rural service centers, and staff houses will be provided as soon as resources become available. The fast Track approach to resettlement also termed *jambanja* or the *Third Chimurenga* in Zimbabwe was officially launched on 15 July 2000 to speed up the pace of land acquisition and resettlement, under the provisions of which 1 million hectares would initially be acquired to resettle 30,000 households. Thereafter another 4 million hectares would be expropriated to accommodate about 120,000 households within three years. However, the target of the programme soon grew exponentially, from 5 million hectares to 9 million and then to 11 million in the following two years (Sachikonye, 2005b). It was now predicted that altogether 300,000 households and 51,000 black commercial farmers would receive land under the A1 and the A2 models, respectively.

Model A1 is intended to decongest communal areas and is targeted at land-constrained farmers in communal areas. This model is based on existing communal area organization, whereby peasants produce mainly for subsistence. Model A2 on the other hand was a commercial settlement scheme comprising small, medium and large scale commercial settlement, intended to create a cadre of black commercial farmers. This model is, in principle, targeted at any Zimbabwean citizen who can prove farming experience and/or resource availability and is based on the concept of full cost recovery from the beneficiary (People First, 2001).

Table 2.3: Allocation pattern and take up rates per Province

Province	No. of farms		Land Area (hectares)		No of Households		Take up Rate (%)	
	A1	A2	A1	A2	A1	A2	A1	A2
Midlands	306	106	513672	181966	16169	229	90	48
Masvingo	211	170	686612	753300	22670	773	95	79
Manicaland	246	138	195644	77533	11019	463	92	42
Mat. South	226	65	683140	191697	8923	271	100	100
Mat. North	258	65	543793	142519	9901	191	120	94
Mash. East	382	319	302511	250930	16702	1646	93	45
Mash. West	670	568	792513	369995	27052	2003	97	50
Mash. Central	353	241	513195	230874	14756	1684	89	73
Total	2652	1673	4231080	2198814	127192	7260	97	66

(Source: Utete, 2003; Sachikonye, 2005b)

In reality, however, only about 127,000 households and 7,200 commercial farmers had been allocated land by mid-2003 (Table 2.3) (Utete, 2003; Sachikonye, 2005b). By July 2003, the amount of land used for large-scale commercial farming had shrunk to 2.6 million hectares, from 11.8 million in 1999 (Utete, 2003). The Third *Chimurenga* entailed a comprehensive redistribution of land that was accomplished with considerable chaos, disorder, and violence and this disrupted production and destabilised human security. As about 11 million hectares changing hands within a three-year period, it was the largest property transfer ever to occur in the region in peacetime (Utete, 2003).

Although the government announced that the programme would be complete by August 2002, the fast track land reform did not come to any end. Land occupations continued until mid-2003, and then on a diminished scale in 2004. Although the government began to instill some order and regulation into the fast-track process from mid-2003, inter-mittent occupations of farms and evictions of farmers continued, even into 2005. This last phase of the process included the ‘land grabs’ by the black elite, in contravention of the government’s ‘one person, one farm’ policy. There was considerable resistance to this policy. Conflicts between the new commercial farmers and settlers on small farms also broke out from time to time during this phase (Sachikonye, 2005a).

2.4 Post-fast track land reform

Zimbabwe’s struggle for land reform was a pervasive sub-Saharan African dilemma. Many countries throughout the region continued to suffer from similar postcolonial struggles. Global organizations and world leaders agreed that in order to help African countries rise out of poverty, resources and wealth had to be redistributed more equally. However, instead of economically elevating the lower class, fast-paced policies like the one adopted by Zimbabweans seemed to bring more poverty. Zimbabwe has been experiencing economic hardships since 2000. Its economy shrank faster than any other country that is not at war (Richardson, 2006). Zimbabwe's currency was nearly worthless from hyperinflation until they resorted to use the American dollar and the South African Rand, its financial institutions were in disarray until the formation of the Government of National Unit (GNU); its world-class farms sit idle and its manufacturing, mining and export sectors declined steeply until September 2008 (Shumba, 2010).

A total of 11.8 million hectares of land was occupied by black large scale commercial farms while the communal area occupied a total of 16.4 million hectares of land at June 2000 (Utete, 2003). Following the implementation of the Fast Track Land Reform Programme a new picture emerged with regard to land ownership patterns as shown in Table 2.4 below. According to Jill (2005), the fast track land reform programme destroyed property rights, the foundation of the economy and led to a chain reaction, which was exacerbated by additional actions of the government. As the market's foundation, property rights serve many purposes: they bind together work and rewards, expand time horizons from days to years, allow wealth to be transformed into other assets, and encourage foreign investment (Shaw, 2003). The speed at which an economy can develop ultimately depends on the ability of the government to inspire trust among citizens, banks, and investors that it will fairly enforce the rule of law.

Between 1998 and 2001, foreign direct investment dropped by 99 % in Zimbabwe. In addition, the World Bank risk premium on investment in Zimbabwe jumped from 3.4 % in 2000 to 153.2 % by 2004 (Richardson, 2006).

Table 2.4: Land ownership patterns after the Fast Track[5] (as at 31 July 2003)

Category	Area (million hectares) as at 31July 2003	% of Total Land Area
A1	4.2	11
A2	2.2	6
Old Resettlement Area	3.7	9
Communal	16.4	41
Large Scale Commercial	2.6	6
Small Scale Commercial	1.4	4
National Parks and Urban	6.0	15
State land	0.3	1
[*]Other	2.8	7
Total Land Area	39.6	100

(Source: Utete, 2003, Sachikonye, 2005b)

A distinctive trend in most agricultural production since redistribution has been a decline in output, although there have been one or two exceptions. For example, maize production declined from an average annual output of about 1.7 million tons in the mid-

[5] **Please Note:** Data on land ownership patterns after the Fast Track as at 2011 was not available hence the latest available data of 2003 was used.

[*] Other refers to land that has been acquired for resettlement under Model A1 and A2 but has not yet been taken up by those allocated to the plots

1990s to between 0.9 million and 1 million tons in 2000-2004. In communal areas, maize yields halved from approximately 1.3 tons per hectare in 1986 to approximately 0.8 tons per hectare in 2004 (FAO, 2007). Since 2000, from being a regional breadbasket, Zimbabwe has become a food importer and between 2001 and 2002 and the country needed to import maize to meet its population’s nutritional requirements (Moyo, 2004).

Similarly, wheat production has fallen by about 20 % from the average annual output in the mid-1990s. Declines in the production of soya beans and groundnuts have also been reported (Central Statistical office, 2004). Tobacco production, the main foreign currency earner crop in Zimbabwe declined heavily from an average annual output of about 200 million kilograms to 65 million in 2003/2004 season (Sachikonye, 2005a). There was also a smaller drop (of about 10 per cent) in the cotton output of both large-scale and small-scale farmers during this period (Central Statistical office, 2004). The production of sugar, tea and coffee has generally remained steady since the beginning of land reform in 2000 (Central Statistical office, 2004). According to Sachikonye (2005a), there appear to have been small increases in the production of paprika, citrus and vegetables between 2000 and 2004, as well as in floriculture. Clearly there is a huge difference between the productivity levels of the white farmers operating on a large scale, who have now largely been expelled from the farms, and those of the resettled farmers who are working smaller farms (Table 2.5). However, according to Utete (2003), some of the resettled farmers particularly those growing commercial crops like tobacco, paprika, cotton highlighted that they had become instant millionaires after marketing their produce whilst others were able to purchase livestock for the first time in their lives. Some newly resettled farmers in Manicaland and Mashonaland East Province had also ventured into horticulture.

On the other hand, high unemployment levels combined with high cost of living in recent years have made the poverty situation worse amongst the Zimbabweans. Particularly caught in this double squeeze are the urban unemployed and the urban poor. Other food insecure groups include farmers who were affected by the January dry spell and February March heavy rains in 2007 causing water logging predominantly in the southern parts of the country, and more than 200 000 farm workers who have been out of work since the farm invasions or land acquisitions for redistribution (Sachikonye, 2005b).

Table 2.5[6]: Productivity per hectare on resettled and large-scale commercial farms

Product	Small resettled farmers in 2003 (kg per ha)	Large scale farms in 2001 (kg per ha)
Maize	596	4809
Wheat	1032	5741
Flue-cured tobacco	888	2811
Cotton	507	2232
Soya beans	421	2505

Source: Central Statistical office, 2004

[6] **Please Note:** Data on the productivity of large scale farms for 2003 was not available; hence the latest available data of 2001 was used.

Farm workers who are jobless, landless and without homes in communal areas have tried various coping strategies which include piecework jobs on the farms where they live. These piece work jobs are often temporary, insecure and badly paid. Some earn income from informal trading in agricultural produce and second hand clothes, and in craft materials in local markets (Sachikonye, 2005b). In provinces which include Mashonaland Central, a large number of former farm workers preferred to engage in gold panning activities which they considered to be more lucrative (Utete, 2003). In rural areas where food insecurity was a problem, the main coping mechanism was remittances from men or children working in the cities. If the urban unemployment increases due to factory shut downs, this income stream could dry up taking away one of the important coping mechanisms from the rural poor and food deficit households.

2.5 Situation in Zimbabwe after the formation of Government of National Unity

Since the formation of the GNU on the 11th of February 2009, there has been positive improvement in the livelihoods of the people. Since the introduction of the multi-currency system, the run-away inflation has been dealt with and has been below 2% for most of 2009 (Bell, 2009; Shumba, 2010). Zero duty on basic commodity imports has meant that food is available and that consumer prices have stabilized. The GNU has resulted in agricultural inputs becoming available in the shelves of many shops as was in the past before the fast track land reform. Bank loans have also been made available for the farmers (Shumba, 2010).

Firms manufacturing agricultural inputs have reopened and others which were operational during hard times have increased their production capacity and this has created employment opportunities for both the skilled and unskilled civilians in the country (Shumba, 2010). Some schools and hospitals that have closed have now been reopened. International finance institutions such as the International Monetary Fund (IMF) and the African Development Bank (ADB) have expressed willingness to reengage with Zimbabwe, and have offered technical support. Some of the Zimbabwe Diaspora population has begun to go back home. Politically, the GNU has significantly reduced incidents of violence in the country. Processes such as constitutional reform have also given the people of Zimbabwe hope.

2.6 Conclusion

Land dispossession of the black population in Zimbabwe was driven by the need to reduce competition to white farmers and to create a pool of cheap labour to work on the farms and mines and, later industry. Experience from Zimbabwe, demonstrated that the market on its own is unable to effectively alter the pattern of ownership in favour of equity for the targeted beneficiaries of land reform, as well as in favour of broader goals of job creation and poverty alleviation. The state should therefore actively intervene in the land market through the use of expropriations to a small extent, scrapping of restrictions on subdivision of land, extensive support for small-scale agriculture, reversing the growing concentration of land holdings, promoting the principle of “one farmer one farm”, changing the current large-farm-size culture, regulating foreign ownership and through regulation of land use to optimise social benefit.

The “willing buyer willing seller” approach should be used to a larger extent and expropriation (with compensation) used as an instrument of last resort where urgent land needs cannot be met, for various reasons, through voluntary market transactions. Government must not support land invasion since it affects property rights and markets resulting in the decline of the economy as was the case in Zimbabwe.

CHAPTER 3

INTERNATIONAL DEBATE ON LAND REFORM[7]

3.1 Introduction

Traditionally, agriculture has played a significant role in the economies of most, if not all developing countries which are classified as non-oil producing countries. It still continues to contribute substantially to the economy of these countries but at a reduced percentage. According to Richardson (2006), the decline in the contribution of agriculture to the economies of third world countries is attributed mainly to climatic change and land reform policies. In the past according to Wekwete (1991), the large scale commercial farmers have relatively met domestic food and local industrial requirement and have exported a wide variety of cash crops especially the non-food cash crops such as tobacco. He also highlighted that the governments of today have no option except to redistribute land more equitably; however, these governments must retain the confidence of large scale farmers who even in times of drought satisfy national food requirements and generate foreign exchange earnings desperately needed by these former colonized states through exports.

The land reform policy has sparked a debate internationally, that the redistribution of agricultural land to small holders will increase, or decrease total factor productivity and

[7] This chapter has been presented at the following conference:
Musemwa, L and Mushunje, A. 2010. Land reform as a strategy of breaking the circles of poverty in former colonized states of developing countries. Paper presented at the 2nd Development Week Dialogue 17-19 March 2010, Nkandla, KwaZulu-Natal, South Africa. This paper has also been accepted in the International Journal of Agri-Science.

efficiency in the long term. As noted by Moyo (2004), the debates from the late 1970s up until today have centered, mainly, on the merits and demerits of the redistribution of land, not to argue that 'some' land should not be redistributed. Farm efficiency and how to measure it, is an important subject in the agriculture of developing countries (Parikh *et al.,* 1995). Production efficiency is usually analyzed by separately examining its two components, technical efficiency and allocative efficiency. Xu and Jeffrey (1997) define technical efficiency as the ability to produce a given level of output with a minimum quantity of inputs with a certain technology. Allocative efficiency refers to the ability to choose optimal input levels for given factor prices. Economic or total efficiency is the product of technical and allocative efficiency.

However, several studies discovered a clear and direct relationship between small farms and a high level of social and economic development in small rural areas. The most important of these studies reported that as compared to a community surrounded by large farms, a small farm community had twice as many businesses, 61 % more retail trade and three times as many households and building supply purchases (Appalachian Land Ownership Task Force, 1981). It supported more people per dollar of agricultural production, had a better average standard of living, a much greater proportion of independent businessmen and white collar workers, more and better schools, and twice as many civic organizations, churches and means of community decision making (Appalachian Land Ownership Task Force, 1981; Van Zyl *et al.,* 1996 and Utete, 2003).

Also, an ecological argument suggests that the farming practices utilized by small farms are more ecologically sound than those on large farms. In most of the developing world, there exists an inverse relationship between farm size and efficiency (Van Zyl *et al.,* 1996). This is to say that once a small minimum size is exceeded, family farms relying primarily on family labour, are generally more productive than larger farms relying primarily on hired labour. They also create a lot of employment for the ever-growing unemployed population than large scale farms that in most cases are mechanized (Van Zyl *et al.,* 1996). Politically, it is not going to be easy to redress the present unacceptable inequalities. It is however, a difficult task to bring about effective change to the present well-established land ownership patterns, without at the same time, seriously impairing the productive capacity of agriculture and without incurring costs which are at times unacceptable to society as a whole. To date, the land reform policies are still facing criticism, obstacles and resistance from the large scale sector and from developed countries. This chapter therefore explores literature on the proponents and opponents of land reform as well as the efficiency arguments for land reform.

3.2 Proponents of land reform

Proponents of land reform claim that the opponents of land reform do not focus on the demerits of not redistributing land and do not see the continued land hunger, food shortages, and unequal distribution of income but only drawbacks related to losses in output and reductions in foreign currency earnings from exports. According to Van Zyl *et al* (1996), the failure to execute a major land reform or the delayed implementation of such reforms and continued neglect of rural sectors seems to have far more adverse consequences than the relatively minor risks associated with the process of land reform in countries with highly dualistic farm size structures, like Zimbabwe.

The proponents of land reform argue that if land redistribution does not take place, the problem of land ownership skewed towards race remains, racial tensions may occur and this may trigger racial conflicts which according to Joireman (1996) are more costly and harmful to the civilians. The proponents of land reform advocate that most of the large scale farmers are underutilizing their land, though they play important role in the farming sector of non-oil producing developing countries whose economies are agricultural based hence they advocate for the large-scale redistribution of such lands. Moyo (2004) and Ankomah (2000) confirm the notion that large scale commercial farmers under utilise their land.

According to Moyo’s 2004 study on land utilisation by large scale commercial farmers in Mashonaland provinces (areas within natural region (NR) II and NR III), the total area in Mashonaland amounts to 4,3 million hectares, which constitutes 32 % of the overall land owned by the large scale commercial farmers. However, Moyo (2004) found that only 10 % of this prime land is actually cropped, and this represents 75 % of the total area cropped by large scale commercial (LSC) farmers in the country as a whole. This therefore implies that substantial portions of land can be made available for land redistribution without necessarily affecting the national output. The ability of former colonized states to distribute the underutilized land will therefore promote equity and improve the livelihoods of the rural poor who are kin to be involved in farming. Those who will be working will therefore not lose their jobs as the confidence within the commercial farmers and that those who own industries will be retained as inputs will remain available for the local industries. This, therefore, stands to reduce rural poverty as both small scale farming is promoted by providing land to those that do not have it currently and increase employment opportunities in both the farming and industrial sectors as investment confidence is maintained for the international community.

3.3 Opponents of land redistribution

One of the most interesting argument raised by opponents of land reform is that there is ‘not enough land’ to allow all those that are involved in farming to have their own land, therefore land redistribution is impractical. With rapid population growth, this problem will only worsen in future. In addition, they highlight that it is not important to divide existing farms, but to increase employment opportunities for the rural poor (Putzel and Cunnington, 1989). However, to argue that there is not enough land to allow distribution ignores the fact that the current rural population actually survive on the land now. Land reform seeks to redistribute land in order to enhance both the productive potential of the existing small scale farmers and that of the land under cultivation. The security and higher incomes for all will create opportunities for alternative employment in both rural and urban industries and increase opportunities for a rapid development of services in the countryside.

Wekwete (1991) notes that some of the conservative views advanced by opponents have been characterized by a strong argument that resettlement areas have not been as efficient as the former commercial farms. This is also based on the premise that the white large scale commercial farmers are more experienced than small scale commercial farmers. They argue that it is risky to transfer much of the prime land to inexperienced farmers as this affects aggregate agricultural output. According to opponents of land redistribution, land reform beneficiaries will not improve the land and that farm workers are incapable of running their own farms. Land owners point to the lack of attention or improvements carried out by peasants on the land they cultivate. This argument represent the traditional sentiments of large land owners whose world-view justifies their privilege position in the rural society. Peasants can make improvement on their farms, when they have the opportunity to cultivate their own land and get security on the land knowing that they, and not the land owners, will reap the benefits (Putzel and Cunnington, 1989).

Land redistribution alone will not bring any lasting benefits to agriculture but it should be accompanied by increases in farm and labour productivity. Also, simply giving or increasing size of land holdings will not achieve the transformation of the traditional peasant sub-sector. There is need for a complete package of the needs of small scale farmers but the governments of third world countries do not have resources to achieve this. As a result the opponents argue that the needs of the large scale commercial farming sector should be guaranteed because it is an integral part of the economy, which makes a significant contribution in terms of employment, foreign exchange, and necessary inputs to industry. Here, the developing countries governments' problem is to counter the efficiency and productivity arguments posed by the commercial farmers.

3.4 The efficiency, food security and economies of scale argument for land reform

3.4.1 Farm size, land use intensity and efficiency

A study of India's Farm Management Survey sparked a debate in the 1960s on an observed inverse relationship between farm size and productivity (Sen, 1962). The observed inverse relationship according to Sen (1962) implied that small farms are more efficient than large scale farms. The observations are based on the fact that on average small farms employed more inputs per unit area and as a result had a higher output. The underlying principle behind this relationship according to Sen (1962) was based on the assumption that peasant farmers were well endowed with potential labour with low or zero opportunity cost while facing a severe constraint on credit. He further attributed this potential labour to the fact that small farms would employ labour up to the point of zero marginal productivity. Contrary, large farms would employ labour up to the point where the wage rate equals to the marginal product implying declining productivity in terms of output per unit area but increasing profitability.

There seem to be a wider consensus among authors that the inverse relationship between productivity and farm size is a result of differential factor use intensity, (Newell *et al.*, 1997). In Rwanda, Bwiringiro and Reardon (1996) find that small Rwandan farms achieve three times greater land yields, use four times more labour and have four times the number of plots per hectare that larger farmers do. They conclude that as a result of this, small farms have greater average and marginal productivity of land and are less allocative efficient. Still on the same note, Cornia (1985), argues that high labour use intensities on small farms is mainly found in the land market where small scale farmers face higher effective purchase prices for land. This biased resource position for peasant farmers has several implications about their use of labour vis-à-vis large scale farmers. Resource-constraint-farmers use labour more intensively for each crop, they use more of the available land, they choose more labour intensive crops, and use their own labour for land improvements.

All these implications according to Cornia (1985) leads to the conclusion that small farmers have a higher resource use per unit of land that will in turn result in them getting more returns from farming thereby alleviating rural poverty. This factor use intensity gives small scale farmers a productivity advantage over their large scale commercial farmers counterpart, but with the advent of the green revolution technology, small scale farmers might lose this advantage, since in the absence of technical extension and credit services, small farmers do not have access to these technologies. Technology is therefore likely to reverse this advantage with small scale farmers of higher factor use intensity. There is also a considerable belief that the greater intensity of family labour as manifested in the small scale farming sector is attributed to desperation (Ghose, 1979). This view suggests that if small farmers are struggling at the edge of survival, they are more likely to work harder compared to their counterparts (large scale farmers) although it would not be prudent from a humanitarian point of view to equate the welfare of the small scale farmers' households with its productivity, if that productivity is as a results of poverty.

Dualistic labour markets have also been proposed as an explanation to factor intensity differentials between small scale and large scale farmers. The rational as it is, lies on the fact that if family labour is cheaper, then there should be a higher labour to land ratio on the smaller farms. There are logistical economic reasons for a gap between the supply prices of family and hired labour. There is less uncertainty about effort with family labour than with hired labour, making the opportunity cost for family labour lower (Mazumdar, 1965).

Feder (1985) offers an alternative explanation of the more intensity use of family labour, based on three propositions: firstly, that family labour is more efficient than supervised labour; secondly that family labour is more motivated than hired labour and can supervise the later; and thirdly, that the supply of working capital is directly related to farm size. The greater efficiency of family labour can be due to two factors. Firstly, as the ratio of hired large farm labour rises, supervision becomes more time consuming and less effective. Secondly, the effectiveness of supervision will decrease as the social distance between supervisors and the hired labour increases (as it would be on larger farms), (Boyce, 1987). Ray (1998) argues that in a world with unemployment someone who hires labour is likely to have the opportunity costs of an additional unit of labour at market wage rate, while for family labour the opportunity cost is lower because of the possibility of unemployment. He argues that this leads to higher employment of family labour by farmers with small sized plots. Therefore, the observed positive relation of share of family labour to efficiency is not surprising and due to the substitutability of inputs, the small size farmers deliver more care to the plants and are able to increase the efficiency of the other production factors without increasing the use of these factors.

According to Helfrand and Levine (2004), the relationship between farm size and efficiency is more complex than what is normally believed. They found that for farms up to 200 hectares, efficiency did fall as farm size rose, but beyond this size it started to rise again. The most important reason forwarded relate to preferential access by large farms to institutions and services that help lower inefficiency (such as rural credit, technical assistance and rural electricity) as well more intensive use of technology and inputs raise productivity. If one could create an environment in which small farms had equal access to productivity enhancing institutions and greater access to modern technologies and inputs, then an inverse relationship could prevail even up to about 1000 hectares.

Bhalla and Roy (1988) argue that, if land quality and farm size are inversely correlated and farm size and cultivated area are directly correlated, then excluding land quality from regressions of land yields on cultivated area would bias the estimated coefficient of cultivated area downwards. But this would bias only if the soil quality differences were not due to investments made by the farmers themselves. Thus agro-climatic conditions and soil quality are crucial determinants of agricultural productivity, as well as measures of farmers' investment in soil quality must be included in investigations of productivity (Nuppenau, 2009). Attempts to incorporate soil quality into empirical investigations of the inverse relationship have mixed results. Newell *et al.* (1997) argue that a farm are smaller in fertile regions than in less fertile regions and as a result of this output per hectare is higher on small farms. However while land quality explains some of the inverse relationship, it does not explain all of it. Both natural soil quality and investments in soil quality all contribute to productivity (Carter 1994; Newell *et al.,* 1997).

3.4.2 Poverty alleviation and food Security

Agrarian reform must be the starting point and the central component of any programme which seeks to break the cycle of poverty and initiate a process of national development (Putzel and Cunnington, 1989). In order to make land reform successful there is need to assist the land reform beneficiaries in their efforts, not only to secure land, but to form cooperatives and to gain access to agricultural credits, inputs and produce markets. By increasing peasant incomes and security on the land and by breaking down rural monopolies, land reform could increase agricultural production and expand the market for domestic manufacturing. In the past, commercial farmers have re-invested only a limited portion of their profits in the agricultural sectors. Much of the wealth earned from export orientated cash crops has been repatriated to the developed countries by the commercial farmers and transnational companies (Putzel and Cunnington, 1989). In fact, wealth earned from exporting agricultural products in the past has not contributed to establishing a viable and dynamic industrial sector in these countries. Agricultural production oriented to the world market has not been developed to supply inputs to local industries (Putzel and Cunnington, 1989).

In addition, most large scale farmers in most developing countries have diverted into game farming from livestock farming and horticulture (flower production) and other non-food cash crops such as tobacco and cotton from food crops. This type of production is now threatening world food security (Utete, 2003; Rugege, 2004). Contrary to this, the beneficiaries of land reform are to spend greater portions of the wealth generated in agricultural production within their areas. This would allow peasant communities to make improvements in housing, education and health services, and stimulate rural development and service activities. Land reform is therefore designed to give more land to the people who produce the bulk of the nation's food requirements (peasant farmers are involved in livestock farming and food crop production) (Moyo, 2004).

For instance in Zimbabwe, in 1998, the former chief executive of the government Agricultural Rural Development Authority (ARDA), Dr. Joseph Made, said even assuming all white commercial farmers stopped farming in Zimbabwe and no one started farming any of those lands at all, the country would still have 70 % of its annual maize production; 65 % of cotton; 40 % of wheat. The crop that would see its production cut all the way down to just 10 % is Tobacco (Utete, 2003). About 30 % of the maize comes from the commercial sector which includes some indigenous blacks, numbering about 700 compared to the 4,300 whites in that sector. In addition to these 4,300 whites, there is the government's ARDA which also produces maize at a larger scale. ARDA is a government parastatal agency which deals with state farm production mainly involving large agricultural and rural development projects. According to Utete (2003), Dr. Joseph Made dismissed widespread fears that the land reform programme will turn Zimbabwe into a nation of subsistence farmers.

> "*We have a lot of agronomists walking the streets because they cannot get jobs. ARDA is willing to release its experts to assist in training and giving skills*."

Hence land reform, according to Dr. Joseph Made is likely to increase the production of food crops (Utete, 2003).

In the Indian state of Kerala, agricultural labourers who received tiny house-and-garden plots of 1/10 acre (.04 ha or about 4350 square feet) found themselves considerably better off in terms of income, family nutrition, and status (Prosterman and Hanstad, 2003). Similar findings have come from recent research in the Indian states of Karnataka and West Bengal. In Karnataka, agricultural labourers families who received government-granted house-and-garden plots of only 1/25 acre (.016 ha or about 1730 square feet) were able to produce most of the family’s nutritional needs for vegetable, fruits, and dairy products and obtain cash income equivalent to one fulltime adult wage from plant and animal products on the tiny plot (Prosterman and Hanstad, 2003). Land reform beneficiaries in Karnataka had invested in land improvement measures and raised their land productivity and socio-economic status. However, conditions of certain categories of people such as widows became worse as a result of tenancy reforms. It was observed that many of the occupant-tenants as well as informal tenants preferred to borrow from local money lenders at high rates of interest because of convenience and out of fear of harassment (Chatterjee, 2002). This calls for credit reform in the institutional sector for streamlining and increasing the accessibility of the farmers to institutional credit which could help improve their productivity and income levels and enhance food security and ultimately reduce poverty.

In China, the Chinese Communist Party won the popular support of the masses of the rural population, largely due to a land tenure reform where numerous poor peasants were given land with full private ownership during 1949-1956 (Prosterman, 2009). This resulted in a 70% increase in grain production and an even higher increase in farm income (Chen *et al.,* 2008). In 1956, China unfortunately decided to follow in the footsteps of the former Soviet Union and promoted collective farms. Private ownership and family farms were prohibited, and collectives (village communities or their agglomerations) became land owners and farm operators. Agricultural production plummeted, and 15 to 30 million consequent deaths occurred due to hunger during the years 1958-1962 (Peng, 1987).

In the late 1970s, facing still-lagging farm production, China chose to abandon collective farming and conducted a so-called “Household Responsibility System” reform (HRS) by giving individual farm families limited “use rights” to farm land (Li and Prosterman, 2009).The introduction of the HRS unleashed the energy and resources of scores of millions of farm families and jump-started China’s agricultural and rural growth. Grain output increased steadily and the percentage of population living below $1.25 a day in China decreased from 84% in 1981 to 16% in 2005. The state distributed virtually all land of the collectives to each farm family in individual landholdings through the decollectivisation process. Unfortunately, the families received insecure rights to the land. Local officials could relocate them from plot to plot through periodic “readjustments” in the name of maintaining absolute equality of distribution as household size changed.

Despite these shortcomings, the change from collective farming to individual (even though insecure) tenure created the conditions for increasing crop yields by more than 80% in less than a decade. By 2003, China was nearly halfway through completing a major new land reform that is giving these families, totaling about 850 million persons, individual land contracts to secure and transferable 30-year use rights (Prosterman and Hanstad, 2003). This land tenure reform was enormously successful in lifting the living standards of hundreds of millions of rural people, and was the driving force behind the single greatest poverty-reduction achievement worldwide (Ravallion and Chen, 2004; Bruce and Harrell, 1989). According to Sachs (2005), this new household responsibility system gave massive incentives to individual farmers to work harder, apply inputs with more care, and to obtain higher yields.

By increasing the production of food crops and raising rural incomes, a land reform programme could put an end to malnutrition and achieve food security. However, reform does not necessarily mean a halt in the production of profitable commercial crops. Rather than ruling out the cultivation of export crops and reform aims to remove the dependence on export-oriented production which places farmers at the mercy of transnational companies and volatile international commodity markets (Putzel and Cunnington, 1989). By allowing farming families to become more independent and self-reliant and encouraging participation in cooperatives, a stronger basis could be established for democratic development in the countryside. Agricultural production after land reform is oriented primarily towards domestic food and industrial consumption and only secondarily to the export market thereby achieving the central objective of the land reform which is to increase food security for the nation and food supply for the rural and urban poor.

Today, the potential for food production in commercial farms is not exploited. They have specialized on the production of export crops. What is more disturbing is that some of the commercial farmers, when prices for export crop are low, land owners often leave land idle rather than allow food-crop production. If the system be rationalized then tenants and farm workers who gain access to land would be able to plant sufficient food crops to satisfy their requirement (Ghose, 1979). Rather than devoting the entire regions of the country to non-food cash crops, small scale farmers would be able to develop a more rational combination of food and non-food crops. Where it is profitable to produce non-food cash crops, peasant producers could combine these with food crops. The redistribution of income involved in a comprehensive agrarian reform programme should help all of the nation’s poor to get an income sufficient to guarantee an adequate diet. According to Putzel and Cunnington (1989), the history of export-oriented production in many countries proves the dangers of an exclusive reliance on the world market for example when sugar prices crashed in the mid-1980s, it led to starvation in Negros and Philippians.

Opponents of land reform argue that small scale farmers and farm workers do not have the knowledge and skills required in the production of export crops (Wekwete, 1991). They claim that land reform is a recipe to subsistence farming and a halt in export production. Export crops do not only require high capital investment, but also considerable skill and specialized knowledge of production techniques and international markets. Small scale farmers and cooperatives can and will produce crops for the export market when it is profitable to do so. Small scale farmers with enough support and encouraged to form cooperatives, will be able to acquire the skills and specialized knowledge required for the production of export crops. By ensuring food production, a diverse crop structure and a significant degree of production for domestic industrial needs, land reform beneficiaries can avoid becoming entirely vulnerable to the price and exchange rate fluctuations in the world market and the protectionist barriers of the developed countries.

3.4.3 Economies of scale

In theory, economies of scale are defined by a production function which exhibits a more than proportional increase in output for a given increase in magnitude of all inputs. In practice, the concept provides problems as there rarely is a situation when an increase in magnitude of some inputs does not imply a change in the factors of production (Peterson and Kislev, 1991). According to Binswanger *et al*. (1993), the sources of economies of scale, in the form of cost advantages accruing to increased farm sizes which underpin the justification for the move towards large-scale production, are:

(i) lumpy inputs that cannot be used below a certain minimum level such as farm machinery and management skills;

(ii) advantages in the credit market and in risk diffusion arising from ownership of large holdings; and

(iii) processing plants that transmit their economies of scale to farms, usually giving rise to wage plantations

Farm machinery such as tractors and combine harvesters are lumpy inputs, and reach their lowest cost of operation per unit at relatively large areas. With the introduction of agricultural mechanization many people believed that the economies of scale associated with it are so large that it makes the small scale farming outdated and this in some instances resulted in some small scale farmers selling or leasing their land to large-scale farmers (van Zyl *et al.,* 1996). However, it became quickly clear that machine rental can permit small scale farmers to evade the economies of scale advantage associated with machines in all but the most time-bound of operations, such as ploughing and planting (seeding) in dry climates or harvesting where climatic risks are high. In those situations farmers compete for early service and therefore prefer to own their own machines. Thus, economies of scale associated with machines do increase the minimum efficient farm size, but by less than expected because of rental markets. The use of lumpy inputs leads to an initial segment of the production function that exhibits increasing returns with operational scale, but these technical economies vanish when farm size is increased beyond the optimal scale of lumpy inputs or when rental markets make the lumpiness of machines irrelevant.

Management skills are also indivisible and lumpy inputs, so the optimal farm size increases along with increases in the manager's skills. Technical change strengthens this tendency. The use of fertilizers and pesticides, and arranging the finance to pay for them, require modern management skills. The marketing of high quality produce also require modern management skills. In an environment of rapid technical change, acquiring and processing information become more and more important, giving better managers a competitive edge in capturing the innovator's rents. Therefore, optimal farm sizes tend to increase with more rapid technical change. However, some management and technical skills, like machinery can be contracted from specialized consultants and advisory services or can be provided by publicly financed extension services. Contract farming for processing industries or bulk marketing companies often involves the provision of technical advice.

Land, because of its immobility and robustness, has excellent potential as collateral, making access to credit easier for the landlord. As pointed out by van Zyl *et al.* (1996), rural credit markets are however difficult to develop and sustain. The high transaction costs of providing formal credit in rural markets imply that the unit costs of borrowing decline with loan size. Many commercial banks do not lend to small farmers because they cannot make a profit (Strauss Commission, 1996). Raising interest rates on small loans does not overcome this problem, since it eventually leads to adverse selection for a given credit value, therefore, the cost of borrowing in the formal credit market vary inversely with the amount of owned land. Most rural credit markets only offer in most cases funds to overcome emergencies which in most cases are very small amounts and at very high interest rates. Access to formal commercial bank credit therefore gives large scale farmers a considerable advantage in risk diffusion over small farmers without access. Hence, emphasis is needed for all efforts to develop rural credit, including co-operative banking and other savings-mobilization mechanisms if small scale land reform beneficiaries are to gain access to credits. Accesses to credit will, therefore, enhance their farm business production levels thereby making them more food secure.

There are also economies of scale that arise from the processing or marketing stage. However, economies of scale in processing alone are not a sufficient condition for the explanation of the existence of very large farms (estates and plantations). The sensitivity of the timing between harvesting and processing is crucial as well, sugarcane, tea or the fruits of the oil palm have to be processed within hours of harvesting. Plantation style production has never been established for easily stored products such as wheat or rice which can be bought at harvest time in the open market and stored for milling throughout the year. Even sugarcane can be contracted by millers with small farmers as long as the logistics of harvesting and transportation can be solved. This applies to commodities as diverse as sugarcane, tea, coffee, bananas, rubber and oil palm, as well as tobacco and cotton. Where the same crops were introduced into existing smallholder systems, contract farming prevails. Processors seem not to have found it profitable to form plantations by buying out smallholders and offering them wage contracts. This suggests either that the coordination problem associated with plantation crops can be solved at a relatively low cost by contract farming, or that imperfections in the land sales markets are so severe that it is prohibitively expensive to create large ownership holdings by consolidating small farmers.

3.5 Conclusion

Large scale land owners and developed countries oppose the land reform, whilst the rural majority of developing countries support the land reform programme. However, most of the studies demonstrate clearly that small farms are efficiently utilized than large scale farms. Experience from other countries such as Zimbabwe and South Africa, which carried out land and agrarian reform programmes, demonstrated that the market on its own is unable to effectively alter the pattern of ownership in favour of equity for the targeted beneficiaries of land reform, as well as in favour of broader goals of job creation and poverty alleviation. If land reform benefits the poor, it will be the best strategy of alleviating rural poverty in former colonized countries. Most of the beneficiaries would be able to farm on the small pieces of land using in most cases family labour and hired machinery. Household family labour is more efficient than hired labour. Land reform beneficiaries use hired machinery as they are not able to buy their own using the small credits that they have access to as a result of their small collateral (pieces of land) as evidenced by the China example. These small scale farmers provide better employment opportunities than large scale farmers for the rural poor as they do not depend on machinery to a larger extent since their access to machinery is limited by lack of availability of finance.

CHAPTER 4

OVERVIEW OF THE AGRICULTURAL SECTOR OF ZIMBABWE

4.1 Introduction

Agriculture is the most important sector in the economies of most non-oil exporting African countries and is the principal occupation of the majority of people. It constitutes approximately 30% of Africa's GDP and contributes about 50% of the total export value (Muthui, undated). Production is subsistence in nature with a high dependence on the rain. Africa, most of whose people are farmers, is unable to feed itself and has been in this situation for many decades now. According to Southern African Confederation of Agricultural Unions (SACAU) (2006), the number of chronically undernourished people has risen from 173 million in 1990-92 to some 200 million in 1997-99. Of these, 194 million (34 % of the population) are in Sub-Saharan Africa.

In Africa it is estimated that out of the 632 million hectares of arable land, only 179 million hectares is actually being utilised for agricultural purposes (SACAU, 2006). In most Sub-Saharan Countries agriculture is the single largest contributor to GDP, the biggest source of foreign exchange and the main generator of savings and tax revenues. The agricultural sector is also the principal provider of raw materials in industries, with two-thirds of manufacturing value added in most African countries being based on agricultural raw materials. The rural areas, where agriculture is the mainstay of all people, the industry supports some 70 to 80 % of the total population, including 70 % of the continent's extreme poor and undernourished (SACAU, 2006).

There is global recognition that hunger and the cycle of poverty in Africa are two of the most significant development challenges that the world faces today. Studies have shown agriculture to be the most effective driver of growth in the world's poorest countries (FAO, 2001; Chaumba *et al,* 2003; SACAU, 2006). Improvement in agricultural performance has potential to increase rural incomes and purchasing power for the majority of the African population. Therefore, raising agricultural productivity is essential for reducing rural poverty, enhancing food security, and stimulating broad-based economic growth. Any plans for improving agriculture depend on improving the technical, economic, and legal trade conditions under which farmers and agribusinesses operate.

4.2 Zimbabwe agricultural sector

In the early 90s, over 95 per cent of all food and beverages in Zimbabwe were locally produced and agriculture accounted for 30 per cent of formal sector employment and over 40 per cent of total national exports (Muir, 1994). Export earnings are particularly important, as the shortage of foreign exchange earnings is a major constraint to growth in Zimbabwe. Manufacturing is dependent to a greater degree on agriculture as a source of raw materials and some 70 per cent of consumer expenditure is on products derived directly from agriculture (Muir, 1994). The strong backward and forward linkages mean that a poor agricultural season has serious implications for the entire economy and this is reflected in national growth rates and private consumption.

Seventy percent of the Zimbabwean population are small-scale farmers and for decades, used external inputs (seeds and chemical fertilisers), and with material and financial support from government, they were able to provide for themselves, and even to produce substantial surpluses (Rukuni and Eicher, 1994). Together with the large commercial farms, they assured Zimbabwe's food security and exported food to the surrounding countries. Since 2000, the total agricultural production per capita index in Zimbabwe has been declining sharply (Figure 4.1). Small-scale farming families now have got more land since the land reform, but government support has disappeared almost completely (Richardson, 2006). External inputs are very difficult to get, and when available, out of reach for most farmers.

In addition, successive droughts, poor investment in production, equipment and inputs, lack of know-how and shortage of labour have taken a toll on Zimbabwe's agricultural sector, which is failing to feed its hungry population or supply raw material to its agriculture-based industries (Chaumba *et al.*, 2003; Richardson, 2006; Muchapondwa, 2008). The collapse of the agricultural sector has brought huge food shortages. One in every 3 Zimbabweans, or about 4 million people, depended on food aid in 2001 (FAO, 2001). According to the Human Rights Watch Group (2003) by early February 2003, there were 7.2 million food vulnerable people in Zimbabwe which translates to almost 50% of the food insecure in southern Africa.

Lower food production and failure of agriculture has led to dependency on food aid (Chipika, 2006). According to the Zimbabwe Emergency Food Security Assessment

Report (2002), 486 000 tonnes of food aid was needed to meet food security requirements of 6 700 000 people (49% of the population) over the period September 2002 to March 2003. Of the 6 700 000 requiring food aid, 5 900 000 were in rural areas and 850 000 in urban areas. Seventy percent of the rural population was at risk of famine-induced starvation (Mudimu, 2003). To add on to this, the ecological degradation is enormous, exacerbating poverty even further.

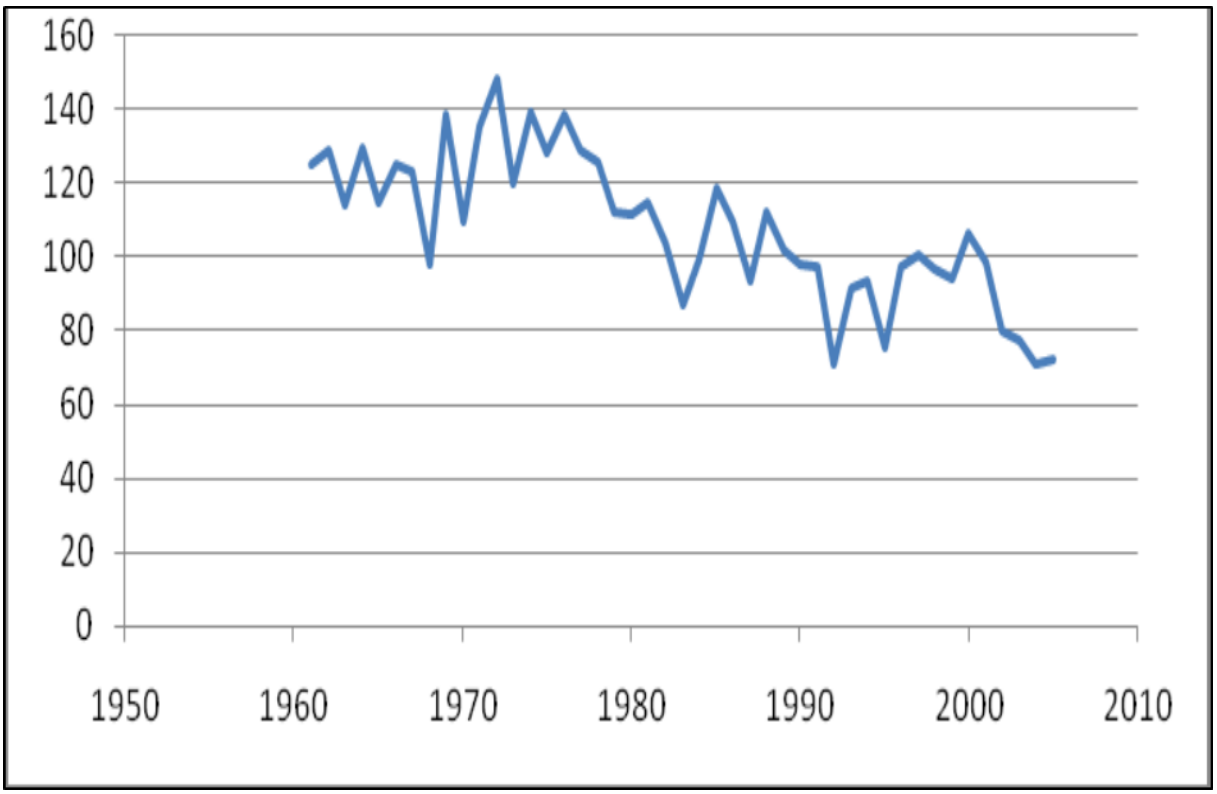

Figure 4.1: Total agricultural production per capita index of Zimbabwe: 1961-2005 (Source: FAO, 2006)

Although, the agricultural sector declined dramatically in the early 21st century, it is still an important productive sector of the country's economy. It regularly generates about 15 % of the gross domestic product (GDP). More than one-half of the total labour force is engaged directly in agricultural activities (Chitiga and Mabugu, 2008).

The agricultural sector in Zimbabwe is divided into large-scale commercial farming, which occupies some 40% of the total land area and was historically dominated by white farmers, and small-scale farming, which is both commercial and subsistence in nature. Occupying about the same total area as the large-scale commercial sector but on land that is considerably less fertile, smallholders have steadily increased their share of the country's total agricultural output since independence, from about one-tenth in the early 1980s to about half of the total production in the early 1990s (Muir-Leresche and Muchopa, 2006; FAO, 2007).

4.2.1 Farming regions in Zimbabwe

Zimbabwe is a landlocked country in the Southern Africa region with an area of over 390 000 km^2. It is bordered by Zambia, Mozambique, South Africa, Botswana and Namibia (Figure 4.2). It is situated between latitude 15 and 22° south of the equator and between 26 and 34° east of the Greenwich Meridian **(**Riddell, 1978). Climatic conditions are largely sub-tropical with one rainy season, between November and March. Rainfall reliability decreases from north to south and also from east to west. Only 37% of the country receives rainfall considered adequate for agriculture (Derman and Hellum, 2007). The country has been divided into five broad Natural Regions (NRs) in which the dominant partitioning factor is rainfall (Table 4.1 and Figure 4.2).

Natural Region I is a specialized and diversified farming region. Rainfall in this region is high (more than 1000 mm per annum in areas lying below 1700 m altitude, and more than 900 mm per annum at greater altitudes), normally with some precipitation in all months of the year (Campbell, 2003**)**. Temperatures are normally comparatively low. Afforestation, fruit and intensive livestock production are the main agricultural activities practiced in this region (Riddell, 1978). In frost-free areas, plantation crops such as tea, coffee and macadamia nuts can be grown. Where the mean annual rainfall is below 1400 mm, supplementary irrigation of these plantation crops is required for top yields. Smallholders occupy less than 20% of the area of this region (Campbell, 2003**).**

In Natural Region II flue-cured tobacco, maize, cotton, sugar beans and coffee can be grown. Sorghum, groundnuts, seed maize, barley and various horticultural crops are also grown. Supplementary irrigation is done for winter wheat. Animal husbandry like poultry, cattle for dairy and meat, is also practiced in. Smallholder farmers occupy only 21% of the area in this productive region (Derman and Hellum, 2007). Rainfall is confined to summer and is moderately high (750-1000 mm). Natural region III is a semi-intensive farming region. According to Stoneman and Cliffe (1989), rainfall in this region is moderate in total amount (650-800 mm), but, because much of it is accounted for by infrequent heavy falls and temperatures are generally high, its effectiveness is reduced (Derman and Hellum, 2007). Smallholders occupy 39% of the area of this region. Large-scale crop production covers only 15% of the arable land and most of the land is used for extensive beef ranching **(**Riddell, 1978). Maize dominates commercial farm production. The region is subject to periodic seasonal droughts, prolonged mid-season dry spells and unreliable starts of the rainy season. Irrigation plays an important role in sustaining crop production (Campbell, 2003**)**.

Table 4.1: Agro-ecological zones of Zimbabwe

Natural Region	Area (km^2)	% of total	Rainfall Characteristics	Type of farming Practiced
I	7 000	2	More than 1 050 mm rainfall per year with some rain in all months.	Specialized and Diversified Farming
II	58 600	15	700 - 1 050 mm rainfall per year confined to summer.	Intensive Farming
III	72 900	18	500 - 700 mm rainfall per year. Infrequent heavy rainfall. Subject to seasonal droughts.	Semi-Intensive Farming
IV	147 800	38	450 - 600 mm rainfall per year. Subject to frequent seasonal droughts.	Semi extensive Farming
V	104 400	27	Normally less than 500 mm rainfall per year, very erratic and unreliable. Northern Lowveld may have more rain but topography and soils are poorer.	extensive Farming

Source: Vincent and Thomas, 1960

Natural region IV is a semi-extensive farming region. This region experiences fairly low total rainfall (450-650 mm) and is subject to periodic seasonal droughts and severe dry spells during the rainy season. The rainfall is too low and uncertain for cash cropping except in certain very favourable localities, where limited drought-resistant crops can afford a side line. The farming sector which is favourable in this region is livestock production. Livestock production in this agro-ecological region can be intensified to some extent by the growing of drought-resistant fodder crops. Communal farmers occupy 50% of the area of Natural Region IV **(**Riddell, 1978).

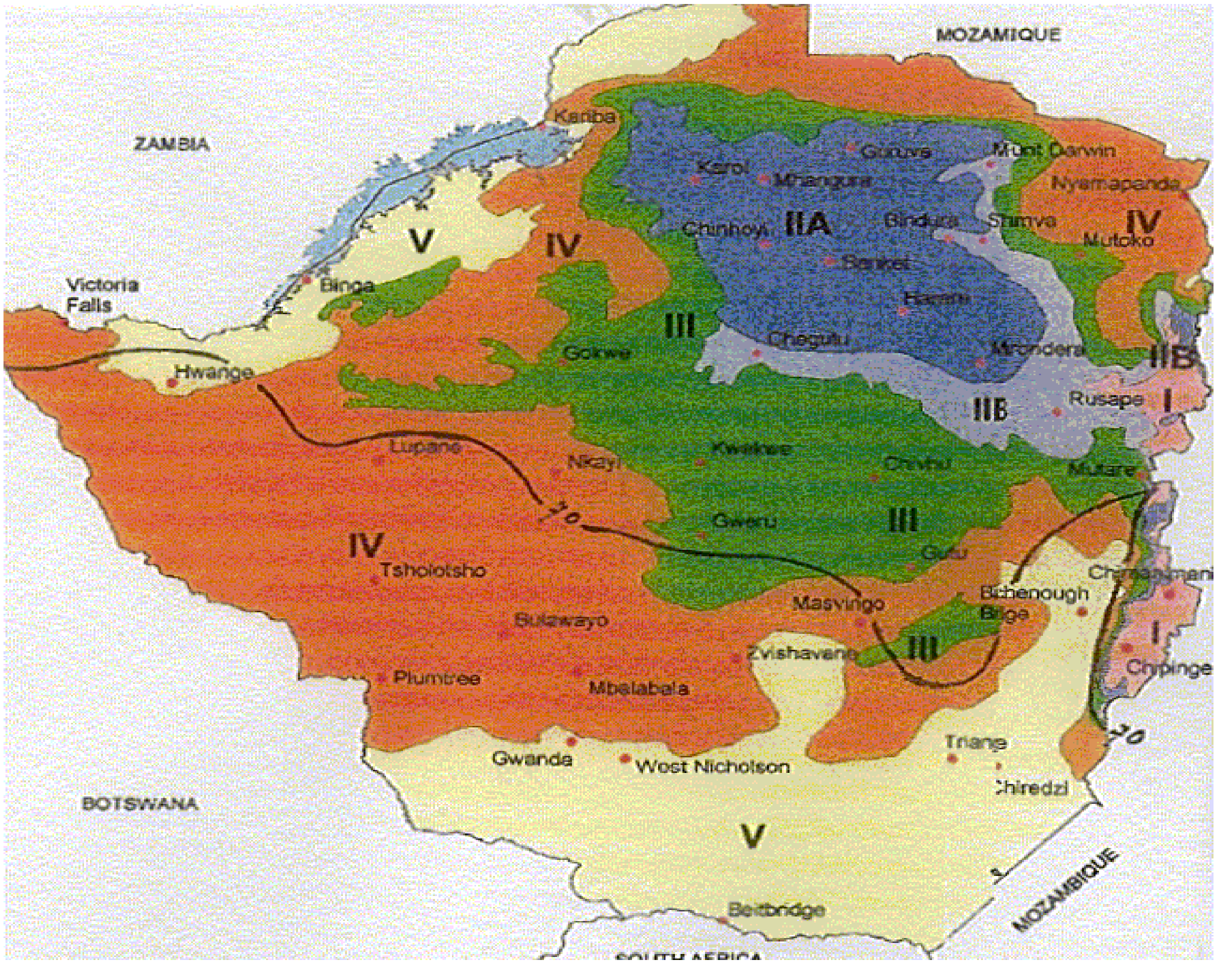

Figure 4.2: The five natural regions of Zimbabwe (Source: Surveyor-General, 1984)

Natural region V is an extensive farming region. The rainfall in this region is too low and erratic for the reliable production of even drought-resistant fodder and grain crops, and farming has to be based on the utilisation of veld alone. The extensive form of cattle ranching or game ranching is the only sound farming system for this region. According to Riddell (1978), included in this region are areas of below 900m altitude, where the mean rainfall is below 650 mm in the Zambezi Valley and below 600 mm in the Sabi-limpopo valley. Communal farmers occupy 46% of the area of Natural Region V.

Actually, about 80% of the rural population live in Natural Regions III, IV and V where rainfall is erratic and unreliable, making dryland cultivation a risky venture (Campbell 2003**;** Riddell 1978). The success rate of rainfed agriculture in Natural Regions IV and V has been known to be in the order of one good harvest in every four to five years.

4.2.2 Farming sectors in Zimbabwe

Agriculture in Zimbabwe is characterized by a high degree of diversification including the cultivation of maize, soya bean, cotton, wheat, groundnuts, sorghum, sunflower seed, cottonseed, coffee, millet and the production of high grade beef and dairy products as main products. Food production is on a gradual decreasing trend in Zimbabwe with sharp decline in 2003 (Table 4.2). The fluctuations in production reflect the vulnerability of Zimbabwe to climatic and political instability.

Table 4.2: Food production trends

Year	**1961**	**1970**	**1980**	**1990**	**2000**	**2003**
Agricultural production per capita index (Index: 1999-2001=1000)	125.6	110.1	111.8	98.1	106.6	83.2

Source: FAO, 2006.

4.2.2.1 Field crops and horticulture

Crop production is well diversified. The most important food crop is maize (corn), which is grown throughout Zimbabwe but does best in the well-watered northeast.

Mashonaland East, West and Central Provinces constitute the breadbasket of the country. In previous years, enough maize was usually produced so that Zimbabwe was able to meet its domestic demand and also export a sizable quantity, but, in the early 21st century, with the significant decline in agricultural productivity, the country was unable to meet domestic needs (Figure 4.3) (FAO, 2010). Other food crops include wheat, millet, sorghum, barley, cassava, peanuts (groundnuts) and soybeans.

Zimbabwe’s farming sector can produce, and has produced in the past, exportable surpluses of maize and certain other food crops (USDA, 2007). But severe constraints on prime land use have resulted in less than full capacity utilization of its natural resources. However, for the 2009/10 agricultural season it was reported that fallow land was brought under cultivation. Nationally, maize yields decreased to 0.75 tonnes/ha, from 0.82 tonnes/ha recorded during the 2008/2009 season. Yields decreased in all farming sectors, with the exception of A2 commercial farms, which recorded an average increase of 6 percent over the previous season. Nationally, yields are just below the ten-year average (2000-2010) of 0.87 tonnes/ha. Similarly, millet and sorghum yields fell during the 2009/2010 season. In regard to cash crops, yields decreased for all crops apart from soya bean during the 2009/2010 season. Cotton and tobacco yields fell to 0.66 tonnes/ha and 1.27 tonnes/ha, respectively, but for tobacco this fall was compensated by a rise in the area planted. Groundnuts, sugar beans and sunflower yields dropped by approximately one-third relative to 2008/2009 season’s level, on account of the erratic rainfall.

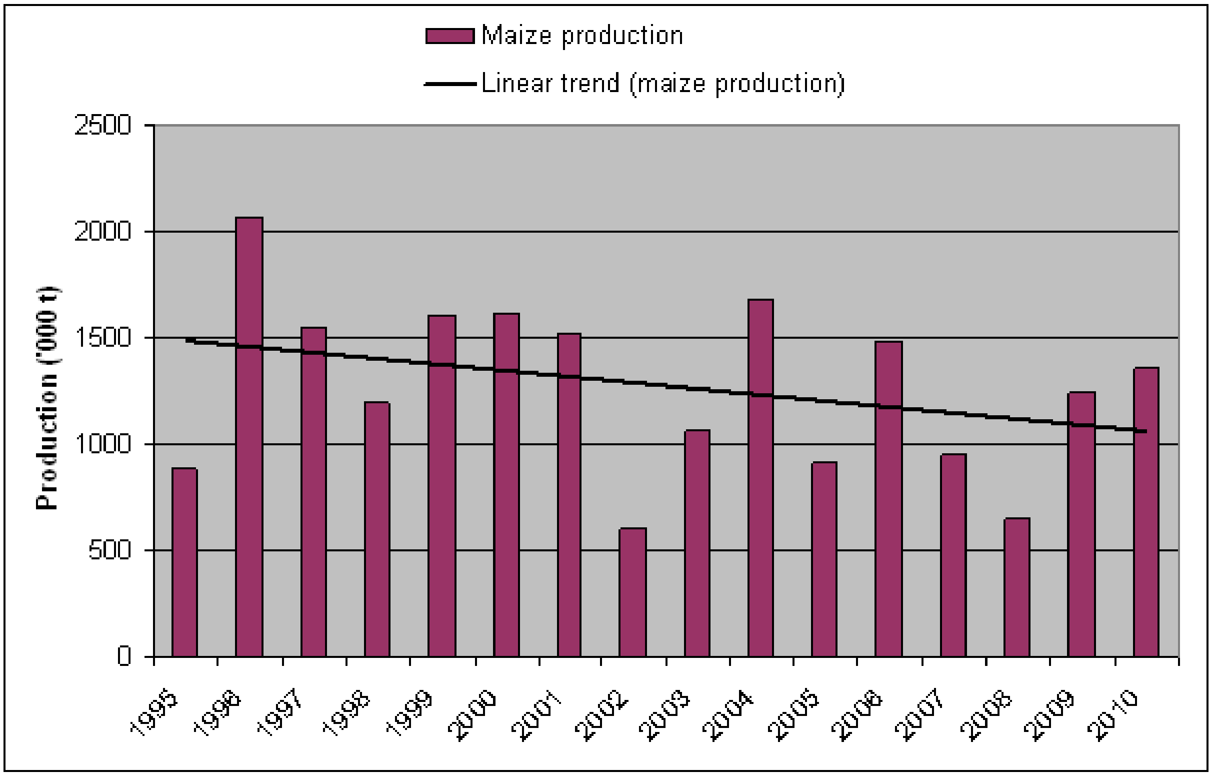

Figure 4.3: Historical corn yields in Zimbabwe (Source: FAO, 2010)

A strong negative trend in production of national maize, which accounts for the major part of food production, over the last 15 years is evident (Figure 4.3). The reasons for the downward trend, before the fast track land reform, include a gradual switch by the large-scale commercial farms from maize, which became a GMB-controlled crop, to other non-controlled crops such as tobacco, cotton, among others (FAO, 2010). A more recent decline is due to the structural change precipitated by land tenure policies, lack of investments/funds domestically and externally in agriculture sector, and overriding economic deterioration. The large-scale commercial sector now produces less than 10 percent of the national maize output (FAO, 2010). Some experts also argue that environmental factors such as increased frequency of drought, combined with maize production being on more marginal lands of the communal farms with little or no fertilizer, can explain some of the long-term negative trends.

Wheat production has also declined dramatically since the mid-1990, when production exceeded a quarter of million tonnes. High input costs, lack of liquidity and unreliable (and expensive) electricity supplies to power irrigation pumps are all attributed to the decline in wheat production. Moreover, the competitive prices on the international market, and the current liberal trade regime, make domestic wheat production less economically viable, given the current high production cost. Cereal yields declined during the 2009/2010 season relative to 2008/2009, as a result of a combination of the inadequate mid-season rainfall and a delay in the distribution of fertilisers. Fertiliser use was not sufficient to cover all the planted areas; therefore farmers practiced extensive farming methods rather than intensive.

Despite the decline in tobacco yield per hectare in Zimbabwe, tobacco is still the country's principal cash crop. Three types of tobacco have traditionally been grown in the country: Virginia flue-cured, mainly on the large commercial farms; burley, mostly by smallholders; and Turkish, of more limited extent. According to the Minister of Agriculture in Zimbabwe, Joseph Made[8], tobacco had become the single agriculture largest foreign currency earner for the economy. There has been an increase in production by seven percent from 123, 5 million kilograms of tobacco produced during the 2009/2010 season to 132, 4 million kilograms during 2010/2011 season due to increased area under cultivation. Zimbabwe was expected to earn US$500 million from

[8]In a speech at the official closing of the tobacco season in Harare on the 28th of October 2011.

the export of tobacco produced during the 2010/11 cropping season. The country had initially raked in US$361 direct earnings from the crop during the 2010/2011 selling season. The continued increase has been attributed to increased production from small scale farmers. The number of tobacco growers has increased dramatically over the last decade from a register of 8 500 (growing an average of 10 hectares each) to over 66 000 growers (growing an average of 1, 3 hectares each) of whom 80 percent are small scale in the A1 and communal sector. According to the Tobacco Industry and Marketing Board chairperson, Mrs. Monica Chinamasa[9], during the 2010/2011 season the A2 sector only accounted for 12 percent of total production, compared to 28 percent for A1, 18 percent communal, 11 percent small scale and 31 percent large scale producers.

Horticultural production has declined over the years since 2000 when most large scale mechanized producers were removed from the farms. Before the fast track land reform programme, horticultural production and exports have been the fastest growing sector in the Zimbabwean economy registering a growth rate in excess of 30% per annum. Between 1985 and 2000 exports have grown from US$3.5 million in the season 1985/86 to US$139.5 million in 2000/1 (Heri,2000). For all horticultural produce, the main export destination was Europe, with 99% of cut flowers, 89% of vegetables, herbs and spices, and 75% of citrus. The bulk of the cut flowers were destined for Holland (1999/2000 - 85.65%), the bulk of the fresh produce were destined for the United Kingdom (1999/2000 - 62.29%), whilst the citrus was less country specific, was being destined mainly for France, UK, Germany and Holland (1999/2000– 78.60%) (Heri, 2000). For

[9] In a speech at the official closing of the tobacco season in Harare on the 28th of October 2011.

the period 1 January 2008 to 31 December 2008 total shipments under the horticulture sub-sector only amounted to, US$24, 7 million (Kuhudzai, 2011).

4.2.2.2 Livestock production

Cattle are the preferred livestock of the country's farmers (Chimonyo *et al*, 1999). Beef and dairy products, produced mainly by the commercial sector, accounted for about one-fourth of agricultural output in most years. After independence there was a growing domestic demand for beef, and, as one of the few African countries allowed to export beef to the European Community (now the European Union [EU]), Zimbabwe developed a significant export trade in beef as well. This trade has been negatively impacted by the overall decline of the agricultural sector in the early 21st century, which resulted from lack of grain available for feed.

Since the Land Reform Fast Track programme in the early 2000s, there was a general shift towards greater smallholder cattle ownership and a reduction in the number of large commercial herds; correspondingly there was also a decline in dairy production. However, the 2009/10 season marked an improvement in livestock conditions compared to the previous season, although, pasture conditions in Matabeleland South and Masvingo provinces was not sufficient to last until the beginning of 2010/2011 rainy season, due to the poor rains received (FAO, 2010). Growth in dairy production in 2010 was attributed to improved economic conditions (FAO, 2010).

Table 4.3: Zimbabwean Livestock Census – 2000[10]

Province	Cattle	Sheep	Goats	Districts
Mash East	1,093,815	37,084	160,962	10
Midlands	1,057,435	90,608	1,089,682	7
Masvingo	827,227	91,954	612,441	8
Mash West	806,006	83,044	178,316	6
Matebeleland South	714,066	159,636	865,466	6
Manicaland	667,291	59,837	274,502	7
Matebeleland North	553,646	135,363	442,635	8
Mashonaland Central	466,826	33,117	179,585	7
Total	**6,186,312**	**690,643**	**3,803,589**	**59**

Source: Department of Veterinary Services, 2000; Government of Zimbabwe, 2001.

Despite this expansion, milk production is still well below levels recorded in 2000 and the erratic power supplies increase the cost of production, particularly harming small-scale producers. Furthermore, it was reported that higher grade cattle were in short supply, and that prices of feed and supplementation was high. Dipping frequency has improved with the Department of Veterinary Field Services procuring enough dip chemical to last the whole year since the formation of Government of National Unity in 2009. FAO, in addition, supported the provision of dipping chemicals, providing a total of 120 tonnes of acaricide. As regards to diseases, incidences of anthrax were reported in all provinces and measures were taken to control its spread. Foot and mouth disease

[10] **Please Note:** The last livestock census was conducted in 2000 in Zimbabwe; therefore the 2000 data was the latest available data.

was detected in Masvingo province in December 2009, but it has been brought under control. While tick–borne diseases - red water and heart water were reported in eastern and southern provinces during the 2009/2010 agricultural season. There were also cases of Newcastle disease in areas of Mashonaland East and Masvingo; in addition, incidences of rabies were reported in grazing animals. Uncontrolled movement of tick infested cattle contributed to the spread of dermatophilosis from north-western provinces.

Sheep, goats, and pigs are raised in some areas, but their importance is minor compared with cattle. Poultry are kept largely for home use. The total numbers of various livestock in the country as per the 2000 livestock census are shown in Table 4.3. The smallholder sector owns 72 % of the total cattle population while the remaining 28 % are owned by the commercial farming sector in 2004. Furthermore, the smallholder sector owns 94 % of the sheep and goat population while the commercial sector owns only 6 %. The commercial farming sector holds 48 % of the total pig population against 52 % held by the smallholder sector (Sibanda, 2005).

The Fast track land reform has caused a reduction of the commercial cattle herd by 75% from 1996 to 2004, while recurrent droughts contributed to further losses of cattle in the small-scale farming sector. However, during the same time the goat population has increased, with more than 90% of the goats owned by small-scale farmers (Sibanda, 2005). Prices for goat meat per kilogram are now at the same level as beef, offering opportunities for small-scale goat farmers to enter commercial markets (Sibanda, 2005).

4.3 Summary

Since the fast track land reform programme in 2000, the total agricultural production has been declining. Small-scale farming families now have more land, but government support has disappeared almost completely. Agricultural inputs are very difficult to get, and when available, they are not affordable to most small scale farmers. In addition, successive droughts, poor investment in production, equipment and inputs, lack of know-how and shortage of labour have also resulted in a decrease in agricultural production. Lower food production and failure of agriculture has led to dependency on food aid.Although, the agricultural sector declined dramatically in the early 21st century, it is still an important productive sector of the country's economy. Since the economic reforms (formation of Government of National Unity) farmers are better equipped to plan and prepare for the season, as a result of the comparatively steady inflation rate. In conjunction with the large input support programme, that significantly increased the availability of inputs, production increased over the last two agricultural seasons, albeit from a very low base in 2007/08, and the 2010/2011 harvest is approximately 15 percent higher than the ten-year average (2000-2009). Although the agriculture sector is improving, limited liquidity as well as weak banking system is still presenting an obstacle for rural farmers to make further investments.

CHAPTER 5

DESCRIPTION OF STUDY AREAS

5.1 Introduction

Agriculture is pivotal in the economic and social development of Mashonaland Central Province as it provides employment, adequate and affordable food for the majority of the population in the province directly or indirectly, thereby contributing to the reduction of poverty (Moyo, 2004). This chapter gives an overview of Mashonaland Central Province of Zimbabwe, the area where this study was conducted. The area's locations (including maps), topography and climate, socio-economic factors and agricultural potential are comprehensively explained.

5.2 Mashonaland Central Province of Zimbabwe

Historically, Mashonaland Central closely follows Mashonaland West in terms of agricultural production. The province's second highest position is attributed to its size which is next to that of Mashonaland West, otherwise rainfall, soil types and other factors are basically the same as those of Mashonaland West. The aggregate contribution of traditional agriculture to the province's total agricultural production was about 19% (Zimconsult, 2004).

It has an area of 28,347 km² and a population of approximately 998, 265 (Census, 1992), representing about 8.5% of the total Zimbabwe population. The population density for Mashonaland central province is about 20 persons per square kilometer and 92 per cent of the population is rural. Though more than 50% of the people live in high potential areas, in terms of wellbeing 80.4% of the people who dwell in Mashonaland Central are classified as poor with 40.4% being extremely poor (Mathende, 1999). The main factor which accounts for the widespread poverty is lack of formal employment or poor salaries and as such use of technical inputs is very low due to the fact that the majority of the farmers cannot afford (Sachikonye, 2005). In addition the erratic rainfall patterns being experienced in Zimbabwe have also contributed to poor agricultural yields hence poverty and food insecurity. Mashonaland Central is divided into seven districts and these are Guruve, Centenary (Mbire and Muzarabani), Mt Darwin, Rushinga, Mazowe, Shamva and Bindura as shown in Figure 5.1 (Zimconsult, 2004).

5.2.1 Topography and soil characteristics

The area is largely composed of flat and undulating terrain. However some districts such as Mt Darwin, Centenary are mountainous and fall in the Zambezi valley which is a low lying area. The soils types vary from sandy loams to clays. Similarly soil fertility varies from place to place. Low lying areas such as the Zambezi valley tend to have deep clay soils whilst high areas such as Shamva South have shallow sand soil which allows tobacco production (Mathende, 1999). In terms of agricultural production, the soils are not much of a limiting factor since crops grow well in both heavy and light soils.

5.2.2 Climate

The Province mostly lies in the agro-ecological region II, which is good for cropping and intensive livestock production. Rainfall is confined to summer and is moderately high (750-1000 mm) in this region (Vincent and Thomas, 1960; Campbell 2003). The

Province also has some small portions falling in regions III and IV which are good for semi-intensive farming and semi-extensive farming, respectively (Utete, 2003). In natural region III, rainfall is moderate (650-800 mm), but, because much of it is accounted for by infrequent heavy falls and temperatures are generally high, its effectiveness is reduced. Region IV is found on the part of the province where Zimbabwe borders Mozambique. Rushinga is the only district in the Province that does not have commercial farms as it lies in region IV. This region experiences fairly low total rainfall (450-650 mm) and is subject to periodic seasonal droughts and severe dry spells during the rainy season (Vincent and Thomas, 1960, Riddell 1978). The rainfall is too low and uncertain for cash cropping except in certain very favourable localities, where limited drought-resistant crops can be grown at a small scale.

Temperatures vary according to area. Generally annual temperatures tend to rise with latitude and summer temperatures can rise to more than 37 degrees Celsius in the Zambezi valley (Mathende, 1999). Winters are generally cool to warm and dry. Droughts are a common feature nowadays in Mashonaland Central. Climate change is said to have caused such a bad weather phenomenon in the Sub Saharan Africa. In the Zambezi valley, floods which are as a result of heavy rains are also a common feature for example in the first three months of 2008, other part of Mashonaland central especially those that fall in the Zambezi valley experience floods as a results of heavy rains. The worst affected area was Muzarabani where more than 1000 households were affected and the Zimbabwe Red Cross Society for instance assisted a total of 4210 people with emergency relief and shelter (IFRC-RCS, 2008).

Figure 5.1: Districts in Mashonaland Central Province (Source: Samwise, 2008)

5.2.3 Agricultural activities for Mashonaland Central.

The main economic activity in Mashonaland central province is farming as most of the people live in rural areas where formal employment opportunities are minimal. The main crop grown in the province is maize due to the fact that it is the staple food for Zimbabwe (Utete, 2003). Other crops grown in the province include cotton, tobacco, groundnuts, soya beans, wheat and sorghum. Amongst the small scale farmers, maize, groundnuts, sweet potatoes and cotton are the most grown crops. In terms of food security the majority of the farmers in Mashonaland Central province used to produce their own food in the early 90s. The government of Zimbabwe and other non-governmental organizations (NGOs) provided inputs (Zimconsult, 2004). However, due to the persistence of droughts in Zimbabwe since 1992, most households in the province now depend on remittances, grain loans extended by the government and food relief provided by NGOs to meet shortfall (IFRC-RCS, 2008).

Livestock production is also a major farming activity in the area and the main livestock enterprises in Mashonaland central regions include cattle, poultry, pigs and goats. Following a series of droughts over the past two decades in Zimbabwe, the livestock sector has suffered a major setback. Stock feeds in Zimbabwe are maize based. The rapid increase in demand for maize for human consumption which resulted in prices of stock feeds skyrocketing coupled with reduction in prices of livestock due to increased supply due to fear of animals dying because of lack of feed (IFRC-RCS, 2008). Most small scale farmers produce cattle and goats using the extensive production system.

5.2.4 Fast track land reform in Mashonaland Central

By the end of July 2002 the province had a total of 712 officially settled farms out of 778 gazetted farms and 14 756 households had been settled under the A1 Model, while 1 684 had been allocated land under the A2 Model (Utete, 2003). The full statistical data is as detailed in Table 5.1 below. The take up rates for the peri-urban scheme near Shamva were low (less than 45%) because of the prevalence of gold panning (Utete, 2003). The panning had rendered whole tracts of land unsuitable for agricultural purposes. Gold panning is also increasing at an alarming rate in Mount Darwin, Bindura and some remote areas of Mazowe.

The issue of security of tenure is of great concern to most settlers, especially those on A2 plots. Settlers pointed out that lack of clarity on the issue of tenure was negatively affecting investment decisions on the allocated land and hence productivity. Most of the A1 plot holders were satisfied with their allocations. A few however, expressed the wish to be promoted to A2 plots. Most of the beneficiaries of the fast tract land reform programme in Mashonaland Central Province have basic farming skills and expressed the need to be trained in farm management, marketing and use of irrigation equipment. By the end of 2010, there were still a sizeable number of former commercial farmers who, after having been served with section 8 notices, still remained on the gazzetted properties.

In many districts of Mashonaland Central Province, double allocation and multiple ownerships had occurred. A2 farmers who previously owned A1 farms had not surrendered them. Decongestion of communal areas did not occur as expected because some land reform beneficiaries maintained dual home i.e. both in the communal area and in the new farms resettlement schemes owing to the uncertainty of tenure in the new resettlement areas. As at the end of September 2010, unofficial land occupations were occurring on some farms.

A small number of farm workers benefitted from land reform. Some former farm workers were given packages and left for their communal homes. However, the majority of the former farm workers in the Mashonaland Central Province remained on the farms. Of those that remained on the farms, the majority of them were not interested in working for the new farmers and preferred to engage in gold panning which paid more. This resulted in a shortage of farm labour in the province. Most of the extension officers in the Province were of the view that the Government should exclusively support A1 and the old resettled farmers, whom they considered to be more deserving. This sentiment was expressed in cognizance of the limited capacity of the Government’s inputs support scheme.

Table 5.1: Allocation pattern by model[11]

District	AI MODEL		A2 MODEL		TOTALS		
	Hectarage	No. of beneficiaries	Hectarage	No. of beneficiaries	No of farms	No of beneficiaries	Hectarage
Bindura	75,618.07	3,454	28,451.29	428	149	3,882	105,494.24
Guruve	74,447.57	2,635	8,014.66	64	76	2,699	82,462.23
Shamva	31,286.06	1,851	12,478.25	378	74	2,229	44,968.04
Mazowe	217,588.05	5,478	145,692.50	873	431	6,351	373,247.89
Mt Darwin	34,117.22	1,744	3.922.22	46	39	1,790	38,039.44
Muzarabani	80,137.57	2,342	32,314.70	186	90	2,528	112,452.27
Rushinga	NIL	NIL	NIL	NIL	NIL	NIL	NIL
Totals	513,194.54	17,504	230,873.62	1,975	859	19,479	756,665.11

Source: Utete (2003)

[11] **Please Note:** Data on allocation patterns on model for 2010 was not available; hence the latest available data of 2003 was used.

5.3 Summary

The majority of the population in Mashonaland Central Province is rural and live in high potential areas. In terms of wellbeing most of the people in the province are classified as poor. Mashonaland Central is divided into seven districts and these are Guruve, Centenary, Mt Darwin, Rushinga, Mazowe, Shamva and Bindura. The area is largely composed of flat and undulating terrain and soil types vary from sandy loam to clay. The province mostly lies in the agro-ecological region II, which is good for cropping and intensive livestock production. Rainfall is confined to summer and is moderately high. The province also has some small portions falling in regions III and IV which are good for semi-intensive farming and semi-extensive farming, respectively. Temperatures vary from area to area. Generally annual temperatures tend to rise with latitude and summer temperatures can rise to more than 37 ^{0}C.

The main economic activity in Mashonaland Central Province is farming and the main crop grown is maize due to the fact that it is the staple food. Most farmers in the province also keep cattle and goats. However due to the persistence of droughts in Zimbabwe since 1992, most households in the province now depend on remittances, grain loans extended by the government and food relief provided by NGOs to meet the shortfalls. By the end of July 2002 the Province had a total of 712 officially settled farms out of 778 gazetted farms and 14 756 households had been resettled under the A1 Model, while 1 684 had been allocated land under the A2 Model. In many districts of Mashonaland Central Province, double allocation and multiple ownerships had occurred. A2 farmers who previously owned A1 farms had not surrendered them. Decongestion of communal areas did not occur as expected because some land reform beneficiaries maintained dual homes.

CHAPTER 6

RESEARCH METHODOLOGY

6.1 Introduction

This chapter focuses on reviewing the theoretical framework on which the thesis was built from and the research methods used. The discussion is intended to show how this study was conducted using the specific research tools which include, the survey design and the analytical framework. The chapter commences by describing the theoretical issues on production functions and efficiency followed by the sampling procedure used in the study. Attention is given to sampling techniques and determination of sample size. The discussion is then followed by the designation of the survey instrument, outlining procedure for data collection, a brief discussion of descriptive statistics as well as the empirical models employed for data processing. The chapter concludes by highlighting the major shortcoming of the survey method.

6.2 Theoretical issues on production functions and efficiency

This section discusses production functions and some related concepts which form the basis of measuring the efficiency of farms. Basic concepts of the production function, technical, allocative and economic efficiency are comprehensively explained and illustrated using graphs.

6.2.1 Production function

In microeconomic theory, the production function explains the technical or physical relationship between output and inputs. Specifically it shows the maximum output obtainable from a given set of inputs. Inputs are rates of resource use and output is the rate of production over a specific time period.

Let $(x_1, x_2..., x_n)$ *denote* the inputs used in the production of output *Y*; the production function can be written as:

$$Y_i = f(x_1, x_2, \dots \dots \dots \dots \dots, x_n) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . 6.1$$

This formulation excludes the possibility of technical inefficiency because output is at maximum for any level of inputs. The production function is the boundary of a production set. Consider the Figure 6.1 where, for simplicity, one input x is used to produce a single output y. The production set, *Q,* denotes the technically feasible production set (y, x), i.e., *Q* = *(y, x).* The region below the production function curve in Figure 4.1 represents the production set.

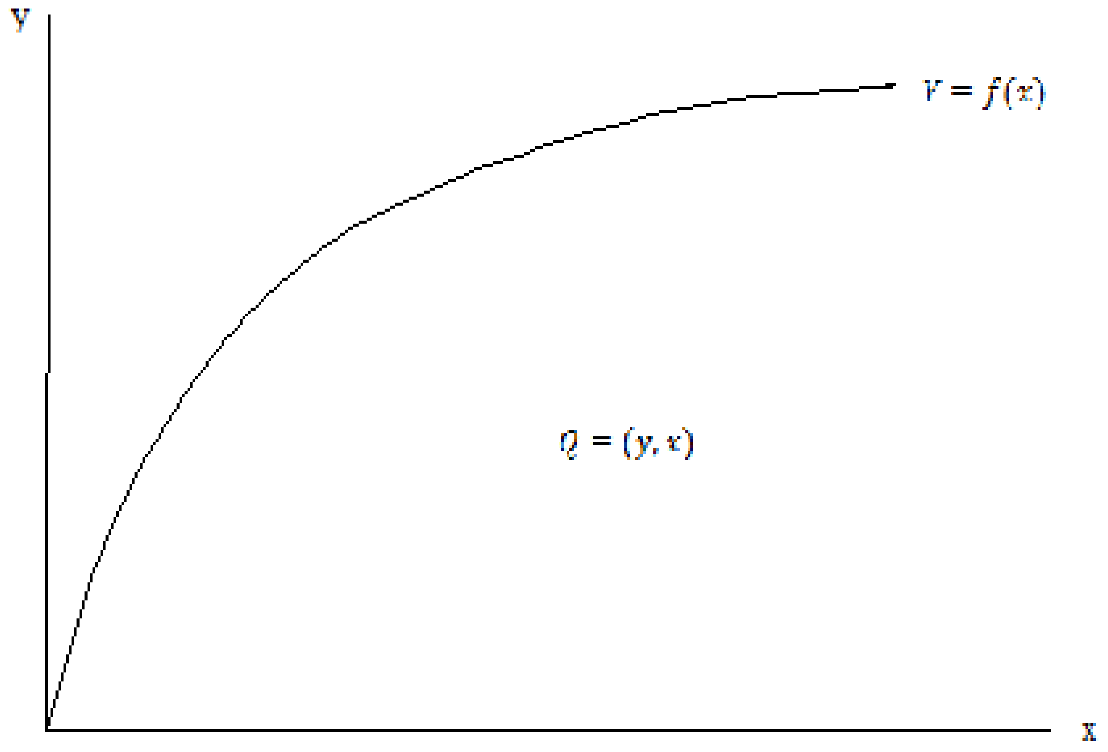

Figure 6.1: The production function

The production combinations which maximize output (Y) for given x or minimize x for given Y are technically efficient combinations constitute the boundary to the production set $Q = f(Y, x)$. Thus the production function $Y = f(x)$ is the set of technically efficient combinations, and all technically inefficient combinations belong to the interior of the production set.

Production functions involve concepts some of which are used in our analysis: the marginal productivities of the factors of production, output elasticity's, the marginal rates of technical substitution, the elasticity of substitution, and returns to scale. The marginal productivity of a factor is defined as the change in output for an infinitesimal change in a factor, holding all other factors constant. Mathematically, the marginal productivity of each input is obtained by the partial derivative of the production function with respect to this input. Consider the production function in (6.1), the marginal productivity of x_i is:

$$f_i = \frac{\delta y}{\delta x_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .6.2$$

Where i= (l, 2, 3,... n)

The basic production theory concentrates on the range of output over which the marginal productivity is positive and diminishing, that is:

$f_i > 0$ and

$$f_{ii} = \frac{\delta^2 y}{\delta x^2} < 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .6.3$$

Where f_{ii} is the second order derivative.

Output elasticity measures the percentage change in output resulting from a percentage change in an input, holding all other inputs constant. Considering the production function in (6.1), it is defined as:

$$E_i = \frac{\delta f_i x_i}{\delta x_i y_i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .6.4$$

It is a unit-free measure of marginal productivity (Chambers, 1988). If E_i = 1, a proportional increase in input *i* results in the same proportional increase in output; if E_i > 1, the proportional increase in output is greater than the proportional increase in the input *i;* and if E_i < 1, the proportional increase in output is less than the proportional increase in the input *i.*

An isoquant or production indifference curve is defined as the locus of all the technical efficient combinations of inputs which produce the same output. It shows the rate at which inputs are substituted in production holding output constant. For simplicity consider the two variable production functions:

$$Y = f(x_{1,}, x_2) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..6.5$$

The equation of an isoquant is obtained by the production function (4.3) when output is held constant at say Y_0:

$$Y_0 = f(x_1, x_2) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.6$$

This represents the isoquant which displays all combinations of inputs that can be used to produce output Y_0. It is illustrated in Figure *6.2.* The slope of the isoquant at any point is derived by differentiating (6.4) implicitly with respect to one of the inputs, say x_1. This yield:

$$f_1 + f_2 \frac{\delta x_2}{\delta x_1} = 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.7$$

Or $$\frac{\delta x_2}{\delta x_1} = -\frac{f_1}{f_2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots\ldots\ldots\ldots\ldots.6.8$$

The negative of the slope of an isoquant is the marginal rate of technical substitution (MRTS) which measures the rate at which inputs can be substituted, keeping output constant. The MRTS is not independent of units of measurement. The elasticity of factor substitution is a better measure of factor substitution as it does not depend on the units of measurement. It is defined as the proportionate rate of change of the input ratio divided by the proportionate rate of change in MRTS:

$$\sigma = \frac{\delta\left(\frac{x_2}{x_1}\right)/\left(\frac{x_2}{x_1}\right)}{\delta(MRTS)/(MRTS)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.9$$

The larger the value of a, the greater the degree of substitutability between the two factors. In general, we expect variable elasticity of substitution production function; however, some production functions have a constant elasticity of substitution. For example, a Cobb-Douglas function has a constant and unitary elasticity of substitution. Returns to scale measures the proportional change in output as all inputs change by the same proportion. It is mathematically defined as:

$$€ = \sum_{i=1}^{\lambda} \frac{\delta y}{\delta x_i} \frac{x_1}{y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.10$$

Returns to scale describes three important characterizations of productions. If €=1, the production function shows constant returns to scale, that is, output increases by the same proportion as the inputs; if € < 1, the production function exhibits decreasing returns to scale, which implies that output increases less than proportionally with the increase in the inputs; and if € > 1, the production function reveals increasing returns to scale, which implies that output increases in greater proportion than the increase in the inputs. Returns to scale can be shown as the sum of the output elasticity.

The isocost line shows the rate at which inputs are exchanged in the market (their relative prices). It is the locus of all combinations of inputs that can be purchased with a given cost outlay, that is, the isocost line is the locus of input combinations that entails the same total cost C_0:

$$C_0 = p_1 x_1 + p_2 x_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.11$$

Where P_1 and P_2 are the input prices of x_1 and x_2 . The isocost line is shown in Figure 6.2. Its slope is found by differentiating the isocost line:

$$\frac{\delta x_1}{\delta x_2} = -\frac{p_2}{p_1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6.12$$

This is the negative of the ratio of the input prices.

6.2.2 Measures of Efficiency

The measure of efficiency was started in 1957 by Farrell (Coelli, 1996). The failure to produce the maximum output from a given input mix at minimum cost results in inefficiency. Inefficiency is caused by factors which include limited access to technology, a lack of knowledge, and limited access to extension services, an unsuitable scale of production and sub-optimal allocation of resources. The efficiency of a farm consists of two components: technical and allocative efficiency.

Technical efficiency concerns the ability of a farm to produce maximum output from a given set of inputs. A farm is technically efficient if it produces a maximum output, given the amount of inputs and technology. Technical efficiency can be measured within two main frameworks: output- or input-oriented (Coelli *et al*, 2005). In an output-oriented framework, technical efficiency gives information about the potential output increase that a firm or a farm business could implement without increasing its use of inputs, while in an input-oriented framework, it gives the potential input reduction that a farm business could apply without having to reduce its output level. Thus the production frontier is associated with the maximum obtainable level of output, given a level of inputs, or the minimum level of inputs required to produce a given output. In other words, it is the locus of maximum attainable output for each input mix.

By contrast to technical efficiency, allocative efficiency accounts for the respective prices of inputs. Allocative efficiency reflects the ability of a farm to choose the inputs in optimal proportions, given their input prices. Allocative inefficiency arises if farms fail in allocating inputs which minimize the cost of producing a given output, given relative input prices. This results from not allocating inputs in the most efficient manner, i.e., there exists resource misallocation or allocative inefficiency. Failure in allocating resources optimally results in increased cost and decreased profit. In particular, a farm is said to be allocative inefficient if the marginal rate of technical substitution between any two inputs is not equal to the corresponding ratio of input prices, that is, allocative inefficiency is when the farm fails to use cost-minimizing input mixes. Thus allocative efficiency is defined as the ability of farmers to adjust inputs and output to reflect relative prices, given the production technology. The distinction between technical and allocative efficiency provides four ways for explaining the relative performance of farms. First, a farm might show both technical and allocative inefficiency; second, it may be technically efficient but allocatively inefficient; third, it may display allocative efficiency but technical inefficiency; and fourth it may be both technically and allocatively efficient.

Economic efficiency is the product of technical and allocative efficiency, that is to say it gives the overall efficiency of a farm business (Fa¨re *et al*, 1994). It can be interpreted as the potential reduction in production costs (and is thus named cost efficiency) or the potential increase in revenue (named revenue efficiency) that a farm business could apply in order to operate at the point of technical and allocative efficiency. Profit maximisation requires a firm to produce the maximum output given the level of inputs employed (i.e. be technically efficient), use the right mix of inputs in light of the relative price of each input (i.e. be input allocative efficient) and produce the right mix of outputs given the set of prices (i.e. be output allocative efficient) (Kumbhaker and Lovell, 2000).

These concepts can be illustrated graphically using a simple example of a two input (x_1, x_2)-two output (y_1, y_2) production process (Figure 6.2). According to Bojnec and Latruffe (2008), efficiency can be considered in terms of the optimal combination of inputs to achieve a given level of output (an input-orientation), or the optimal output that could be produced given a set of inputs (an output-orientation).

In Figure 6.2(a), the firm is producing a given level of output (y_1^*, y_2^*) using an input combination defined by point A. The same level of output could have been produced by radially contracting the use of both inputs back to point B, which lies on the isoquant associated with the minimum level of inputs required to produce (y_1^*, y_2^*) (i.e. Iso(y_1^*, y_2^*)). The input-oriented level of technical efficiency ($TE_I(y,x)$) is defined by 0B/0A. The least-cost combination of inputs that produces (y_1^*, y_2^*) is given by point C (i.e. the point where the marginal rate of technical substitution is equal to the input price ratio w_2/w_1). To achieve the same level of cost (i.e. expenditure on inputs), the inputs would need to be further contracted to point D. The cost efficiency (CE(y,x,w)) is therefore defined by 0D/0A. The input allocative efficiency (AE_I(y,w,w)) is subsequently given by CE(y,x,w)/TE_I(y,x), or 0D/0B in Figure 6.2(a) (Kumbhaker and Lovell 2000).

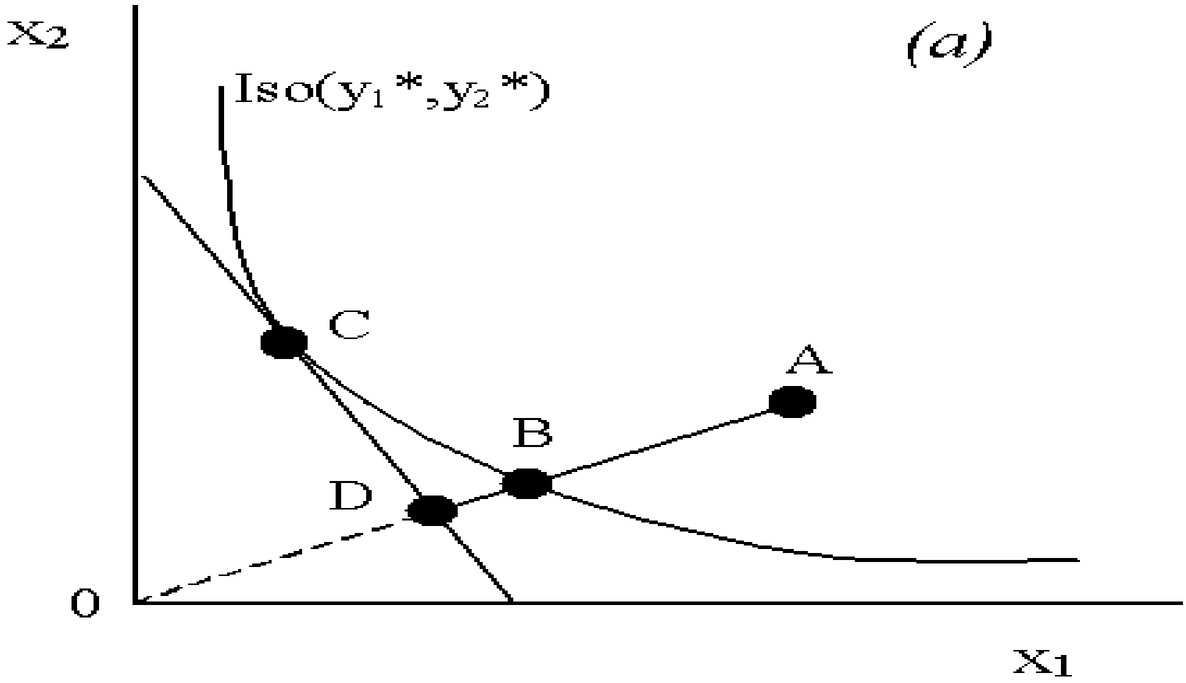

Figure 6.2 (a): Input oriented efficiency measures

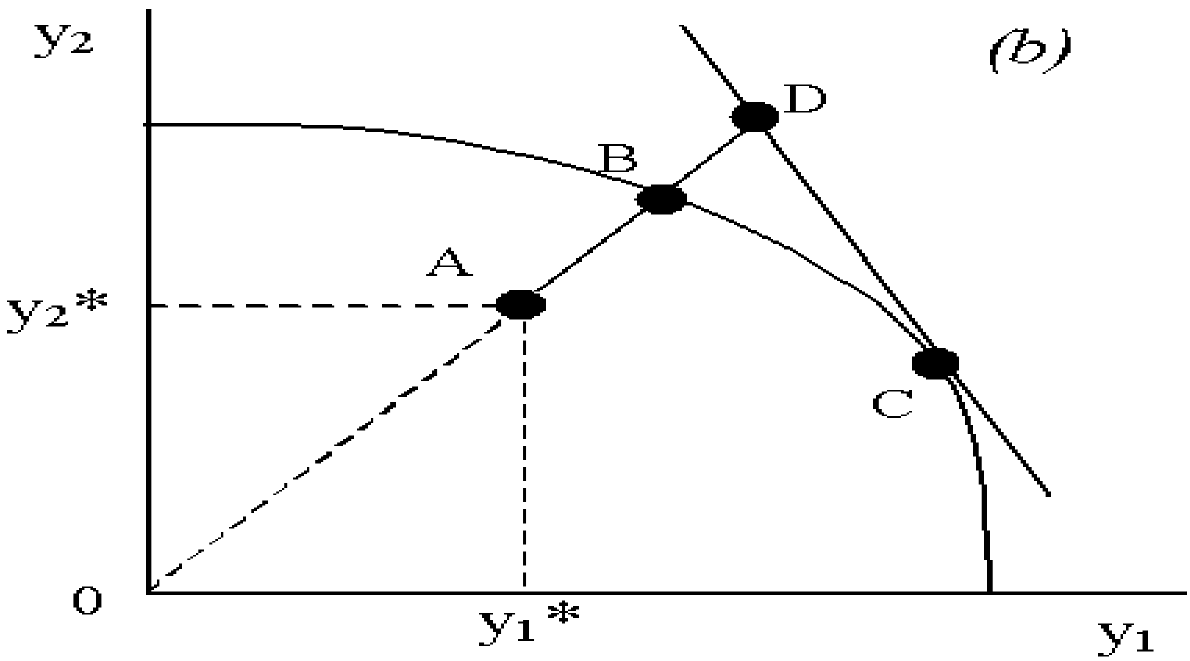

Figure 6.2 (b): Output oriented efficiency measures

The production possibility frontier for a given set of inputs is illustrated in Figure 6.2(b) (i.e. an output-orientation). If the inputs employed by the firm were used efficiently, the output of the firm, producing at point A, can be expanded radially to point B. Hence, the output oriented measure of technical efficiency ($TE_O(y, x)$); can be given by 0A/0B. This is only equivalent to the input-oriented measure of technical efficiency under conditions of constant returns to scale. While point B is technically efficient, in the sense that it lies on the production possibility frontier, higher revenue could be achieved by producing at point C (the point where the marginal rate of transformation is equal to the price ratio p_2/p_1). In this case, more of y_1 should be produced and less of y_2 in order to maximize revenue. To achieve the same level of revenue as at point C while maintaining the same input and output combination, the output of the firm would need to be expanded to point D. Hence, the revenue efficiency (RE(y, x, p)) is given by 0A/0D. Output allocative efficiency ($AE_O(y, w, w)$) is given by RE(y, x, w)/$TE_I(y, x)$, or 0B/0D in Figure 6.2(b) (Kumbhaker and Lovell 2000).

6.3 Sampling procedure

The study was conducted in the Mashonaland Central Province of Zimbabwe. This province was purposively selected because the majority of its areas fall under agro-ecological region II. In this region, a wide variety of field crops are grown by reseltted farmers. In addition, the main economic activity in Mashonaland central province is farming and most of the people live in rural areas where formal non-farm employment opportunities are minimal as explained in Chapter 5.

Shamva District was randomly selected from 6 districts of the 7 that exist in Mashonaland Central Province. From the population, Rushinga district was purporsively excluded as there are no fast track land reform programme beneficaries within this district due to reasons explained in Chapter 5. In the selected district, communities that benefited from land reform were randomly selected.

A multistage sampling procedure was used in the study. Respondents were stratified according to the model of land reform. Three strata were formulated, these included:

(i) Resettlement scheme: beneficiaries of land reform before 2000

(ii) Fast Track A1 model

(iii) Fast Track A2 model

The reason for this type of stratification is that the land reform emerged from different models and in most cases these models differ on how they were implemented and supported thus might lead to different efficiencies of the resettled farmers. Simple random sampling selection procedure was then applied separately to each of the strata to give each farm household in the population an equal chance of being selected in such a way that there was some relationship between being in a particular stratum and the answer sought in the survey research and that within the separate strata there is as much homogeneity as possible.

Information concerning individual stratum was desirable so as to increase precision. Selection of respondents was based on being a land reform beneficiary and farmer’s willingness to participate in the research. From the A1, A2 and the old resettlement scheme, 79, 67 and 99 respondents, respectively, were selected randomly from a list of beneficiaries that was provided by the Department of Lands and Resettlement. Interviews were conducted at farmers' homesteads by trained enumerators (extension officers) under the supervision of the researcher from June to September 2010. Motorbikes of extension officers were used as the main mode of transport as the roads in the study areas were in very poor state due to lack of maintenance. Respondents were household heads. In the absence of household heads, any adult member of the household was interviewed. Some household heads refused to be interviewed, either because of misinformation about the purpose of the study (sensitivity regarding the land reform process) or because they did not see any benefit from the study. If, after careful explanation, the household representative still was not willing to participate, the next homestead was chosen.

6.4 Data collection

The Land officers of the respective districts were chosen as key informants as they were hypothesized to have a broad knowledge of the districts they work in (agricultural activities and culture), its services, and its people. Interviews with key informants were conducted informally in a setting familiar to the informant in the month of April 2010. In addition, the interview setting allowed flexibility to explore new and unanticipated issues which were relevant to the study. The information of the key informants was very helpful in both the designing of the research and the questionnaire. Secondary data sources on beneficiaries of land reform used in designing the questionnaire and for the literature review was obtained from extension officers, experts in the field of land reform in Zimbabwe, books, newspapers, bulletins, land reform reports, journals and the internet.

In the month end of May 2010, the first draft of the questionnaire was pretested to 10 land reform beneficiaries in the area of study with a view to check and pre-test the appropriateness and relevance of the questions being asked and to ensure data accuracy. During the pre-test survey, the main problems identified was that the questionnaire was too long and needed too much time to be completed hence most of the questions were paraphrased and some open ended questions were replaced with closed ended questions which were easy and quick to answer.

Respondents were also reluctant to answer questions about their production output for the last season in fear that they might lose their farms as their production was too low. Consistency questions were added to validate the responses and enumerators were again trained on how to assure farmers that the research data was not going to be used by the Ministry of Lands and Resettlement (during the proposed land audit).

Following the pilot survey, the edited versions of the structured questionnaires were administered to 245 randomly selected land reform beneficiaries from June to September 2010. Face-to-face interviews were considered the relevant method for data collection in this study. The following guidelines as proposed by Babbie (2001) were considered prior to the implementation of this survey:

- Appearance and behaviour of the interviewers
- Knowledge of the questionnaire
- Following questionnaire wording exactly
- Recording responses accurately
- Probing for response

The questionnaire consisted of both closed and open-ended questions, in order to improve the quality of data collected. Open-ended questions gave the respondents greater freedom of expression as they offered respondents an opportunity to qualify their answers thus reducing bias due to unlimited response ranges. Because of time constraint and the fear of researcher/interviewee bias that could have arisen from using only open ended questions, the questionnaire was balanced with close ended questions that were quick to answer. Data on farm output and output prices, input and input prices, socioeconomic characteristics and other information were comprehensively collected. The questionnaire was structured in English and translated to local language (Shona) during its administration.

A personally administered questionnaire was used mainly because of the following reasons:

- Of the high response rate associated with this data collection technique as the interviewer can ensure that all questions are answered.
- The high reliability of the data that could be obtained because the interviewer can probe in with further questions if the respondents appeared to have misunderstood the question or appeared to be giving false information. In addition, the interviewer can explain to the respondent if they have any problems.

Farmers were reassured by explaining the importance of the survey and the survey data. According to Musemwa *et al*. (2007), farmers say that a lot of surveys have already been undertaken in their areas but no development steps have been taken. They blame the government authorities and some NGOs. Some farmers also hide information in fear of the tax authorities. Farmers were assured that the data collected was to be solely utilized for personal research for a higher degree and may be used to develop policy guidelines for Land Reform Programme and not for tax motives and that they remain anonymous. Most of the respondents did not keep records of their farming resources, activities and utilities. Most of the primary data was obtained through memory recall of the farmers. Since most of the farmers in this region are middle-aged, experienced and full-time it was easy to collect important information on various farming activities for the cropping operations in stages and by probing.

6.5 Data analysis

Details regarding data analysis are described in chapters seven, eight and nine. For the purpose of this chapter, only a summary is provided. Descriptive statistics was applied to the basic characteristics of the sampled households. To determine factors affecting revenue per hectare and land use rate of land reform beneficiaries in Mashonaland Central Province of Zimbabwe, the GLM procedure of SAS was used (details are described in section 7.2.3). To empirically investigate and calculate efficiency, DEA was adopted mainly because its capability of handling multiple inputs and outputs (details are described in section 8.3.3). A Tobit model censored at zero was used to identify factors that influence efficiency of the resettled farmers (details are explained in section 9.2.3).

6.6 Summary

The study was conducted in Shamva district in Mashonaland Central Province of Zimbabwe. Primary data was collected using a questionnaire. Descriptive statistics was applied to basic characteristics of the sampled households. To empirically investigate and calculate efficiency, the non-parametric method DEA was applied mainly because of its capability of handling multiple inputs and outputs. Analysis of production efficiency scores would not provide evidence regarding factors that cause variation in efficiency. A linear probabilistic model was used to examine factors explaining differences in production efficiency. The problem of farmers being unable to recall some of the needed information, financial shortage and political instability were some of the major problems that were encountered during the data collection process.

CHAPTER 7

FACTORS AFFECTING REVENUE FROM FIELD CROPS AND LAND USE RATE AMONGST THE RESETTLED FARMERS IN MASHONALAND CENTRAL PROVINCE OF ZIMBABWE [12]

Abstract

The objectives of the study were to determine the level that resettled farmers in Mashonaland Central Province of Zimbabwe use their land in the production of field crops as well as to determine their mean revenue per hectare. Factors that affect revenue from field crops and land use rate were also determined. Data were collected from 245 households using a questionnaire as the main instrument. The majority of the households in the resettled areas, A1 (91%), A2 (87%) and the old resettlement areas (70%) were male-headed and had at least primary education. A2 farms have the lowest mean revenue per hectare of US$714.80 which significantly differed from A1 (US$854.60) and the old resettled farms (US$846.55) which had higher but similar mean revenue per hectare. The mean land use rate varied significantly ($p<0.05$). Land reform model with A2 having highest land use rate of 67%. The A1 and old resettlement households had land use rates of 53% and 46%, respectively. Average total revenue varied significantly with the model of land reform. Sex, marital status, age of the household head, education and household size significantly affected land use rate ($P<0.05$).

Keywords: land reform, land use rate, old resettlements, revenue, yield

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7.1 Introduction

Agriculture accounts for about 30% of Africa's GDP and 75% of total employment (World Bank Development Report, 2008). Consequently, agricultural performance determines Africa's economic performance. Three out of four poor people in developing countries lived in rural areas in 2002 (FAO, 2005). Most depend on agriculture for their livelihoods, directly or indirectly. Hence, a more dynamic and inclusive agriculture could dramatically reduce rural poverty, helping to meet the Millennium Development Goal of halving poverty and hunger by 2015 and continuing to reduce poverty and hunger for several decades thereafter. Agriculture alone will not be enough to massively reduce poverty, but it has proven to be uniquely powerful for that task.

The World Bank Development Report for 2008 shows that Sub-Saharan Africa has lagged behind in agricultural performance: rapid yield gains in cereals were realised from 1960 to 2005 in all parts of the world except the sub-Saharan Africa (World Bank Development Report, 2008). Food security remains challenging for most countries in sub-Saharan Africa, given low agricultural growth, rapid population growth, weak foreign exchange earnings, and high transaction costs in linking domestic and international markets. In the 1980s, continuing deterioration of food production in sub-Saharan Africa was caused partially by extended drought and soil degradation (Bole *et al*, 1994). Ambient temperature, precipitation and soil moisture, as well as frequency of heat waves and droughts, are significant factors influencing crop production in sub-Saharan Africa (Makhado, 1996).

In Zimbabwe for instance, since the implementation of the fast track land reform, the decline in agricultural production was the worst in Sub Saharan Africa. Only 300 of 4,500 commercial farmers remain on farms (Sachikonye, 2005). The eviction of the mostly white farmers has been partly blamed by critics and aid agencies for Zimbabwe's worst famine in living memory, which left about two-thirds of the 11.6 million people facing severe food shortage (Chipika, 2006). The main factor which accounts for the widespread poverty is lack of formal employment or poor salaries and as such use of technical inputs is very low due to the fact that the majority of the farmers cannot afford (Sachikonye, 2005). In addition, the erratic rainfall patterns being experienced in Zimbabwe have also contributed to poor agricultural yields hence poverty and food insecurity (Mushunje, 2005).

Although, it has been more than two decades since the start of Zimbabwe’s resettlement experience, this massive socio-economic change remains relatively unstudied. Such unstudied areas include areas related to the comparison of the productivity and livelihood changes of the resettled farmers of the first phase of land reform with that of the beneficiaries of the fast track land reform programme which kick started in June 2000. This chapter seeks to provide micro-evidence on the financial benefit from field crop production by the resettled farmers. The level at which the beneficiaries of land reform are utilizing their land was also determined in this chapter. This will enable us to see if land reform beneficiaries are reaping any benefits from the programme.

7.2 Materials and methods

Details regarding the study area and the methodology which encompasses sampling procedures, questionnaire design, methods of data collection and data analysis are described in chapter five and six, respectively. For the purpose of this chapter, only a summary is provided.

7.2.1 The study area

The study was conducted in Shamva District in Mashonaland Central Province of Zimbabwe. Details on the description of the study area are given in Chapter 5.

7.2.2 Sampling procedure

Randomly selected land reform beneficiaries from three models of land reform were interviewed by trained enumerators under the supervision of the researcher from June to September 2010. Details regarding the sampling procedure are given in Section 6.3.

7.2.3 Data analysis and description of variables used in the analysis

Descriptive statistics was applied to the basic characteristics of the sampled households. This employed both frequency and means to describe the data which included religion, age of head of household and crop outputs. The dependency ratio which is an age-population ratio of those typically not in the labor force (the dependent part) and those typically in the labor force (the productive part) was calculated using simple statistics. In published international statistics, the dependent part usually includes those under the age of 15 and over the age of 64. The productive part makes up the population in between, ages 15 – 64. Dependency ratio was calculated using the formula below:

$$(Total)\ Dependency\ ratio = \frac{(number\ of\ people\ aged\ 0\ to\ 14)\ +\ (number\ of\ people\ aged\ 65\ and\ over)}{number\ of\ people\ aged\ 15 \rightarrow\ 64} \times 100$$

The effects of model of land reform, gender of the household head, marital status, age of the household head, education, household size, religion, dependence ratio, whether the farmer was fulltime or part-time in farming, experience of the farmers in farming at that environment, total land size owned by the farmers and soil type on yield and land utilization were determined using the GLM procedure of SAS (2003). Significance differences between least-square group means were compared using the PDIFF test of SAS (2003). The linear statistical model used was:

$$Y_{ijklmnopqrst} = \mu + B_i + D_j + E_k + F_l + G_m + H_n + J_o + K_p + L_q + M_r + N_s + O_t + E_{ijklmnopqrst}$$

Where

$Y_{ijklmnopqrst}$ = response variable (revenue per hectare and land use rate). The dependent variable is *Revenue per hectare*, which is the value of total agricultural output per hectare, in United States Dollars (US$). Land use rate is calculated as a ratio of total cultivated land to total available arable land using the formula below

$$LandUseRate = \frac{Arable\ Land\ Cultivated\ by\ a\ farmer\ in\ the\ last\ Season}{Total\ Arable\ Land}\ X100\%$$

μ = constant mean common to all observations;

B_i = household size (i=≤ 6, >6);

D_j = age of head of household (j= ≤50,>50);

E_k = gender of head of household (k=male, female);

F_l = marital status (l= Married, Single, Divorced, Widowed);

G_m = religion (m= Christianity, Traditional, Muslim, Other);

H_n = education level (n= none, primary, secondary, tertiary);

J_o = model of land reform(y=resettlement, A1, A2);

K_p = farmer status (p=full time, part time);

L_q = farm size (u= ≤10, >10);

M_r = dependence ratio (<0.5, ≥0.5);

N_s = years of experience (s= ≤10, >10);

O_t = soil type (w= Clay, loam, Sandy Loam, Clay loam, Sand);

$E_{ijklmnopqrst}$ = random residual error, assumed to be normally distributed

The relationship between revenue per hectare and land use rate was examined using the Pearson's correlations analysis (PROC CORR procedure of SAS (2003)). Dependence between response variables that had an effect on either revenue per hectare or land use rate with all the other response variables was tested using the Chi-square test for dependence. To find the effect of arable land used and herd size (continuous variables) on revenue per hectare and land use rate the RSREG Procedure of SAS (2003) was used.

7.3 Results

7.3.1 Farmers' socioeconomic profile

The majority of the households in the resettled areas, A1 (91%), A2 (87%) and the old resettlement areas (70%) were male-headed and at least primary education, with all the households heads in both A1 and A2 having attended at least primary education. However, more effort is still needed in providing tertiary education since across all the land reform models, very few had tertiary education. The majority of the interviewed land reform beneficiaries were married. A1 land reform beneficiaries had most of the household heads being married (91 %), followed by A2 household head being married (78%). Old resettlement land reform beneficiaries had the least number of married household heads.

About 67, 83 and 92% of the farmers in the A1, old resettlement and A2 land reform model, respectively, were Christians, 33, 17 and 8% were African tradition worshipers. Most of the interviewees in A1 model (100%); A2 model (76%) and the old resettlement scheme (96%) were full time farmers. Sand-loam was the most popular soil type among all the farms in all the categories with almost 63% of the A2, 39% of the A1 and 38% of the old resettled farms, respectively. A2 farmers were found to possess only clay-loam and sandy-loam. No record of farmers in category A2 has clay, silt or sand. The mean household size varied significantly ($p<0.05$) among the land reform models, A2 having higher household size than both the A1 and old resettlement households. No difference was, however observed between the A1 and the old resettlement models, respectively.

Table 7.1: Household characteristics of farmers and soil types

Characteristics	Model of Land Reform		
	A1	A2	Old Resettlement
Sample size	79	67	99
Gender of household head (%)			
Males	91.1	86.6	69.7
Females	8.9	3.4	30.3
Marital Status (%)			
Married	91.1	77.6	67.7
Single	1.3	13.4	4.0
Divorced	3.8	3.0	2.0
Widow	3.8	6.0	26.3
Literacy Level (%)			
None	0.0	0.0	2.0
Primary	24.1	14.9	79.2
Secondary	75.9	55.2	18.2
Tertiary	0.0	29.9	0.0
Religion (%)			
Christianity	67.1	92.5	82.8
Traditional	32.9	7.5	17.2
Soil Type (%)			
Clay	29.1	0.0	27.3
Silt	15.2	0.0	17.2
Sandy Loam	39.2	62.7	38.4
Clay loam	7.6	37.3	6.1
Sand	8.9	0.0	11.1
Level of specialization (%)			
Full time farmers	100.0	76.1	96.0
Part-time	0.0	23.9	4.0

The mean age of the household heads were similar ($P>0.05$) for A2 and the old resettlement model, however, both were significantly different from A1 model, having the least mean age of household head of 36.4 years (P<0.05). There was significant difference between the mean land size owned by A2 land reform beneficiaries and both AI and the old resettled farmers (P<0.05). A2 farmers owned more land than both the A1 and the old resettlement land reform beneficiaries; however land size owned by both A1 and the old resettled farmers was similar (P>0.05).

Table 7.2: Least square means and standard errors of means of household size, age of household head, landholding, experience of farmer, number of field crops grown and herd size of the land reform beneficiaries.

Characteristic	Model of Land Reform		
	A1	A2	Old Resettlement
Sample size	79	67	99
Household size	5.7 (0.52)[a]	9.5 (0.57)[b]	6.5 (0.46)[a]
Age of household head (years)	36.4 (1.26)[a]	53.3 (1.37)[b]	60.7 (1.13)[b]
Landholding (Ha)	5.0 (0.69)[a]	39.7 (0.75)[b]	5.0 (0.62)[a]
Experience (years)	5.4 (0.40)[a]	11.2 (0.43)[b]	26.3 (0.36)[c]
Herd size	4.1 (9.29)[a]	51.4 (10.11)[b]	5.3 (8.33)[a]
Number of crops grown	6.2 (2.98)[a]	3.2 (1.33)[b]	6.6 (3.11)[a]

Means in the same row with different superscripts are significantly different at P < 0.05.

Experience of land reform beneficiaries in the study area significantly differed among models, A1 farmers have minimum farming experience with a mean of 5.4 years. The beneficiaries of the old resettlement model had more experience than both the A1 and A2 farmers. The mean head size varied significantly (P<0.05) among the land reform models. A2 farmers had the highest mean number of cattle than the A1 and the old resettled farmers. No difference was, however observed between the A1 and the old resettlement models. A1 and the old resettled farmers diversified more in term of field crop production than the A2 farmers as evidenced by more field crops they grow than the A2 farmers as shown in table 7.2 above. However, no significant differences were observed between the A1 and the old resettled farmers.

7.3.2 Effect of land reform model on land use rate and revenue per hectare

A2 farms had the lowest mean revenue per hectare of US$714.80 and significantly differ from A1 and the old resettled farms which had higher and similar mean revenue per hectare (Table 7.3). Though A1 and the old resettled farmers had similar revenue per hectare, A1 farmers had the highest revenue per hectare of US$854.60 whereas the old resettlement had a mean revenue per hectare of US$846.60. The mean land use rate varied significantly ($p<0.05$) among the land reform models. A2 had the highest land use rate of 67%, whilst A1 and old resettlement households had land use rates of 53% and 46%, respectively. No difference was however observed between the A1 and the old resettlement models ($P>0.05$).

There is a positive insignificant relationship between land use rate and revenue per hectare for all the sampled households. However, the relationships between land use rates and revenue per hectare varied among the models of land reform. For A1 beneficiaries of land reform, revenue per hectare and land use rate had a positive insignificant relationship ($P>0.05$). There was a positive significant relationship between land use rate and revenue per hectare for the old resettlement scheme whilst for A2 land reform beneficiaries there was a negative significant relationship.

Table 7.3: Least square means and standard errors of means of yield and land use rate from Resettlement, A1and A2 land reform beneficiaries

	Model of Land Reform		
Characteristics	A1	A2	Resettlement
n	79	67	99
Revenue/ ha(US$)/ha	854.6 (38.92) [a]	714.8 (42.26) [b]	846.6 (34.77) [a]
Land Use rate (%)	52.5 (2.01) [a]	67.0 (2.18) [b]	46.0 (1.80) [a]

Means in the same row with different superscripts are significantly different at P < 0.05.

7.3.3 Variations of average total cost of production, revenue and profit margins

The average total cost of production for field crops was higher (US$4974.47) and significantly different from A1 (US$1772.84) and the old resettlement (US$1732.00. However, the reverse is true for average total cost per hectare. Average total revenue varies significantly among the models of land reform. A2 farmers attained the highest average total revenue of US$6437.89 explicitly followed by A1 farmers who on average had average total revenue of US$2034.98. The old resettlement farmers attained the minimum average total revenue of US$1865.48. There was a significant variation of average profit margins amongst the three models of land reform. The mean profit margins for old resettled, A1, and A2 farmers were US$133.48, US$262.14 and US$1463.42, respectively. An interesting observation was that A1 and the old resettled farmers attained the highest average total revenue per hectare as illustrated in Table 7.4.

Table 7.4: The average costs, revenue and profit margin of field crop production from the old resettlement, A1and A2 land reform beneficiaries

Variable	means			Range					
	A1	A2	OR	A1		A2		OR	
Total Cost (TC)	1772.84(74.97) [a]	4974.47(241.16)[b]	1732.00(86.37) [a]	667.50	3932.5	1113.0	9189.0	490.0	5910.0
TC/ ha	758.24 (27.27)[a]	563.22 (25.87)[b]	792.63 (29.47)[a]	330.00	1696.25	159.00	1118.14	372.50	2955.00
Total Revenue (TR)	2034.98 (106.99)	6437.89 (374.78)	1865.48 (108.36)	447.5	6000.0	1900.0	20600.0	290.0	8040.0
Yield (TR)/ ha	854.57 (35.79)	714.78 (33.21)	846.55 (40.86)	298.33	1811.00	249.08	1343.33	222.50	4020.00
Potential Yield/ha*	816.91 (0.61)	660.26 (6.60)	813.87 (0.62)	809.14	827.38	520.42	786.35	809.14	854.73
Profit Margin (π)	262.14 (69.54)	1463.42 (238.62)	133.48 (26.79)	-300	4680.0	-700.0	11702.0	-500.0	2130.0
π/ha	96.33 (21.05)	151.56 (18.18)	53.92 (12.89)	-200	1170	-88	641	-250	1065

Please note:* Potential yield per hectare was determined using the linear regression model of yield and used arable land based on the assumption that farmers utilise all their arable land for field crop production.

7.3.4 Factors influencing revenue per hectare and land use rate

From the results of the study, land use rate was not affected by model of land reform, religion, dependence ratio, whether the farmer was fulltime or part-time in farming, experience of the farmers in farming at that environment, total land size owned by the farmers, and soil type as shown in Table 7.5.

Table 7.5: Factors influencing land use rate by land reform beneficiaries

Source	**Mean Square**	**F Value**	**Pr > F**
Model	402.092207	1.42	0.2443
Sex	1150.531537	4.06	0.0451*
Marital Status	742.183065	2.62	0.0418*
Age	1049.623167	3.70	0.0456*
Education	658.490485	2.32	0.0459*
Religion	28.998724	0.10	0.7494
Household Size	5831.158476	20.57	0.0001*
Dependence ratio	117.235926	0.41	0.5208
Farmer Status	52.374002	0.18	0.6677
Experience	13.701087	0.05	0.8262
Land size	204.278110	0.72	0.4876
Soil type	265.908715	0.94	0.4427

* Factor significantly affect land use rate of land reform beneficiaries in Mashonaland Central Province, Zimbabwe

Sex, marital status, age of the household head, education and household size significantly affected land use rate ($P<0.05$). Males had a significantly higher mean land use rate of 52% than females who had a mean land use rate of 39%. Single households had the least and significantly different land use rate (37.44± 10.73) than the married households heads (55.91± 9.80), divorced (43.03± 11.73) and widowed (46.55±10.37). Older farmers utilise more of their arable land than younger farmers ($p<0.05$). The mean land use rate for farmers who were older than 50 years old was significantly higher (49.53±9.85) than of those farmers who were less than or 50 years old (41.94±9.88).

Significantly lower land use rate was obtained by farmers that had not accessed any form of education (28.24 ± 15.88). Land use rate however increased with education level. Those that had tertiary education had the highest level of land use (59.41±9.53), closely followed by those that had reached secondary level of education (50.49±9.58) and primary level of education (44.80±9.64). Significantly higher land use rate was observed in bigger households (51.51±9.78) than for smaller households composed of less than 7 members (39.96±9.72). All these factors fit well in the model as the R^2 value of 0.79 is far much closer to 1. Revenue per hectare were not affected by all the factors that were entered in the model which included model of land reform, gender of the household head, marital status, age of the household head, education, household size, religion, dependence ratio, whether the farmer was fulltime or part-time in farming, experience of the farmers in farming at that environment, total land size owned by the farmers and soil type.

7.3.5 The effect of arable land used and herd size on yield per hectare and land use rate

Herd size and size of arable land used significantly affected revenue per hectare from field crops of the resettled farmers in Zimbabwe negatively (P<0.05) whereas the same factors significantly affect land use rate of the resettled farmers positively (P<0.05) as illustrated in equations 1 and 2 below. An increase in herd size by a unit results in a decline in revenue by 1.1 (Marginal Physical Product (MPP) = -1.1) and a 0.22 (MPP=0.22) increase in land use rate by land reform beneficiaries in Mashonaland Central Province. When arable land under cultivation is increased by a unit, revenue per hectare decline by 15.2 (MPP= -15.2) and land utilisation rate rise by 5.05 (MPP= 5.05) (equation 3 and 4). Knowing the value of herd size and land under cultivation more than 50 % of the variances in yield per hectare and land utilisation rate can be explained using all the equations as the R^2 values are higher than 0.5.

$Y_{1\ Xl}$ = 836.915067 (24.816671) - 1.097220 X_1 P<0.05 **R^2 =**0.8180..................... (1)

$Y_{2\ X1}$= 49.237003 (1.236220) + 0.220844 X_1 P<0.05 **R^2 =**0.6883..................... (2)

$Y_{1\ X2}$= 885.121710 (54.532070) -15.195801 X_2 P<0.05 **R^2** =0.9432..................... (3)

$Y_{2\ X2}$= 35.521480 (2.217662) + 5.050230 X_2 P<0.05 **R^2 =**0.7972..................... (4)

Where

Y_1= Yield per hectare = Total Revenue per hectare (US$/ha);

Y_2=Land use rate (%);

X_l= herd size (unit);

X_2= size of arable land used/cultivated (ha);

() = standard error

To calculate potential yield of the resettled farmers, the linear regression model of yield ($Y_{1\ X2}$) and size of arable land used (X_2) was used. This model was used mainly because the size of arable land that each individual farmer had was known. In addition, the R^2 value of this equation was higher than the rest of the equations. Knowing the size of arable land each individual farmer had, 94% of the variations in yield can be explained by this model. Assuming that land reform beneficiaries utilise all their arable land, the potential yield per hectare is lower than their actual yield per hectare, as shown in Table 7.4. Land productivity is declining with an increase in size of arable land used.

7.4 Discussion

The finding that males dominated in the agricultural sector in the studied area concurs with earlier reports (Chawatama *et al*, 2005; Montshwe, 2006; Musemwa *et al* 2010) that highlighted that men are, by custom, traditional heads of households in rural communities in most African societies. In addition, this clearly shows that the effect of rural-urban migration, where the males go to urban areas in search of greener pastures is minimal among the beneficiaries of land reform as the majority of the households were full time farmers and depended on agriculture for their living. This is consistent with the findings of Montshwe (2006) and Musemwa *et al.*, (2007) in their studies in rural communities of South Africa.

As expected, findings from the study reveal that the majority of the household heads were married; this is in line with the findings of Mushunje (2005) in his study on efficiency of land reform beneficiaries in cotton and maize production in Manicaland

Province of Zimbabwe. In African societies marriage is perceived to be of high importance and according to Utete (2003), preference on land allocation was given to married household heads; this may be the reason why the majority of the interviewed household heads were married.

However, there were also a significant percentage of widows in the old resettled farms. The reasons for this are not entirely certain. Traditional arguments tend to favor socio-environmental factors, according to the World Health Organization (WHO) (2004) historically; men have generally consumed more tobacco, alcohol and drugs than females in most societies, and are more likely to die from many associated diseases such as lung cancer, tuberculosis and cirrhosis of the liver. According to Stanistreet *et al* (2005), men are also more likely to die from injuries, whether unintentional (such as car accidents) or intentional (suicide, violence, war). In an extensive review of the existing literature, Kalben (2002), concluded that the fact that women live longer than men was observed at least as far back as 1750 and that, with relatively equal treatment, today males in all parts of the world experience greater mortality than females. Of 72 selected causes of death, only 6 yielded greater female than male age-adjusted death rates in 1998 in the United States.

An interesting observation that large farm owners were observed to be having the largest household size concurs with the findings of Mushunje (2005) in his study on efficiency of land reform in cotton and maize production in Manicaland Province of Zimbabwe. A larger family size means that the required labour for field crop production is available; however pressure is set on consumption. The increase in land use rate per farm as family size increased may reflect a strategy to provide employment for children and older members (especially women) of the extended families. Further, larger households require more cash to pay for school fees and other household expenses and this, therefore, motivates them to utilise more of their land since the majority of the resettled farmers sorely depend on agricultural production for their living.

The observation that the majority of the household heads had at least primary education concurs with the findings from a study by Nkhori (2004) in communal areas of the Botswana and Binam *et al* (2004) in Cameroon. The problem of household heads having never attended school is likely to diminish quite significantly over the years as access to education is improving significantly in rural areas (Montshwe, 2006). Efforts should, however, be made to ensure better access to secondary and tertiary education as majority of the households have primary education only. Many of the existing household heads are elderly and today's youths will have had considerably more basic education by the time they become household heads since they have better access to education nowadays than before. However, the problem that may arise is that most of the youths may be employed in the non-farm sectors in urban areas where there are bright lights as most of them view agriculture as a dirty business, primitive and old fashioned. This therefore justifies why the small scale agricultural sector is dominated by the old aged. According to Gwaze (2008), there is a gap that will be difficult to fill once the aging farmers retired, possibly leading to the collapse of small scale agriculture.

The low mean cattle herd sizes observed for A1 and old resettlement areas were similar with the findings of Chawatama *et al* (2005) in communal areas of Chikomba, Kadoma, Matobo who observed mean herd size of 5 in aggregate from the three studied communal areas. The observed herd sizes are however far much lower to that reported for other areas of Zimbabwe. Francis and Sibanda (2001) reported that in Nharira-Lancashire communal area of Zimbabwe, over 90 % of the households kept 18 ± 11 cattle. The highest mean herd size of 33 ± 6 was reported by Ndebele *et al* (2007) in their study on cattle breeding management practices in the Gwayi smallholder farming area of South-Western Zimbabwe. The lower mean herd sizes observed among the A1 and the old resettlement farms may be attributed to farmers having limited access to grazing land. In addition, the lower mean herd sizes among A1 and old resettlement farms can be attributed to the adequate rain received in the area of study which made crop production a more appropriate agricultural enterprise. Livestock production, therefore, was not a priority to the majority of the A1 and old resettled farmers. According to the survey, A2 farmers owned more cattle with an average of 51 cattle per household. The higher mean herd size observed for A2 farmers was due to their having access to well-developed grazing land. In addition, the majority of these A2 farmers were educated and had well developed paddocked grazing areas which made good breeding strategies possible resulting in their herd sizes growing at a good rate than small land holders who had access to communal grazing land.

The finding that A2 farms (large farms) had the lowest mean yield per hectare of US$714.80 than smaller farms (A1 and the old resettled farms) concurs with earlier reports (Sen, 1962; Bwiringiro and Reardon, 1996; Newell *et al*, 1997). Similar findings have come from recent research in the Indian states of Karnataka and West Bengal. In Karnataka, agricultural laborer families who received government-granted house-and-garden plots of only 1/25 acre (.016 ha or about 1730 square feet) were able to produce most of the family's nutritional needs from vegetable, fruits, and dairy products and obtain cash income equivalent to one fulltime adult wage from plant and animal products on the tiny plot (Prosterman and Hanstad, 2003). Land reform beneficiaries in Karnataka had invested in land improvement measures and raised their land productivity and socio-economic status. In a study typical of this approach, Bwiringiro and Reardon (1996) found that small Rwandan farms achieved three times greater land yields, used four times more labour and had four times the number of plots per hectare that larger farmers did.

The study by Sen (1962) of India's Farm Management Survey observed an inverse relationship between farm size and productivity. Still on the same note, Cornia (1985), argued that high labour use intensities on small farms is mainly found in the land market where small scale farmers face higher effective purchase prices for land. This biased resource position for peasant farmers has several implications about their use of labour vis-à-vis large scale farmers. Small plot holders use labour more intensively for each crop, they use more of the available land, they choose more labour intensive crops, and use their own labour for land improvements. All these implications according to Cornia (1985) lead to the conclusion that small farmers have a higher resource use per unit of land that will in turn result in them getting more revenue from farming thereby alleviating rural poverty. In addition, family labour is more efficient than supervised labour; secondly family labour is more motivated than hired labour and this in turn results in small plot holders have more yield per hectare than A2 farmers who also in most cases depend on hired labour.

The observation that A2 farmers utilise more land than both the A1 and old resettlement households deviates from the findings of Moyo (2004) on land use rate by large scale commercial farmers in Mashonaland Province in Zimbabwe. Moyo (2004) observed that large scale commercial farmers under-utilise their land and observed that the total area in Mashonaland amounts to 4.3 million hectares, which constitutes 32 % of the overall land owned by the large scale commercial farmers. However, he found that only 10 % of this prime land is actually cropped, and this represents 75 % of the total area cropped by large scale commercial (LSC) farmers in the country as a whole. The deviation of this study's findings from Moyo's (2004) findings may be due to the government input scheme programme that was available to A2 farmers. For instance, A2 farmers in Zimbabwe were provided with tractors and fuel under the Reserve Bank of Zimbabwe mechanisation programme, this enabled them to utilise most of their arable land. In addition to the tractors, those who did not get tractors had access to the District Development Fund (DDF) tractors. All these strategies created an enabling environment for A2 farmers. In addition, this mechanisation programme resulted in A2 farmers minimising their cost of production per hectare hence the observed results that A2 households' had lower costs of production per hectare than A1 and the old resettled households (small farms).

Gender disparities in land access, tenure security and sustainability, have more impact on female-headed farm households (Utete, 2003). The female-headed farm households tend to be poorer and more disadvantaged than households headed by men. In Bangladesh, many female heads of household are either landless or have small, marginal holdings. In Guatemala and El Salvador, many of the farms managed by women are less than a half hectare. In Botswana, female-headed farm households tend to work on less land, have access to less farm equipment, and own fewer cattle and small stock than male-headed households (Katrine & Spurling, 1992). In the Congo, nearly 60% of women cultivate less than 1 hectare of land (FAO, 1995). These findings are similar to what was observed in this study that male headed households had bigger farm size than female headed households. The main reasons for male headed farms utilizing land better than their female counterparts are similar to the ones found in Botswana. In addition females are involved in many household activities such as child rearing, cooking and general house work, and this may be the reason why they minimally cultivate their land for field crop production than male headed households. Most of the land reform beneficiaries depend on animal traction when it comes to cultivation of their fields. In the Limpopo Province of South Africa, Mokoena (1996) found that the use of animal traction depends on the gender of the head of the household. Those households headed by men make use significantly of animal traction more than those households headed by females (Moholwa, 1995). This, therefore, results in male headed households utilising more of their arable land than female headed households.

Married household heads utilise more of their arable land as also observed in Ghana where household heads that were married had less poverty than single headed households due to factors which Owusu (2008) attributed to combined household income, more labour , more information and knowledge. The observation that older farmers utilise more of their arable land than younger farmers may be due to the fact that older farmers have acquired many assets such as tractors and cattle and have more capital that they have acquired and have better access to aid from non-governmental organizations of agricultural inputs than younger farmers resulting in older farmers utilizing more of their land than younger farmers. In addition, older household heads may also be having children who may be working in various sectors of the economy and may be financing them in agricultural production hence resulting in older households utilizing more of their arable land than younger people. Older farmers are able to utilise most of their available land in agricultural production than younger farmers because they have more access to labour as they have larger families.

As education level increases, the farmers become more knowledgeable on effective land use and consequently increased land use rate. In addition, the farmers would be able to be employed formally in non-farm sector thereby generating income that can be used to sustain increased farming activities. The farmers would also be able to access credit facilities to purchase farming implements and inputs resulting in an increase in land use rate. Farmers who had at most primary education in most cases are the old aged farmers and they had traditional knowledge about agriculture. Such farmers, however, might not be in a position to adopt new technologies (Agwu *et al*., 2008) that are meant to improve agricultural production. Educated farmers are more likely to be receptive to new technologies faster than uneducated and the more educated the farmers, the more active and innovative they become.

Herd size and arable land used significantly affect yields of field crops of the resettled farmers negatively. An increase in herd size would mean a corresponding increase in grazing requirements. Depending on the available feed resources, one livestock unit may require more hectarage than the normal 1 LU/ha (Cousins, 1989; Abel and Blaikie, 1989). Taking into cognisance the increased need for grazing land with an increase in herd size, land use rate for field crop production would suffer as more land would be assigned towards cattle production than field crop production. According to Swanepoel *et al*. (2000) and Chimonyo *et al* (1999), labour for livestock production in Africa is mainly supplied by female and child labour, who have limited employment options. A similar observation has been made by Gryseels (1988) and Quinsimbing (1994) with respect to labour inputs in livestock production in the Ethiopian highlands. It is also likely that the labour requirements for field crop production are also the same, this, therefore, results in conflict of labour between livestock production and field crop production. As herd sizes increase, there is a resultant increase in labour needed to look after the increased livestock herd at the expense of field crop production. On the other hand, an increase in arable land use, where labour, capital and all other necessary factors of production remain constant, causes a reduction in efficiency of field crop production due to decline in labour productivity per hectare and consequently, yield of field crops per hectare falls.

Crop production in the resettlements is characterised by use of animal draught power (Mushunje, 2005). In the current study, an increase in herd size resulted in a corresponding increase in land use rate. However, all other factors constant, an increase in herd size and land use rate does not mean an automatic increase in efficiency of production. The increased need for labour requirements may reduce the efficiency of land productivity. Arable land use also had a positive effect on land use rate, meaning that an increase in the size of arable land used would result in an increase in land use rate. However, an increase in arable land use means that there is an increased need for inputs, labour and other capital which may not be available to the resource poor farmers. Consequently, efficiency of productivity decreases.

Bhalla and Roy (1988) argue that, if land quality and farm size are inversely correlated and farm size and cultivated area are directly correlated, then excluding land quality from regressions of land yields on cultivated area would bias the estimated coefficient of cultivated area downwards. But this would bias only if the soil quality differences were not due to investments made by the farmers themselves.

Thus, agro-climatic conditions and soil quality are crucial determinants of agricultural productivity, as well as measures of farmers' investment in soil quality must be included in investigations of productivity (Nuppenau, 2009). Attempts to incorporate soil quality into empirical investigations of the inverse relationship have mixed results. Newell *et al* (1997) argue that farms are smaller in fertile regions than in less fertile regions and as a result of this, outputs per hectare are higher on small farms. However while land quality explains some of the inverse relationships, it does not explain all of it. Both natural soil quality and investments in soil quality contribute to productivity (Carter 1994).

7.5 Conclusion

Small plot holders have higher revenue per hectare (though they have a lower land use rate rate) than larger plot holders who have a higher land use rate. As herd size increases, the revenue per hectare of field crops of the resettled farmers in Zimbabwe decreases. However, an increase in herd size results in an increase in use of arable land by the resettled farmers in Zimbabwe. There is also an inverse relationship between size of arable land used and revenue from field crops per hectare. To increase national agricultural land productivity, beneficiaries of land reform should be allocated small farms as they produce more output per hectare than large farms. In addition, farmers can utilise all their land if they are allocated small farms based on their household size. Preference must be given to married household heads when allocating land as married household heads have better yields per hectare than single headed households. Educating land reform beneficiaries using informal methods is of paramount importance and should be included and prioritised in the budget of the Department of Agriculture.

CHAPTER 8

EFFICIENCY OF RESETTLED FARMERS IN MASHONALAND CENTRAL PROVINCE OF ZIMBABWE IN FIELD CROPS PRODUCTION [13]

Abstract

Pretested structured questionnaires were administered to 245 land reform beneficiaries to determine efficiency of the resettled farmers in the production of field crops in Zimbabwe. Respondents were stratified according to the model of land reform. To empirically calculate efficiency, DEA was adopted mainly because of its capability of handling multiple inputs and outputs. Results showed that A2 farmers (large land owners) had an average technical efficiency score of 0.839, while the lowest ranking model (A1) had an average score of 0.618. Small land holders (A1 and the old resettled farmers) are on average less cost-efficient than large land owners, with a score of 0.29 for the former compared with 0.45 for the latter. The decomposition of cost-efficiency into technical and allocative efficiency suggests that cost inefficiency for A2 farmers was mostly due to the poor use of inputs at the prevailing input prices, rather than waste of inputs. Small land holders' cost inefficiency was mostly due to both the poor use and waste of inputs. Efficiency could be improved through improving the ability of the resettled farmers to choose optimum input levels for given factor prices and saving inputs through correct usage.

Keywords: allocative efficiency, cost efficiency, DEA, land reform, technical efficiency

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8.1 Introduction

Agriculture is at the heart of the Zimbabwean economy, accounting for as much as 17% of GDP, about 27% of employment and a 33% of total foreign exchange earnings (Gono, 2005). The significance of agriculture to the economy further includes, food security, particularly for maize and wheat, which are key staple food agricultural products. As with most developing economies, agriculture has strong linkages with other sectors of the economy, particularly the manufacturing. About 60% of manufacturing, covering sub-sectors such as foodstuffs, textiles and ginning, paper and printing are directly linked to agriculture (Gono, 2005). The inputs and raw materials in these sub-sectors are derived from agriculture. The country's manufacturing sector employs about 15% of formal sector employment.

A distinctive trend in most agricultural production since redistribution has been a decline in output largely due to tenure insecurity, drought, distorted markets, weak agricultural support services and acute shortages of seeds, fertilizer and fuel (World Bank, 2007). Areas under cultivation have decreased substantially between 1999/2000 and 2007/8. Maize plantations reduced from 850.000ha to 500.000 ha, soya plantations from 220.000 ha to 60.000 ha and tobacco from 180.000-60.000ha (World Bank, 2007). Domestic productions of the main food crops in Zimbabwe (maize and wheat) have been inadequate and unable to bridge the increasing demand-supply gap. Although, the Fast Track Resettlement Program started in the early 2000s, provided new opportunities for farmers to make a living (Scoones, 2008), the shrinking economy severely reduced employment opportunities in general and structural unemployment had increased to more than 50 % in the early 2000s and an estimated 80 to 94 % in 2007/2008 (ZimVAC, 2009). From being a regional breadbasket, Zimbabwe has become a food importer. As such, economic turnaround is predicated on good agriculture recovery. Given the importance of agriculture, specific interventions in the sector are necessary so that the land is effectively used to underpin the turnaround program. The battle cry at this stage is, therefore, for all those who hold land to view this resource as an effective means of economic unrestraint, rather than a status symbol.

The limited capacity of the Zimbabwe's agricultural sector to meet the domestic demand has raised a number of pertinent questions both in policy circle and among researchers. For example, what are the factors explaining why domestic agricultural production lags behind the demand for agricultural commodities in Zimbabwe? Central to this explanation is the issue of efficiency of the farmers in the use of resources. Methods of attaining food self-sufficiency in the agricultural sector of Zimbabwe include increases in area cultivated, productivity of land or both. The first possibility is difficult to achieve in Zimbabwe in the long run due to a high population growth.

Certainly with a quarter million people being added to the world population each day, the demand for grains and all other food will reach unprecedented levels. In addition to population growth, fertile cropland is being lost at an alarming rate. For instance, nearly one-third of the world's cropland (1.5 billion hectares) has been abandoned during the past 40 years because erosion has made it unproductive (Pimentel *et al*., 1995). Because of the high number of unaccounted emigrants, the recent increase of emigration, labour, one of the most important factors of production in agriculture has become so scarce. In Zimbabwe, HIV/AIDS pandemic has its own effect on food production by infecting more than 20 % of adults (Gono, 2005). Even in years of normal rainfall, crop production has suffered due to the number of HIV positive adults who are too ill to carry out the hard labour required for subsistence farming (ZimVAC, 2009).

Thus, strategies that focus on methods of increasing the productivity of land and other resources while conserving those which are over-utilized are preferred. Researchers, employ various kinds of statistical and mathematical tools to assess the viability of agricultural technologies. Usually, analyses of farming systems have attempted to measure small farms feasibility by dealing with real farmers' performance, using existing figures of production costs and agricultural revenue. But some important questions arise when this approach is put to work: ''what happens if current farming practices of some individual farms are inefficient when compared with best practices under present available technologies?'' and, ''are all farmers using the most favourable input mix according to present input prices?'' The interest of finding an answer to these questions is not simply scholastic as they have some significant financially viable and ecological policy implications.

The previous chapter was based on the yields and land utilization rates of the resettled farmers; however the causes of variations in yields per hectare across the three models of land reform are not known but presumed to be due to differences in efficiency in use of the available resources. The current chapter describes the determination of efficiency scores of the resettled farmers of Zimbabwe in the production of field crops across the three models of land reform using Data Envelopment Analysis (DEA) to answer the questions from the paragraph above.

8.2 Review of efficiency studies

The main aim of this subsection is to review past studies conducted to determine the efficiency in agriculture in general. Investigating efficiency in this case means evaluating how farm businesses perform under an existing technology. For agricultural enterprises to achieve sustainable production, it is necessary to determine their efficiency level and the factors affecting efficiency. Majority of efficiency studies in agriculture focused on dairy farms and rice farms.

Mbaga *et al* (2003) conducted a study in Canada, based on the Cobb Douglas production functions and they reported that the mean herd size was 57.7 animals in Quebec dairy farms and the growth was 6.8%. Another important finding of this research was that DEA allowed for the easy performance of multiple output calculations on the basis of multiple inputs; it was found to be superior to the Stochastic Production Frontier analysis method.

Coelli *et al.* (2002) estimated technical, allocative, cost and scale efficiencies using a non-parametric approach in Bangladesh rice cultivation. For the dry season, mean technical efficiency was 69.4%, allocative efficiency was 81.3 %, cost efficiency was 56.2% and scale efficiency was 94.9%. The wet season results were similar with a few points lower. Inefficiency effects model results showed that farmers with better access to input markets and doing less off-farm work were more efficient, whereas large families were more inefficient.

Dhungana *et al* (2004) used DEA approach to estimate economic, technical, pure technical, scale and allocative inefficiencies. The respective results were

34,13,24,18, and 7 %. Seed, labour, fertilizers and mechanical power contributed towards the significant variations in the levels of inefficiency across sample farms. A Tobit regression model was used to determine inefficiency model. Results revealed that farm specific attributes such as the farmers' level of risk attitude, the farm manager's gender, age, education level and family labour endowment were associated with the variation in the efficiency.

Dev and Hossain (1995) estimated the farm specific technical efficiency of rice farmers. Technical efficiency estimation showed that technology had significant positive contribution to technical efficiency in the rice production while farmers' education level had no significant contribution. Llewelyn and Williams (1996) adopted non-parametric approach of technical efficiency for irrigated farms in the Madim regency in the west-central part of East Java, Indonesia. Farmer age, the level of diversification of cropping activities and high school education were related to technical efficiency in the rain season under irrigated conditions. It was also estimated that inefficient farms were using excessive levels of inputs, particularly nitrogen fertilizers. Sharif and Dar (1996) found that small farmers with the least education and growing experience were least technically efficient.

In New England, Bravo-Ureta and Rieger (1991) examined efficiency of dairy farms using the Stochastic Frontier Approach and Cobb Douglas production function. They found on the average overall economic inefficiencies of 30%. However, there was little difference between technical (83%) and allocative efficiency (84%). Farm size, education, experience of farmer and extension visits were significantly related with the level of efficiency. Baily *et al* (1989) estimated efficiency on a sample of

Ecuadorian dairy farms. They found that a positive relationship exists between enterprises size and technical efficiency. In contrast to the New England study, medium sized Ecuadorian farms were found to be as allocative efficient as large farms. A study of technical efficiency of Finnish farms using DEA by Lansink *et al* (2002) reported that the conventional livestock farms had technical efficient scores of 69%.

Ngwenya *et al* (1997) found the mean technical efficient of wheat farmers in the Eastern Free State, province of South Africa to be around 67% using the 1988/89 agricultural years from a sample survey of wheat farmers. The technical inefficiency effects were negatively and significantly related to the size of the farms.

Jaforrullah and Whiteman (1999) used DEA to measure the scale efficiency of the New Zealand dairy industry. Overall efficiency was 83% with a minimum of 33%. Bakhshoodeh and Thomson (2001) determined input and output technical efficiencies of wheat production in Kerman, Iran using the Cobb-Douglas frontier to establish a simple relationship between a farm level output based technical efficiency measure and an input-based measure. The respective efficiencies were estimated at 0.93 and 0.91, implying that there was limited scope to increase the profitability of Iranian wheat production either by increasing the output, given input levels or by decreasing inputs for the current level of wheat production.

Reddy (2002) investigated productivity differences between tenant and owner operated sugarcane farms in Fiji using a stochastic frontier production function. Significant difference was found between the two types with respect to input usage, productivity and technical efficiency. Mean technical efficiency estimates for tenant operated farms and owner operated farms were 0.82 and 0.90, respectively. Comparison of the efficiencies of the different studies that used DEA is not possible, since the scores only measure the relative efficiency within the sample (Coelli *et al*, 2005).

Review of literature demonstrates that studies on agricultural enterprises such as dairy, wheat and rice to estimate technical efficiency and factors causing technical inefficiency were conducted most. DEA and the econometric frontier approach were adopted most in the above mentioned studies. Nevertheless, the stochastic frontier production function approach is used mostly in studies. In the present study, Data Envelopment analysis was used to evaluate the performance of decision making units. This is because DEA is widely used in the processes where different inputs and outputs are used together (Reifschneider and Stevenson, 1991; Sharma *et al,* 1999; Tauer, 2001).

8.3 Materials and methods

Details regarding the study area and the methodology which encompasses sampling procedures, questionnaire design, methods of data collection and data analysis are described in chapters five and six, respectively. For the purpose of this chapter, only a summary is provided.

8.3.1 The study area

The study was conducted in Shamva District in Mashonaland Central Province of Zimbabwe. Details on the description of the study area are described in Chapter 5.

8.3.2 Sampling Procedure

Randomly selected land reform beneficiaries from three models of land reform were interviewed by trained enumerators under the supervision of the researcher from June to September 2010. Details regarding the sampling procedure are given in Section 6.3.

8.3.3 Data analysis and description of variables used in the analysis

To empirically investigate and calculate efficiency, two main streams of approaches compete in the literature: non-parametric and parametric approaches (Bojnec and Latruffe, 2008). Both have advantages and drawbacks; however in this study the non-parametric method, DEA was adopted mainly because it has the ability to incorporate technical parameters that may not be captured by parametric production efficiency methods and its capability of handling multiple inputs and outputs (Coelli *et al,* 2005). In Zimbabwean agriculture, many types of field crops are produced and the assumption of homogeneous outputs does not hold if physical units of measurements are used. Therefore, physical outputs are multiplied by their respective market prices. The outputs include maize, groundnuts, round nuts, beans and cotton (most grown crops). The physical inputs required to produce maize for instance include arable land, seed, labour and fertilizer.

The parametric approach has an important drawback in that the maintained hypothesis of the functional form cannot be observed (Banker and Maindiratta, 1988) and thus it imposes restrictions on the frontier production technology that may not hold; this affects the distribution and estimation of the efficiency measures (Chavas and Aliber, 1993). DEA estimates efficiency relative to the Pareto-efficient frontier which estimates best performance (Murthi *et al*., 1997). Furthermore, DEA can obtain target values based on the best practice units (peers) for each inefficient farm that can be used to provide guidelines for improved performance. DEA was proposed by Charnes *et al*. (1978) and later developed further by Fa¨re *et al*. (1994) and it uses linear programming to construct a piece-wise efficient frontier with the best performing farm businesses of the sample used. Under the assumption of constant returns to scale (CRS) technical efficiency is calculated, while scale efficiency can be obtained by the residual between efficiency under CRS and efficiency under variable returns to scale (VRS). The DEA frontier gives either the maximum output for a given input level or uses the minimum input for a given output level. Thus, the analysis of efficiency can have an input saving or an output-augmenting interpretation. While these two approaches might give same results in assumptions of constant returns to scale, they might give different results in assumption of Variable Returns to Scale.

Input oriented DEA model under the assumption of constant return to scale was used to estimate the technical efficiency in this study. It addresses the issue of 'by how much' can the amounts of inputs be proportionally reduced without changing the quantities of outputs produced. Coelli*, et al*. (2002) argued that one should select orientation from input oriented DEA model or output oriented DEA model according to which quantities the operator has more control over. As, the resettled farmers in Zimbabwe have more control over inputs than outputs, therefore, input oriented DEA model was used in the study. In the study DEA software version 2.1 developed by Coelli (1996) was used. From DEAP Version 2.1, output orientation is not applicable in cost efficiency DEA. The input-orientated DEA linear programming models to calculate technical efficiency (equations (1)-(4)) and economic efficiency (equations (5)-(8)) are as follows (Coelli *et al*., 2005):

$$\text{Min}_{\theta,\lambda}\,\theta \qquad (1)$$

$$\text{s.t} - x_i + X\lambda \geq 0 \qquad (2)$$

$$y_i - Y\lambda \geq 0 \qquad (3)$$

$$\lambda \geq 0 \qquad (4)$$

where, Y and X are, respectively, the output and input matrices of the sample; y_i and x_i are, respectively, the output and input matrices of the *i*-th farm; I is a vector of 1; λ is a matrix of parameters.

1 ≤ θ ≤ *1*, 1- θ is the potential proportional decrease in all inputs for the *i*-th firm, and 1/0 defines the technical efficiency score that varies between 0 and 1:

$$\text{Min}_{\lambda,yi^*piyi^*} \qquad (5)$$

$$\text{s.t} - x_i^* + X\lambda \geq 0 \qquad (6)$$

$$y_i - Y\lambda \geq 0 \qquad (7)$$

$$\lambda \geq 0 \qquad (8)$$

where, x_i* is the cost-minimising vector of inputs. Economic efficiency is given by the ratio p_ix_i/p_ix_i*. The above models are under the assumption of CRS. Allocative efficiency is given by the ratio of economic efficiency to technical efficiency.

For DEA, the variable in the objective function is market value of field crops measured in United States Dollar (US$). Variables that form the constraint set include crop area (hectares), seed (kilograms), fertilizer (kilograms), pesticides (litres), cultivation (US$), labour for crop production (man days per production process). The following production processes were included: planting, weeding, fertilising, spraying and harvesting. In the past, studies have valued labour using man days (Bravo-Ureta and Rieger, 1991; Ngwenya *et al*, 1997; Mushunje *et al*, 2003). However, in this study, man days per production activity were used as it was noted during interviews with key informants that wages varied with farming activities. Deere (1982) also observed a similar situation that wages varies with farming activities. Family labour and use of own machinery was valued using opportunity cost while the rest of the inputs and outputs was valued using the market prices.

8.4 Results

Results obtained by the application of the input-orientated DEA under the assumption of constant returns to scale are illustrated in Figure 8.2. The resultant efficiency scores from DEA were divided into three categories: namely technical, allocative and economic efficiency. Model differences in technical efficiency proved to be substantial. During the cropping season of 2010, A2 farmers (large land owners) had the highest average technical efficiency score of 0.839, while the lowest ranking model (A1) had an average score of 0.618. Consequently, the A1 land reform beneficiaries produce on average about 20 per cent less output than the A2 land reform beneficiaries for the same inputs, or alternatively, if the A1 resettled farmers had been as efficient as the A2 beneficiaries of land reform; they would have produced their outputs with an average of 20 per cent less resources.

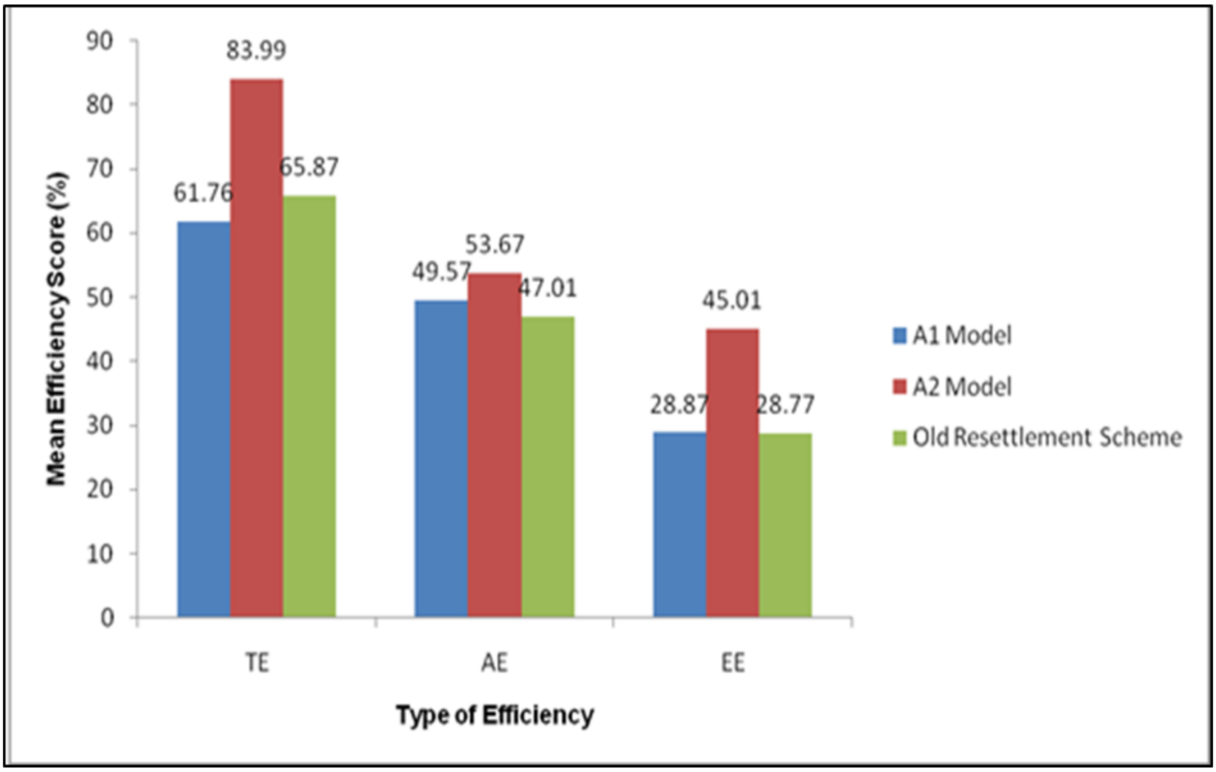

Figure 8.1: Mean technical, allocative and economic efficiency scores

The mean technical efficiency scores for small land holders (A1 and the old resettled farmers) were almost similar, ranging between 60 and 65 %. On average, the ability to choose optimum input levels for given factor prices (AE) was almost similar and lower than for technical efficiency for all the studied models of land reform. Small land holders also observed lower average economic efficient scores of 0.288 and 0.289 for A1 and the old resettlement land reform beneficiaries, respectively. The average cost-efficient score for A2 farms for the 67 observations over the 2010 crop production season was 0.45 (Figure 8.1), that is, the sampled A2 farmers could on average have produced the same output quantities with only 45 % of the observed costs whereas the A1 and the old resettled farmers could on average have produced the same output quantities with only 29 % of the observed costs.

Simple comparison suggests that small land holders are on average less economic-efficient than large land owners (A2), with a score of 0.29 for the former compared with 0.45 for the latter. For A2 farmers, the decomposition of economic-efficiency into technical and allocative efficiency (Figure 8.1) suggests that economic inefficiency was mostly due to poor use of inputs at the prevailing input prices, rather than waste of inputs. Small land holders' cost inefficiency was mostly due to both the use of 'wrong' inputs at the prevailing input prices and waste of inputs.

The frequency distribution of technical, allocative and economic efficiency scores of sampled households are tabulated in Table 8.1. The results clearly showed that given level of output with a minimum quantity of inputs under certain technology, the majority of the farmers who benefited from the A2 Fast track land reform model in Zimbabwe are clustered around 0.9 to 1. The minority of A1 farmers have their ability to produce a given level of output with a minimum quantity of inputs under certain technology lower than 50 % that is 42%. For A2 farmers the percentage that scored above 50% is 6% whilst those that scored above 50% is 94%. For the old resettled farmers the percentage of land reform beneficiaries with a technical efficiency score below 50% is 17% whilst the majority (83%) of these old resettled farmers had efficiency scores above 50%.

The results on the frequency distribution for allocative efficiency show that the majority of the A1 and the A2 farmers have efficient score above 50% whereas for the old resettled farmers the minority scored above 50%. For the A1 and A2 farmers, 44 and 45 % of these farmers that benefited under these two models of land reform had allocative efficient scores below 50% respectively.

Table 8.1: Frequency distribution of efficiency scores

Efficiency level Frequency												
	Technical Efficiency				Allocative Efficiency				Economic Efficiency			
Scores	A1	A2	OR	Total	A1	A2	OR	Total	A1	A2	OR	Total
0.01 – 0.10	0 (0)	0(0)	0(0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
0.11 – 0.20	0 (0)	0(0)	0(0)	0 (0)	3 (4)	0 (0)	6 (6)	9 (4)	7 (9)	3 (4)	13 (13)	23 (9)
0.21 – 0.30	0 (0)	0(0)	1(1)	1 (0)	10 (13)	4 (6)	20 (21)	40 (16)	47 (60)	11 (17)	48 (48)	106 (44)
0.31 – 0.40	3 (4)	1(1)	2(2)	6 (2)	9 (11)	14 (21)	5 (5)	28 (11)	20 (25)	19 (29)	34 (34)	73 (30)
0.41 – 0.50	30 (38)	3(5)	14(14)	47 (20)	13 (16)	12 (18)	19 (19)	44 (18)	3 (4)	9 (13)	1 (1)	13 (5)
Sub Total	**33 (42)**	**4 (6)**	**17 (17)**	**54 (22)**	**35(44)**	**30(45)**	**50(51)**	**121(49)**	**77 (98)**	**42(63)**	**96 (97)**	**215 (88)**
0.51 – 0.60	10 (13)	4(6)	41(42)	55 (22)	19 (24)	10 (15)	26 (26)	55 (21)	1 (1)	9 (13)	2 (2)	12 (5)
0.61 – 0.70	12(15)	11(16)	11(11)	34 (14)	23 (30)	16 (24)	20 (20)	59 (24)	0 (0)	10 (15)	0 (0)	10 (4)
0.71 – 0.80	8 (10)	8 (12)	5(5)	21 (9)	1 (1)	9 (13)	3 (3)	13 (5)	0 (0)	4 (6)	1 (1)	5 (2)
0.81 – 0.90	4 (5)	6(9)	3(3)	13 (5)	0 (0)	2 (3)	0 (0)	2 (1)	0 (0)	2 (3)	0 (0)	2 (1)
0.91 – 1.00	12 (15)	34(51)	22(22)	68 (28)	1 (1)	0 (0)	0 (0)	1 (0)	1 (1)	0 (0)	0 (0)	1 (0)
Sub Total	**46 (58)**	**63 (94)**	**82 (83)**	**191(78)**	**44 (56)**	**37 (55)**	**49 (49)**	**124 (51)**	**2 (2)**	**25 (37)**	**3(3)**	**30 (12)**
Total	79 (100)	67 (100)	99 (100)	245 (100)	79 (100)	67 (100)	99 (100)	245 (100)	79 (100)	67 (100)	99 (100)	245 (100)
Minimum	0.33	0.39	0.29	0.29	0.18	0.23	0.19	0.18	0.12	0.16	0.11	0.11
Maximum	1.00	1.00	1.00	1.00	1.00	0.90	0.75	1.00	1.00	0.90	0.75	1.00

X(Y) where X is the number of households the class and Y is the frequency of households in the class expressed as a %age

On aggregate the majority of the sampled farmers have an allocative efficiency below 50%. As for economic efficiency, most of the sampled farmers in all the studied models of land reform have efficiency scores below 50%. The A1 beneficiaries led in this regard with 98 % of the sampled farmers who benefited under this model having less than 50% efficiency score closely followed by the old resettled farmers with 97 %. The A2 land reform beneficiaries had the least percentage of 63% having economic efficient score of less than 50%.

The low economic efficiency scores indicate that there is a wide room for improving efficiency among all the land reform beneficiaries. Improving efficiency would be important because, as pointed out in the previous section, most of the productive land in Zimbabwe is now under the hands of the newly resettled farmers and there is heavy grain shortage and consequently hunger in the country. The only way hunger could be reduced is through improving the efficiency of the resettled farmers.

8.5 Discussion

Using the Data Envelop Analysis, the average technical, allocative and economic score for the sampled households are less than 60%, which is relatively low indicating a heterogeneous sample. This suggests that although the sample contains very different production systems in terms of farm size, farms have different management practices and make use of the existing technology differently, with A2 farmers utilizing available technology better than the small land holders (A1 and the old resettled land reform beneficiaries). The finding that large land owners are more technically efficient corresponds with the findings of Philip (2007) in his study on efficiency of farmers in the production of crops used in bio fuel production in

Tanzania. The study conducted in Tanzania observed that farms measuring more than nine hectares have higher DEA technical efficiency scores than those who have farms measuring between three and six hectares. The higher efficiency scores for farms with areas of more than nine hectares could be attributed to improvements in supervision of hired labourers. Large farms which hire many labourers are likely to employ field officers or hired labourers' supervisors. The employment of hired labour supervisors is likely to increase the productivity of hired labour and hence improving the efficiency of the farm as a whole. Furthermore, since the number of supervisors does not change with slight changes in the number of hired labourers, farmers who employ many hired labourers are likely to benefit from scale economies in hired labour supervision[14].

Heltberg (1998); Ngwenya *et al* (1997) and Himayatullah (1995) also reported a similar farm size-efficiency relationship. In addition, the high technical efficiency scores for A2 farmers can be attributed to better technology used by the A2 farmers. The Government distributed farm equipment and machinery to boost agricultural production to communal farmers and land reform beneficiaries. Tractors, combine harvesters, disc harrows, ploughs, generators, motorbikes, grinding mills, planters and fertilizer spreaders were among the implements that were made available to farmers (Gono, 2005). However, the A2 farmers benefited most by receiving tractors, planters and other sophisticated machinery which are more efficient than the ox-drawn equipment that the A1 and the old resettled farmers received. The Farm Mechanisation Programme was meant to replace obsolete equipment on farms while

[14] Increasing the number of hired labourers from say 5 to 10 would not necessarily require an increase in the number of hired labourers' supervisors.

providing machinery to farmers that were inadequately capacitated following the land reform programme.

Education had a positive effect on technical efficiency as noted by Battese *et al* (1996). A2 farmers, as noted in Chapter 7, are more educated than the small land holder counterparts. Large farm land holders possess higher education and have greater access to better irrigation arrangements, extension services, and apply higher doses of chemical fertilizers with more balanced nutrients. Moreover, they are usually financially better off and thus are in a position to use and adopt modern technologies more efficiently and effectively (Ghura and Just, 1992). This may be the reason why A2 farmers were more technically efficient than small land reform beneficiaries.

Educated farmers have better access to information as they can read magazines such as farmers weekly that may boost their knowledge base on farming and they comprehend agricultural experts' advice better than the uneducated farmers (Musemwa *et al*, 2010). In addition educated farmers are more likely to practice crop rotation unlike the uneducated farmers who are in this scenario small land holders. The low technical efficient score of the small land holders can therefore be attributed to depletion of land resources caused by planting the same crops year after year, and the prevalence of higher cropping intensity as evidenced by higher yields per hectare in the previous chapter.

Chapter 7 on factors affecting revenue per hectare from field crops and land utilisation amongst the resettled farmers in Mashonaland Central Province of

Zimbabwe shows that A2 farmers tend to specialise in the production of few field crops than the small land holders. According to Zhu and Lansink (2010), farm size reflects the impact of economies of scale which may partly materialise through a higher technical efficiency. Degree of specialisation captures any advantages related to specialisation such as the ability to gain more in-depth knowledge about a single activity or the ability to capture economies of size by increasing the relative size of a single activity (Zhu and Lansink, 2010). This therefore can be the reason why A2 farmers who have some degree of specialisation are more technically efficient than the A1 and the old resettlement farmers who are characterised by diversification of agricultural activities as mentioned in Chapter 7.

The slight difference on average technical scores between the A1 and the old resettled farms can be attributed to the homogeneity of land size, level of education, access to agricultural inputs and other social-economic characteristics amongst these two categories of farmers. However the old resettled farmers are more experienced than the A1 land reform beneficiaries in terms of farming. This may be the reason why the old resettled farmers are slightly more technical efficient than their small land holder counterpart. In addition, the old resettled farmers might also have acquired more assets used in agricultural production than the relatively new A1 farmers. During the period of study, allocative efficient was very low to all the farmers across all the models of land Reform. This may indicate that the agricultural input market in Zimbabwe is still distorted by government policies, despite the efforts that the government has made to liberalize the market after the formation of the Government of National Unity in September 2009[15].

With some farmers being catered for by the government and the donor community, most of the inputs in the shops were specifically meant for the large-scale commercial farmers and other smallholder farmers who do not qualify for subsidized inputs. Due to poor planning on the part of the government, the donor community and agricultural companies in relation to importing inputs on time, farmers who qualify for subsidized inputs ended up purchasing inputs such as seeds and fertilizers from the black market as the inputs in the shops were being bought in bulk by scrupulous people who were active in the black market as sellers (Gono, 2005). This resulted in price of agricultural inputs being very high due to supply and demand forces. This therefore created distortion in the market resulting in low allocative efficient scores among the resettled farmers.

On the output side, the prices which were offered by the Grain Marketing Board and Cottco (major buyers of grain and cotton respectively) were low very low[16]. The resettled farmers in Zimbabwe had limited options when selling their produce due to high transactional costs which are barriers to the efficient participation of farmers in different markets (Musemwa *et al*, 2008). Producers will not use a particular channel when value of using that channel is outweighed by the costs of using it. Remote location of most resettled farmers coupled with poor road networks resulted in high transactional costs (especially transport costs). On the input side, this will increase

[15] The fact that this study only analyzes the allocative efficiency among inputs, but not among outputs may underestimate the improvement in allocative efficiency. Furthermore, this study only covers one district in one province in Zimbabwe, and the conclusion may not be generalized for the whole country.
[16] Grain particularly maize and cotton are the major crops grown by the resettled farmers in Zimbabwe

the price that input suppliers will charge the farmers due to the high transactional costs they incur in bring the inputs closer to the farmers. This increase in input prices and reduction in output prices worsens the situation which resulted in farmers scoring very low allocative efficient scores. The aggregate of the reasons that causes low technical efficiency and allocative efficient scores justifies the low economic efficient score among the resettled farmers.

8.6 Conclusion

The limited capacity of the Zimbabwe's agricultural sector to meet the domestic demand can be explained by the inefficiency of these resettled farmers. Improving efficiency of the resettled farmers would be important because most of the productive land in Zimbabwe is now under the hands of the newly resettled farmers. The low economic efficiency scores imply that there is wide room for improving efficiency among all the land reform beneficiaries. For large land reform beneficiaries economic inefficiency was mostly due to the poor use of inputs at the prevailing input prices, rather than waste of inputs. Small land holders' economic inefficiency was mostly due to both the poor use of inputs at the prevailing input prices and waste of inputs. Efficiency could be improved through improving the ability of the resettled farmers to choose optimum input levels for given factor prices and saving inputs through correct usage. If the right inputs are made available at the right time, allocative efficiency could also be improved amongst the land reform beneficiaries. The study is based on data from a single production period. It may be important to investigate the time pattern of inefficiencies and also see whether there is a tendency towards convergence in the efficiency levels over time.

CHAPTER 9

FACTORS AFFECTING EFFICIENCY OF RESETTLED FARMERS IN MASHONALAND CENTRAL PROVINCE OF ZIMBABWE

Abstract

A Tobit model censored at zero was selected to examine factors explaining differences in production efficiency obtained in Chapter 8. Efficiency scores obtained from DEA were used as the dependent variable. From the factors that inputted in the model, age of household head, excellent production knowledge and whether a farmer was full time or part time in farming affected technical efficiency whereas allocative efficiency was only affected by good production knowledge, farm size, arable land owned and area under cultivation. Factors which affected economic efficiency of the resettled farmers are secondary education, household size, farm size, cultivated area and arable land owned. None of the included socio-economic variables have significant effects on the allocative and economic efficiency of the resettled farmers. Thus, the allocative and economic inefficiencies of the farmers might have been accounted for by other natural and environmental factors which are not captured in the model. Efficiency of the resettled farmers can be improved significantly if the government focuses on increasing the education level of farming communities to at least secondary level by opening more secondary and tertiary schools in the rural areas. The promotion of large farms through promotion of co-operatives could also improve efficiency of the resettled farmers.

Keywords: farm size, inefficiencies, production knowledge, resettled farmers, Tobit model,

9.1 Introduction

Historically, there have been numerous attempts to reduce rural poverty and address the rising income gap between the rich and the poor by increasing agricultural production, often with limited success (World Development Report, 2008). The contemporary call for agricultural subsidies in the face of pathetic monetary capacity in the developing countries is also unlikely to present a sustainable solution to substantial rural poverty. Increasing agricultural output, including yields for staple crops, will be essential in offsetting pressures for the growing population. But rising incomes alter the composition of food expenditure from basic and unprocessed staple foods to more varied diets with processed foods (World Bank, 2005). So development in agriculture is gradually more driven by the rapidly increasing demand for livestock products and high-value crops, which are also more labour demanding.

Accelerated agricultural development to meet the demand requires a sharp productivity increase in smallholder farming combined with more effective support to the millions surviving as subsistence farmers, many of them in inaccessible areas. Three out of every four poor people in developing countries live in rural areas, and most of them depend directly or indirectly on agriculture for their livelihoods (FAO, 2006). This, therefore, makes agricultural development in agricultural based countries the only way for achieving the Millennium Development Goal (MDG) that calls for halving by 2015 the share of people suffering from extreme poverty and hunger (World Bank, 2005). However, agriculture has not been exploited to its full potential in many countries because of anti-agriculture policy biases and underinvestment, frequently compounded by misinvestment and donor neglect, with soaring costs in human agony (World Development Report, 2008). New opportunities for realizing this potential are present today, but also coming are new challenges, particularly in pursuing a smallholder-driven approach to agricultural growth that reconciles the economic, social, and environmental functions of agriculture.

In Sub-Saharan Africa high rural population growth drives crop farm expansion into forest or grazing land, creating conflicts with traditional users or into areas subject to human and animal diseases (FAO, 2002). Even so, there is considerable room for land expansion in some Sub-Saharan countries, but this will require large investments in infrastructure and human and animal disease control to convert these lands to productive agriculture. Even land now used for agriculture is threatened. Productivity growth of available land is often undermined by pollution, salinization, and soil degradation from poorly managed intensification, all reducing potential yields. Some sources suggest that globally, 5 to 10 million hectares of agricultural land are being lost annually to severe degradation (Scherr and Yadav, 1996). Soil degradation through nutrient mining is a huge problem in Sub-Saharan Africa, though much of it is reversible through better soil management and fertilizer use.

Demand for water for both agricultural and non-agricultural uses is rising, and water scarcity is becoming acute in much of the developing world, limiting the future expansion of irrigation. The water available for irrigated agriculture in developing countries is not expected to increase because of competition from rapidly growing industrial sectors and urban populations as noted in the Comprehensive Assessment of Water Management in Agriculture in 2007. According to the United Nations Development Program (2006), new sources of water are expensive to develop, limiting the potential for expansion, and building new dams often imposes high environmental and human resettlement costs.

The only way agricultural productivity could be increased is through the efficient use of the currently available resources as capital is limited in developing countries. In the previous chapter production efficient scores were calculated for the resettled farmers in Zimbabwe. However, the production efficiency scores would not provide evidence regarding factors that cause variation in efficiency (Coelli *et al*., 2005; Bojnec and Latruffe, 2008). To guide extension agents, researchers and policy makers, it is essential to identify factors that influence production efficiency. The main objective of the current chapter was to determine the factors that affect technical, allocative and economic efficiency of the resettled farmers in Zimbabwe in the production of field crops as well as to come out with solutions to factors hindering efficiency of the resettled farmers in field crop production.

9.2 Materials and methods

Details regarding the study area and the methodology which encompasses sampling procedures, questionnaire design, methods of data collection and data analysis are described in chapter five and six respectively. For the purpose of this chapter, only a summary is provided.

9.2.1 The study area

The study was conducted in Shamva District in Mashonaland Central Province of Zimbabwe. Details on the description of the study area are described in Chapter 5.

9.2.2 Sampling Procedure

Two hundred and forty five land reform beneficiaries were randomly selected from the three models of land reform. These were interviewed by trained enumerators under the supervision of the researcher from June to September 2010. Details regarding the sampling procedure are given in Chapter 6.

9.2.3 Data analysis and description of variables used in the analysis

Analysis of production efficiency scores would not provide evidence regarding factors that cause variation in efficiency (Llewelyn *et al,* 1996; Coelli *et al*., 2005; Bojnec and Latruffe, 2008). To guide extension agents, researchers and policy makers, it is critical to identify factors that influence efficiency of these resettled farmers. Efficiency scores lie between 0 and 1. Formulation of a regression equation with a truncated continuous dependent variable (efficiency score) may result in a predicted output that may lie beyond the interval 0-1. In addition, the dependent variable in regression model does not have normal distribution (Dhangana, *et al*. 2000). As Wooldridge (2000) noted, traditional methods of regression are not suitable for censored data, since the variable to be explained is partly continuous and partly discrete. In this situation, ordinary least squares (OLS) analysis generates biased and inconsistent estimates of model parameters. This implies that ordinary least square (OLS) regression is not appropriate and evaluation with an OLS regression would lead to a subjective parameters estimate (Krasachat, 2003). A Tobit model was however adopted in this study.

A Tobit model is a statistical model proposed by James Tobin (1958) to describe the relationship between a non-negative dependent variable y_i and an independent variable (or vector) x_i. It is also called a censored regression model, designed to estimate linear relationships between variables when there is either left or right-censoring in the dependent variable (also known as censoring from below and above, respectively). Censoring from above takes place when cases with a value at or above some threshold, all take on the value of that threshold, so that the true value might be equal to the threshold, but it might also be higher (Bruin, 2006). In the case of censoring from below, values those that fall at or below some threshold are censored. Greene (1993) argues that it is more suitable to have data censored at zero that at 1. A Tobit model censored at zero was selected to examine factors explaining differences in production efficiency. The model used is given as:

$E = E^* = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \ldots\ldots\ldots\ldots\ldots\ldots + \beta_{26} Z_{26} + \mu$ *if* $E^* > 0$ $\quad E = 0$ *if* $E \leq 0$

Where:

E is the efficiency measures representing technical, allocative and economic efficiency.

E^* is the latent variable.

β are unknown parameters,

μ is a disturbance term.

Z_1 Dummy variable showing male household heads =1, female headed household=0

Z_2 Dummy variable showing married household heads=1, otherwise zero

Z_3 Age of the farmer in years

Z_4 Dummy variable showing poor production knowledge=1, otherwise zero

Z_5 Dummy variable showing fair production knowledge=1, otherwise zero

Z_6 Dummy variable showing good production knowledge=1, otherwise zero

Z_7 Dummy variable showing very good production knowledge=1, otherwise zero

Z_8 Dummy variable showing excellent production knowledge=1, otherwise zero

Z_9 Dummy variable showing no education=1, otherwise zero

Z_{10} Dummy variable showing primary level of education =1, otherwise zero

Z_{11} Dummy variable showing secondary level of education=1, otherwise zero

Z_{12} Dummy variable showing tertiary level of education=1, otherwise zero

Z_{13} Dummy variable showing Christianity =1, otherwise zero

Z_{14} Household size (number of household members)

Z_{15} Dependence ratio-the ratio of independent to the number of dependent members of the family

Z_{16} Dummy variable showing full time farmer =1, otherwise zero

Z_{17} Farming experience in number of years

Z_{18} Total farm area in hectares

Z_{19} Arable land used in hectares

Z_{20} Arable land owned in hectares

Z_{21} Herd size (number of cattle owned)

Z_{22} Dummy variable showing clay soil =1, otherwise zero

Z_{23} Dummy variable showing silt soil=1, otherwise zero

Z_{24} Dummy variable showing sandy loam =1, otherwise zero

Z_{25} Dummy variable showing clay loam=1, otherwise zero

Z_{26} Dummy variable showing sand soil=1, otherwise zero

Z_{27} Number of extension visits per season

For the Tobit model, efficiency scores obtained from DEA were used as the dependent variable. The model was used separately for economic efficiency, technical efficiency and allocative efficiency. Variables that were anticipated to cause variation in efficiency include years of farming experience, level of education, number of visits by extension agents, farm size, dependence ratio, region, production knowledge and household characteristics (age of head of household, religion of head of household, household size and gender of head of household) and level of specialization (whether a farmer was doing farming full time or part).

To measure production knowledge and skills related to current production technologies and practices, problem solving tests were constructed. Studies in cognitive psychology have demonstrated the usefulness of measuring knowledge using problem solving tests or comprehension ability (Charnes *et al*, 1978; Eisemon 1988). The tests were intended to examine the kinds of solutions households provide to crop production problems based on their agricultural knowledge. For instance, farmers who plant maize were presented with the following problem solving task: Your maize plants are stunted exhibiting yellowish colour on leaves. What are the possible causes of this problem? How may it be prevented? Answers obtained from problem solving tests are scored to compare variations in knowledge of farmers within and between land reform models. A score of 1 to 5 was prepared and individual farmers' response was ranked relative to their answers.

9.3 Results

Results obtained from the Tobit analysis are presented in Table 9.1. They indicate that sex, age, fair, good, very good and excellent production knowledge, secondary education, household size, dependency ratio, experience of head of household in farming, farm size, arable land owned, cultivated area, herd size and sandy soil affected technical efficiency positively. However, from the factors that affected technical efficiency positively, only age and excellent production knowledge had a significant effect. All the other factors affected technical efficiency negatively. Only farmer status had a negative and significant effect on technical efficiency (p≤0.05).

Table 9.1: Sources of Technical, Allocative and Economic efficiencies

Variable	Technical Efficiency		Allocative Efficiency		Economic Efficiency	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
Constant	0.366 (0.140)	0.009	0.673 (0.111)	0.000	0.293 (0.083)	0.001
sex	0.097 (0.071)	0.172	-0.062 (0.056)	0.267	-0.006 (0.042)	0.878
marital status	-0.075 (0.066)	0.259	-.004 (0.053)	0.946	-0.036 (0.039)	0.361
age	0.003 (0.002)	0.047*	-0.001 (0.001)	0.605	0.001 (0.001)	0.147
Poor production (prod) knowledge	-0.119 (0.080)	0.141	-0.114 (0.064)	0.076	-0.050 (0.048)	0.300
Fair prod knowledge	0.144 (0.082)	0.082	-0.117 (0.065)	0.075	-0.038 (0.049)	0.440
Good prod knowledge	0.113 (0.083)	0.177	-0.134 (0.066)	0.044*	-0.073 (0.049)	0.140
Very good prod knowledge	0.130 (0.085)	0.126	-0.127 (0.067)	0.061	-0.059 (0.050)	0.247
Excellent prod knowledge	0.119 (0.065)	0.048*	-0.080 (0.051)	0.120	-0.020 (0.038)	0.598
No education	-0.011 (0.158)	0.947	-0.023 (0.125)	0.855	0.025 (0.094)	0.788
Primary education	-0.008 (0.069)	0.903	0.065 (0.055)	0.239	0.061 (0.041)	0.140
Secondary	0.106	0.110	0.020	0.705	0.093	0.019*

education	(0.066)		(0.052)		(0.039)	
religion	0.014	0.687	-0.027	0.327	-0.009	0.652
	(0.034)		(0.027)		(0.020)	
Household size	0.002	0.491	0.004	0.131	0.004	0.035*
	(0.003)		(0.003)		(0.002)	
Dependence ratio	0.006	0.941	0.021	0.760	0.022	0.666
	(0.087)		(0.067)		(0.052)	
Farmer Status	-0.103	0.041*	0.043	0.323	-0.024	0.463
	(0.055)		(0.044)		(0.033)	
Experience	0.001	0.739	-0.002	0.341	-0.001	0.317
	(0.002)		(0.002)		(0.001)	
Farm Size	0.001	0.975	0.004	0.026*	0.003	0.014*
	(0.002)		(0.002)		(0.001)	
Arable land owned	0.004	0.645	0.014	0.023*	0.009	0.046*
	(0.008)		(0.006)		(0.005)	
Cultivated area	0.008	0.254	0.010	0.045*	0.012	0.007*
	(0.007)		(0.006)		(0.004)	
Herd size	0.001	0.476	0.001	0.608	0.001	0.195
	(0.001)		(0.001)		(0.001)	
Clay Soil	-0.037	0.436	-0.018	0.634	-0.045	0.113
	(0.047)		(0.038)		(0.028)	
Silt Soil	-0.010	0.852	-0.065	0.127	-0.065	0.060
	(0.053)		(0.042)		(0.032)	
Sandy Loam Soil	-0.014	0.715	-0.042	0.179	-0.041	0.080
	(0.039)		(0.031)		(0.023)	
Sand Soil	0.038	0.512	0.010	0.831	0.005	0.880
	(0.058)		(0.046)		(0.035)	
Extension visits	-0.008	0.483	-0.002	0.974	-0.004	0.595
	(0.012)		(0.009)		(0.007)	
Prob > chi2	0.000		0.032		0.000	
Pseudo R^2	-1.021		-0.196		-0.437	

*Significant at 5%

Allocative and Economic efficiency are insignificantly affected by sex of head of household, marital status, poor, fair, very good and excellent production knowledge, religion, experience in farming of head of household, soil type (except sand soil) and extension visits negatively. Primary education, dependency ratio and herd size insignificantly affected both allocative and economic efficiency positively. Good production knowledge significantly affected allocative efficiency negatively whilst farm size, arable land owned and cultivated area had a positive significant effect. Economic efficiency is positively affected by household size, secondary education, farm size; arable land owned and cultivated area considerably.

9.4 Discussion

The finding of the study that age affects technical efficiency of the resettled farmers positively and significantly implies that older farmers are more efficient than younger ones and this is consistent with findings of previous studies (Chen and Tang, 1987; Lundvall and Battesse, 2000; Dhungana *et al.*, 2004). It is expected that older farmers tend to be more conservative and less receptive to modern and newly introduced technology as noted by Jovanovic (1982). However, Little *et al.* (1987), argue that older firms (people) tend to employ capital of an older vintage, which is less productive than the industry average, and this leads to a technical efficiency decrease with age. In this case the opposite is true. The older farmers tend to be more efficient. This is possibly because of growing stock of experience in the particular industry. One other possible reason is that older farmers have more resources at their disposal, which includes capital (cattle).

The co-efficiencies of the knowledge dummy variables are positive meaning as production knowledge increases technical efficiency also increases. However, the dummy variable excellent production knowledge is significant in affecting technical efficiency of the sampled households. Having excellent knowledge on agriculture information on topics ranging from agriculture production, marketing, and post-harvest handling of agricultural products and management of natural resources, new research and technology, government programs and services, and farm business management are very essential in improving efficiency in agriculture. None or poor provision of agricultural information is a key factor that has greatly limited agricultural development in developing countries (Chimonyo *et al*., 1999). The farmers' information needs are those that enable him to make rational, relevant decisions and strengthen their negotiating ability during transactions with product buyers and sellers of agricultural inputs and consequently prevent possible exploitation by better informed buyers and sellers (Coetzee *et al*., 2004).

The lack of timing and reliable information is severe, particularly in the resettled areas of Zimbabwe. Although, considerable progress has been observed in the provision of communication systems such as telephone and cellular phone network facilities, resettled farmers still remain uninformed in terms of new production techniques, market prices, trends and weather patterns (Utete, 2003). Radio and personal communication are still used as main source of information. However, access by smallholder farmers to cellular phones, radios and televisions is still limited. The poor transfer of knowledge, skills and information is further manifested by limited interaction of the farmers with extension officers due to poor road networks and resources (Utete, 2003). This therefore calls for training programs to be focused on visual aid materials and adequate illustration. In addition, training programmes and manuals to be conducted or written in local languages. Training should also be directed at developing farmers' negotiating skills during the settlement of transactions, crop production and basic farm management tools such as marketing, record keeping and financial management.

Household size, according to Montshwe (2006), is a useful unit of analysis given the assumptions that within the household resources are pooled, income is shared, and decisions are made jointly by responsible household members. Household requirement are many and one person in most cases cannot handle them alone and small holder farmers depend on family labour for most of the agricultural activities. Results from the study, however, reveal the importance of household size in enhancing the overall efficiency of the farm business. Large families were more economic efficient that smaller families who depend on hired labour. This is in line with the findings of Mushunje *et al.* (2003) amongst cotton producers in Zimbabwe. According to Feder (1985) family labour is more efficient than hired labour mainly because family labour is more motivated than hired labour.

Degree of specialisation captures any advantages related to specialisation such as the ability to gain more in-depth knowledge about a single activity or the ability to capture economies of size by increasing the relative size of a single activity. This therefore, may be the major reason why farmers who specialised in farming only achieved higher technical efficiency scores than those that practised farming as part time. This therefore means specialisation has a positive and significant effect on technical efficiency ($p<0.05$). Coelli *et al.* (2002) also found a similar result that farmers doing less off farm work were more efficient.

The parameter estimate of secondary level of education dummy variable carry a positive sign and is statistically significant at 5 % level. This result evidently demonstrates that secondary education emerges as an important factor in enhancing agricultural productivity. This result is in line with Hussain (1999); Battese *et al* (1996) and Hassan (2004). Rauf (1991) also found that the effect of higher education on efficiency was higher compared to that of primary education during the Green Revolution in the entire irrigated areas of Pakistan. Educated farmers usually have better access to information about prices, and the state of technology and its use. Better-educated people also have higher tendency to adopt and use modern inputs more optimally and efficiently (Ghura and Just, 1992).

According to Nkhori (2004), education increases the ability of farmers to use their resources efficiently and the locative effect of education enhances farmers` ability to obtain, analyse and interpret information. It is more likely that the farmers with higher educational status are more perceptive to agriculture expert advice as noted by Mushunje *et al* (2003). In addition, education enhances the acquisition and utilization of information on improved technology by the farmers as well as their innovativeness (Dey *et al*, 2000; Effiong, 2005; Idiong, 2006). The results from the study suggest that primary education has a negative but insignificant effect on efficiency for the sampled households. On the other hand, Hussain (1989) argue that there is no association between education and agricultural efficiency. For the Indian village of Kanzara, Coelli and Battase (1996) found that the farmers with more years of schooling were more technically inefficient.

From the results, farm size, size of arable land and cultivated area do not affect technical efficiency significantly. These factors only affected allocative and economic efficiency positively. This positive relationship was also observed in several other studies (Kumbhakar *et al* 1989; 1991; Bravo-Ureta and Rieger, 1991; Ngwenya *et al*, 1997; Handri and Whittaker, 1999; Hazarika and Alwand 2003). It may be the case that the smaller-sized farms are populated heavily by young and inexperienced people and therefore, they are expected to have lower average efficiency levels than large and more experienced farmers.

The large scale and experienced farmers may also have an easier access to cheaper or superior quality of inputs or may enjoy greater economies of scale. The coefficient of farming experience and extension visit variables had the expected positive sign and negative sign for technical efficiency, respectively and unexpected negative signs for allocative and economic efficiency but was not significant. This means being an experienced farmer or having as many extension officers' visits was not enough to significantly cause a farmer to attain higher levels of technical efficiency if he cannot rearrange his inputs to obtain higher output levels with a given technology or increase levels of allocative and economic efficiency if he cannot use his inputs correctly at the prevailing input prices. However Kebede (2001) found that farming experience is a significant variable for improving technical efficiency.

9.5 Conclusion

None of the included socio-economic variables have significant effects on the allocative and economic efficiency of the resettled farmers. Thus, the allocative and economic inefficiencies of the farmers might have been accounted for by other natural and environmental factors which are not captured in the model. These factors include, among others, land quality, weather, labour quality, diseases and pest infestation and so on. It is also clear from the results of the study that secondary education was positively related to economic efficiency of the resettled farmers in Mashonaland Central Province. This, therefore, means efficiency of the resettled farmers can be improved significantly if the government focuses on increasing the education level of farming communities through conducting crop production informal training in resettlement areas. Government should design policies to attract more educated people into farming by providing incentives to the educated people.

CHAPTER 10

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

10.1 Introduction

Since the implementation of the fast track land reform programme in Zimbabwe, grain shortages have hit the country hard, areas under cultivation have decreased substantially and majority of the rural poor now depend on food aid (Richardson, 2005). Reports from the Food and Agricultural Organization of the United Nations, African Union, the Southern African Development Community and scientific research also confirm the existence of this serious food problem in Zimbabwe. Most resettled farmers are failing to utilize their land economically.

According to Sachikonye (2005), the land reform programmes especially the fast track programme worsened production poverty amongst the rural poor. This, therefore, implies that the Zimbabwean land reform programme has not lived up to its promise to transform land-holding, combat poverty and revitalize the rural economy. If land reform is to meet its wider objectives, efficiency has to increase amongst the resettled farmers. The identification of factors affecting efficiency amongst the land reform beneficiaries could assist in the formulation of land reform policies and models as well as institutional reforms that can enhance economic efficiency of resettled farmers. This would capacitate the resettled farmers to become part of the commercial agricultural economy. Increase in agricultural production amongst the land reform beneficiaries in Mashonaland Central Province of Zimbabwe increasing area under cultivation and yield increase. Yield increase is however, limited by inefficiency.

10.2 Research summary

At the end of minority rule in 1980, Zimbabwe inherited a thriving agro-based economy. To address the imbalances in land access while alleviating population pressure in the communal areas, extend and improve the base for productive agriculture in the smallholder farming sector, and bring idle or under-utilized land into full production, the government of Zimbabwe adopted land reform and a resettlement program premised on land acquisition and redistribution. The land reform that has unfolded in Zimbabwe since 1980 has different models and diverse consequences such as shortage of grain. This necessitates a need for empirical analyses of efficiency of land reform beneficiaries across different models of land reform. The broad objective of the study was to determine and to compare the efficiency and productivity of resettled farmers in Zimbabwe across land reform models used by the Government. In addition the study will also determine the level of land use intensity by these resettled farmers.

The study was conducted in the Mashonaland Central Province of Zimbabwe. This province was mainly selected as the majority of this areas fall under agro-ecological region two. In this region, a wide variety of field crops are grown by reseltted farmers. Respondets were stratifiedaccording to the model of land reform. Three strata were formulated, these included:

- (i) Resettlement scheme: beneficiaries of land reform before 2000
- (ii) Fast Track A1 model
- (iii) Fast Track A2 model

A total of 245 respondents were randomly selected and structured questionnaires were administered at their homesteads by trained enumerators (extension officers) under the supervision of the researcher from June to September 2010. Respondents were household heads. In the absence of household heads, any adult member of the household was interviewed.

Descriptive statistics was applied to the basic characteristics of the sampled households. This employed both frequency and means to describe the data of variables which included religion, age of head of household and crop outputs. Land use rate was calculated as a ratio of total cultivated land to total arable land. Revenue was the average value in United Sates dollars of all field crops produced per hectare. The effect of models of land reform, on gender of the household head, marital status, age of the household head, education, household size, religion, dependency ratio, whether the farmer was fulltime or part-time in farming, experience of the farmers in farming at that environment, total land size owned by the farmers and soil type on revenue per hectare and land use intensity were determined using the GLM procedure of SAS (2003). Significance differences between least-square group means were compared using the PDIFF test of SAS (2003). The relationship between yield and land utilization was examined using the Pearson's correlations analysis (PROC CORR procedure of SAS (2003)). Dependence between response variables yield and land utilization with all the other responses variables was tested using the Chi-square test for dependence. To find the effect of arable land used and herd size on yield per hectare and land utilisation the RSREG Procedure of SAS (2003) was used.

Input oriented DEA model under the assumption of constant return to scale was used to estimate each of the technical, allocative and economic efficiency in this study. It addresses the issue of; by how much can the amounts of inputs be proportionally reduced without changing the quantities of outputs produced. In the study, DEA software version 2.1 developed by Coelli (1996) was used. A Tobit model censored at zero was selected to examine factors explaining differences in production efficiency. The model was used separately for economic efficiency, technical efficiency and allocative efficiency.

The majority of the households in the resettled areas, A1 (91%), A2 (87%) and the old resettlement areas (70%) were male-headed and had at least primary education. A2 farms have the lowest mean revenue per hectare of US$714.80 which significantly differed from A1 (US$854.60) and the old resettled farms (US$846.55) which had higher but similar mean revenue per hectare. The mean land use rate varied significantly ($p < 0.05$) with the land reform model with A2 having highest land utilisation rate of 67%. The A1 and old resettlement households had land utilisation rates of 53% and 46%, respectively. Average total revenue varied significantly with the model of land reform. Sex, marital status, age of the household head, education and household size significantly affected land utilisation ($P < 0.05$). Revenue per hectare was not affected by all the factors that were entered in the model.

Results obtained by the application of the input-orientated DEA under the assumption of constant returns to scale showed that A2 farmers (large land owners) had an average technical efficiency score of 0.839, while A1 had the lowest of an average score of 0.618. Small land holders (A1 and the old resettled farmers) are on average less cost-efficient than large land owners, with a score of 0.29 for the former compared with 0.45 for the latter. The decomposition of cost-efficiency into technical and allocative efficiency suggests that cost inefficiency for A2 and A1 farmers was mostly due to the use of ‘wrong’ inputs at the prevailing input prices, rather than waste of inputs. Small land holders’ cost inefficiency was mostly due to both the use of ‘wrong’ inputs at the prevailing input prices and waste of inputs.

From the factors that were entered in the Tobit model, age of household head, excellent production knowledge and farmer status affected technical efficiency whereas allocative efficiency was only affected by good production knowledge, farm size, arable land owned and area under cultivation. Factors which affect economic efficiency of the resettled farmers are secondary education, household size, farm size, cultivated area and arable land owned. None of the included socio-economic variables have significant effects on the allocative and economic efficiency of the resettled farmers. Thus, the allocative and economic inefficiencies of the farmers might have been accounted for by other natural and environmental factors which were not captured in the model.

10.3 Conclusions

The collapse of the agricultural sector which in turn has brought huge food shortages in Zimbabwe can be attributed to the inefficiency of the resettled farmers. The poor performance of the agricultural sector explains much of the slow progress towards reducing poverty and hunger in Zimbabwe. The low efficiency scores for the resettled farmers in Mashonaland Central imply that there is a large opportunity for improved efficiency among the land reform beneficiaries. For large land reform beneficiaries overall inefficiency was mostly due to the use of ‘wrong’ inputs at the prevailing input prices, rather than waste of inputs. Small land holders’ economic inefficiency was mostly due to both the poor use of inputs at the prevailing input prices and waste of inputs. The higher yields per hectare attained by small land holders were mostly due to use of more inputs per hectare rather than efficiency in production.

Efficiency amongst the resettled farmers could be increased through improving the ability of the resettled farmers to choose optimum input levels for given factor prices and saving inputs through correct usage. Improving efficiency of the resettled farmers will result in agriculture significantly contributing towards meeting the Millennium Development Goal of halving hunger and poverty by 2015. Increasing agricultural productivity not only relies on improved production efficiencies, such as through adoption of modern or improved technologies and practices, but also critically relies on many other factors such as adequate access to productive resources, well-functioning markets and infrastructure, and stable macro-economic policies

10.4 Policy implication and recommendation

Recommendations which include those that are related to the improvement of factors that are hindering efficiency of the resettled farmers in Zimbabwe can be made from the results and the discussion of the study. It is evident that an integrated approach is likely to underpin an efficient land reform system in Zimbabwe. This entails an understanding of farmers’ livelihoods (household characteristics) and their development in a much more explicit context of community dynamics.

The government should mobilize more financial and material resources towards both formal and informal education. This includes learning materials and learning institutions to increase the available capacity. Financial support in form of bursaries and scholarships to children of land reform beneficiaries is of utmost importance since land reform was implemented mainly to help the previously disadvantaged rural population. In most cases, resettled farmers cannot afford to send their children to school because of scarcity of financial resource and trained teachers do not prefer working in remote areas hence incentives should be provided by the government and other non-governmental organisations so as to motivate trained teachers to be willing to work in resettlement areas. Incentives such as rural allowance, free or subsidized accommodation may be of great importance when it comes to incentives. Staff development in the form of workshops and training should regularly be provided to teachers especially in the newly opened schools in resettlement areas.

Policy makers in agriculture should partner with the education department such that they design and implement a curriculum that has got a larger bias towards improving land use and productivity starting at primary level such that even if a person drops out before getting to secondary school, the person would be having the basic needed agricultural knowledge. The curriculum should ensure that the land reform is sustainable in terms of both productivity and intergenerational continuity. Most farmers in developing countries as also observed in the current study only have access to primary education. This, therefore, implies that agricultural education in primary curricula should be of high quality, simple and clear as well as to make careers in farming and related branches of agriculture more striking. This can only be made possible by fine-tuning the way agriculture is presented to students at primary level.

Most resettled farmers are old aged, this implies that there should be educational policies and learning models aimed at this age group. The policies should include agricultural short courses aimed at equipping farmers with the basic farming techniques using various forms of learning aids such as visual aids, pictures and practical work. As most of these farmers only have primary education, informal learning techniques may yield positive results. The agriculture department in partnership with other non-governmental organisations should play a role in the convening of the workshops and training to farmers. Research institutions and institutions of higher learning such as colleges and universities should also play a role by providing recent information pertaining the agricultural sector and field work that are aimed at improving farmers' knowledge base. Focus should be given to efficient resource utilisation. Funders of agricultural research should give first priority to research that benefit the resettled farmers. The agricultural department should also implement programmes such as field days, Master Farmer courses, and give awards to best farmers. This assists in transferring knowledge amongst farmers and also motivates the farmers. These programmes will create the conditions under which farmers, extension staff and researchers can learn from one another.

The agricultural extension service of Zimbabwe faces serious constraints of staffing and facilities as well as access to recent technological developments as observed during the pre-survey. The government should partner with the non-governmental organisations in providing resources such as travelling allowances, rural allowances and performance based bonuses in order to improve the productivity of the extension officers. The performance bonuses should be designed in such a way that they match the productivity of the extension officer as reflected by the output per farmer. Newly resettled farm areas are characterized by poor road network and communication systems. In this regard, there is need to provide extension officers with motorbikes so that they can be able to access all the areas with little difficulty. There is need to improve communication technology by providing resources such as mobile technology in order to increase farmer–extension officer interaction and internet access to extension officers which links them with recent agricultural developments from researchers and other key players in the agricultural sector such as marketing boards and other service providers.

Extension services should increasingly be provided through performance-based contractual arrangements, rather than by civil servants. Potential extension service providers may include combinations of private sector, NGOs, farmers' associations, universities, or any other entities with the capacity to provide extension services. In allowing for a variety of providers, such provisions take advantage of a broad array of now available field expertise. They contribute to developing the private sector in rural areas. Extension services provided by the private sector are classically more efficient and responsible for their performance and outcomes. They also allow more flexibility, promoting staff members who do well and sacking those who do not. Moving towards more participatory agricultural extension will allow greater responsiveness to farmers' desires and facilitate learning how they could upsurge their own productivity, increase their incomes, join forces effectively with one another (and with partners in agri-business and agricultural research) in addressing their different and collective teething problems, and become aggressively involved with main participants in determining the process and guidelines of innovation, including technology generation and adoption. Thus, while the underlying motivation is growth, extension also contributes to empowerment (helping farmers to help themselves) through the generation of human and institutional capital.

Most of the land reform beneficiaries lack capacity to produce because of lack of capital and equipment. Therefore, selection and allocation of land should be based on asset ownership especially for those that apply for large farms. For those without resources, they must be given small pieces of land which they can utilise using the minimum resources they have such as family labour. Size of land allocated to small farm beneficiaries should be based on household size. There is need to come up with models to calculate the accurate labour productivity ratios such that the size of land allocated to each farmer is proportional to the number of labours, which in rural Mashonaland central is a function of family size as most of the farmers in this category do not have the resource to hire labour.

The regulation guiding the land allocation should be flexible. For example, fragmentation is prohibited by the act; this means even if a farmer cannot maximize land use, the farmer cannot transfer property rights to the next farmer or at least to lease out land. Thus, regulation should ensure that land is transferred between incapable and capable farmers without difficulty. To speed the process, the government should improvise ways to ease the barriers to land fragmentation or even at least land leasing. This will in turn promote high land use intensity as well as efficiency in production.

Low allocative efficiency scores obtained for the resettled farmers may be due to exorbitant prices they pay for their inputs and lower prices they get form their produce. The resettled farmers could get better prices for their produce if they can attract large number of buyers in their communities. If many buyers are attracted they will end up bidding the prices hence this will result in the farmers getting more returns from their produce. The other alternative way farmers could get better returns from their produce is by adding value to their produce, for instance processing maize into maize meal. The returns that a farmer gets from selling unprocessed produce is far much lower than the capital that the farmer gets from selling processed produce. If the government promote rural development through bringing services as well as attracting investors in rural areas, this will in turn improve the infrastructure in rural areas such as road networks. Townships will develop fast and this in turn lowers higher transactional costs faced by the newly resettled farmers. These townships will benefit the local communities through employment creation and improved access to inputs and agricultural markets to the land reform beneficiaries. The other way to speed the development of townships could be through the provision of loans to people who like and have the capability of doing business in remote areas and also provision of free land by local municipalities to set up businesses.

Large farms were found to be more efficient than small farms and this according to literature may be due to economies of scale. Policy makers should encourage small land holders to form farmer groups. The bargaining power that a farmer can receive in a small group is obviously less than that from a larger group. By aggregating into larger associations such as inter-group associations, small farmers have the potential to achieve even greater economies of scale in accessing services, information, infrastructure and markets. As far as transporting their products and inputs is concerned, costs can be easily cut if these groups use the same transport. By transporting in bulk they stand a better chance of getting good discounts from transport firms as compared to transporting as individuals and in small quantities. By pooling resources to invest in transport or processing operations, land reform beneficiaries can become more active participants in the agricultural systems in Zimbabwe. Most land reform beneficiaries cannot afford to hire large equipment such as combine harvesters and tractors individually as they incur more transactional costs; therefore they incur low costs when they hire the equipment collectively. As a group, farmers have got bargaining power when buying inputs or selling their produce.

10.5 Areas for further research

It is recommended that a bigger study should be done in all the provinces of Zimbabwe for all enterprises and sectors of agriculture; in this case most of the major causes of inefficiencies among the beneficiaries of land reform in Zimbabwe would come out strongly. However, the results from this study are a guide to the bigger picture of what is on the ground. In addition, there is also need to do such a study not only among the resettled farmers, white commercial farmers as well as communal farmers should also be included in the sample. In the model to determine sources of inefficiency, natural and environmental factors such as amount of rainfall received, soil quality rather than type and so on should also be inputted in the model as independent variables. Results of the model drawn from a large survey covering different agro-ecological zone and the comparison of the results across various zones and crops over a number of years can further improve the predictive power of the model. Determination of efficiency scores across different crops would help in advising farmers to specialize in the production of crops that they are more efficient in producing hence farmers benefiting from their competitive advantage.

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APPENDIX 1

QUESTIONNAIRRE

EFFICIENCY OF RESETTLED FARMERS IN THE PRODUCTION OF FIELD CROPS:

A COMPARATIVE ANALYSIS OF ZIMBABWE AND SOUTH AFRICA

All information provided by interviewee will be treated as STRICTLY CONFIDENTIAL for mutual benefit of both the researcher and the respondents.

Questionnaire number…………………… Ward number……………………………

Enumerator name……………….…....... District name...…………………….............

Name of respondent…………………….. Type of land reform………………….........

Date.. Name of Community/Farm.........................

A. HOUSEHOLD DEMOGRAPHIC INFORMATION				
Head of household				
A1. Sex	Male			
	Female			
A2. Marital status	Married	Single	Divorced	Widowed
A3. Age of head of household (nearest year)				
A4. Highest level of education				
A5. What is your principal occupation?				

A6. What is your religion?	Christianity	Traditional	Muslim	Other (specify)

A7. What is the size of your household?	Less than 15yrs	15-64	Older than 64 yrs

A8. Are you a full time farmer?	Yes	No
A9. When did you start farming (year)?		

A10. What are your sources of income? (Rank 1 as the most important source)			
	Source	Amount raised per year	Rank
	Crops		
	Livestock		
	Salary/wages		
	Pension		
	Other (specify)		

B. LAND OWNERSHIP AND USE			
B1. How much land do you own (ha)?			
B2. When did you get the land?			
B3. Do you have title deeds for the land that you own?	Yes	No	
B4. How much land is arable (ha)?			
B5. How much arable land did you use last season (ha)?			
B6. Looking at your field, do you consider it to be:	Too small	Of the right size	Too big
7. Do you B7. Do you need more land for farming?	Yes	No	
B8. If Yes, what do you need the land for?	Grazing		
	Cultivation of food crops		
	Cultivation of cash crops		
	Garden (vegetables)		
	Orchard (Fruits)		
	Residential		
	Other (Specify)		
B9. Where is this land that you need?	State land (Chief)		
	Mission land		
	Commercial farms		
	Municipality/ Council		
	Relatives		
	Other (Specify)		
B10. How much arable land did you lease last season (ha)?	In		
	Out		
B11. In your area how much does it cost to rent 1 ha of arable land?(US$)			
B12. How much land is used for grazing (ha)?			
B13. Is grazing communal?	Yes	No	

B14. What crops did you grow last season? (Rank 1 as the most important crop)				
Crop	Rank	Area (ha)	What did you use to plough this land? (State hectares)	Purpose of production

			Tractor	Draught	Zero tillage	Consumption	Sale

B15. What is the cost of ploughing 1 ha of land using a tractor in your area?	US$
B16. What is the cost of ploughing 1 ha of land using draught power?	US$

B17. What type of livestock species do you keep? (Rank 1 as the most important specie)

	Class	Cattle	Goats	Sheep	Chickens	Pigs	Other (specify)
	Number						
	Rank						

C. OUTPUTS AND PRICES OF CROPS

NOTE: Specify units for quantity and price per unit

Crop	Quantity	Price/Unit (US$)	Total Value (US$)
Maize			
Sorghum			
Millet			
Potatoes			
Wheat			
Sunflower			
Soya-beans			
Dry/Sugar beans			
Round-nuts			
Ground-nuts			
Tobacco			
Cotton			

D. INPUTS												
D1 LABOUR (FL-family labour; HL- hired labour)												
D1.1 For each of the following farming activities, how many people did the job?												
Crop	Planting		Weeding		Fertilising		Spraying		Harvesting		Other	
	FL	HL	FL	HL	FL	HL	FL	HL	FL	HL	FL	HL
D1.2. For each of the following activities how much time on average does an individual spent? (hrs per day and number of days for the whole season in brackets e.g. 2hrs per day, 10 day per season as 2 (10)												
Crop	Planting		Weeding		Fertilising		Spraying		Harvesting		Other	
	FL	HL	FL	HL	FL	HL	FL	HL	FL	HL	FL	HL
D1.3 What is the hourly cost of hired labour in your area for the following Agricultural Activities?(US$ per person)												

Crop	Planting	Weeding	Fertilising	Spraying	Harvesting	Other

D2SEED

D2.1 What is the cost and quantity of the seed that you used last season?

(If you use your own seed please give the market value)

Crop	Quantity	Unit Cost

D3 FERTILISER

D3.1. What is the unit cost and quantity of fertiliser that you used last season?

(If you use your own/donated fertiliser please give the market value) (specify name and quantity on the quantity column)

Crop	Fertiliser 1 (e.g. Compound D)		Fertiliser (2) (e.g. AN/LAN)		Fertiliser 3 (e.g. AN/LAN)	
	Basal		Top dressing		Top dressing	
	Quantity	Cost (US$)	Quantity	Cost (US$)	Quantity	Cost (US$)

D4 PESTCIDES

D4.1 What is the quantity and unit cost of pesticides that you used last season?

(If you use your own/donated pesticides please give the market value) (specify name and quantity on the quantity column)

Crop	Pesticide 1		Pesticide (2)		Pesticide 3	
	Quantity	Cost	Quantity	Cost	Quantity	Cost

D5 HERBICIDES

D5.1 What is the quantity and unit cost of herbicides that you used last season?
(If you use your own/donated herbicides please give the market value) (specify name and quantity on the quantity column)

Crop	Herbicide 1		Herbicide (2)		Herbicide 3	
	Quantity	Cost	Quantity	Cost	Quantity	Cost

D6 MACHINE AND EQUIPMENT HIRE AND USE

D6.1 What is the total cost of the machine that you hire/used during the following production processes?

Crop	Planting	Weeding	Fertilising	Spraying	Harvesting	Other

D7 OTHER COST INCURED LAST FARMING SEASON

D7.1 What other variable costs did you incur last seasons?

Crop	Cost 1 (US$)		Cost 2 (US$)		Cost 3 (US$)	
	Description	Cost	Description	Cost	Description	Cost

E. SUPPORT SERVICES			
E1. Are you aware of advisory services or extension or government support institutions in your region/area?		Yes	No
E2. Where do you obtain advice for crop and livestock production?			
	None received		
	Neighbours		
	Extension officers		
	Sales representatives (Input and output markets)		
	Other: specify		
E3. How often do extension officers visit your farm in a month?			
E4. What is your opinion on the quality of service provided by extension officers who visit you?			
	Very poor		
	Poor		
	Satisfactory		
	Very good		
	Excellent		
E5. Do you belong to one or more farmers' organisations?		Yes	No
E6. If yes, state which ones?	Name	Purpose	
E7. Have you ever needed to borrow money for farming?		Yes	No
E8. If yes, why did you borrow the money?			
	To purchase inputs		
	To purchase farm implements		
	Other (specify)		

E9. Where did you borrow the money from?		
	Friends	
	Relatives	
	Commercial Bank	
	Money lenders	
	Input suppliers	
	Product buyers	
	Government	
	Other (Specify)	

E10. Where do you market your crops? (state distance)

Crop	MZ	SO	MI	PT	WH	SF	SB	DB	GN	RN	TO	CO
1. Neighbors												
2. Local shops												
3. Marketing boards												
4. Nearest town												
5. Other: specify												

E11. Mode of transport used to transport crops to the market

	MZ	SO	MI	PT	WH	SF	SB	DB	GN	RN	TO	CO
1. Neighbors												
2. Local shops												
3. Marketing boards												
4. Nearest town												
5. Other: specify												

FIELD CROPS Maize MZ Sorghum SO Millet MI Potatoes PT Wheat WH Sunflower SF Soya-beans SB Dry/Sugar beans DB Ground-nuts GN Round-nuts RN Tobacco TO Cotton CO

MODE OF TRANSPORT No transport NT Foot FT Bus/Taxi BT Hired Truck HT Own Truck OT Own Cart OC Hired Cart HC

E12. Do you have any problems with getting your produce sold?	Yes	No
E13. If yes, state the problems you have		
E14. Do you market your produce as a group?	Yes	No
E15. Please state the reasons for your answer to question E13.		

F. PERCERPTION ON LAND REFORM		
F1. How much land were you allocated?		
F2. Under which model?		
F3.What criterion was used?		
F4.How did you apply?		
F5. How much land is arable?		
F6. Are you satisfied with the land that you were allocated?	Yes	No
F7. If no, state reasons	Soil fertility	
	Poor access to transport	
	Poor communication network	
	Size	
	Low rainfall area	
	Other (specify)	
F8. What is the inheritance rule of the land that you were allocated?		
F9. Are you allowed to subdivide the land that you were allocated?	Yes	No
F10.What did you do with the land that you lived on before you were allocated land?		
F11. Do you believe that land reform is inevitable	Yes	No
F12. How do you think the government should acquire the land from white/commercial farmers?		
	Willing buyer willing seller	
	Compulsory acquisition	
	Using both methods	
	Other (specify	

F13. What is your opinion on compensation to land acquired?	None	
	Compensation for infrastructural developments only	
	Full compensation	
	Other: specify	
F14. Who should be resettled?	Best Farmers	
	People from heavily congested areas	
	Anyone who needs land	
	Youths	
	Graduates from agricultural colleges	
	Women	
	Other (Specify)	
F15. Compared to the years before you were resettled, has your agricultural production		
	Deteriorated	
	Remained the same	
	Improved	

F16. Which agricultural enterprise has changed after land reform?

	Deteriorated	Improved
Cash crops		
Cereal crops		
Vegetables		
Livestock		
Vegetables		

F17. Compared to the years before you were resettled, has the quality of life of your household		
	Deteriorated	
	Remained the same	
	Improved	

F18. Do you think land reform improved your access to credit	Yes	No
F19. Do you think the soils of your new farms are more fertile than the ones in former home areas	Yes	No
F20. Do you produce enough to feed your family for the whole year?	Yes	No

F21. If no, why are you unable to produce enough food?		
	Land is too small	
	Soil is too poor	
	Labour is too scarce	
	Drought	
	Other (Specify)	

F22. What do you think have to be done, to increase your output?

F23. Which cost cutting strategies can be adopted at your farm?

F24. Which soils are there on your farm?					
	Clay	Silt	Sandy Loam	Clay loam	Sand

G. COMMENTS

Thank you

APPENDIX 2

Published papers

Musemwa, L and Mushunje, A. 2011. Agrarian and life style change in Zimbabwe: From colonization to the formation of government of national unity. African Journal of Agricultural Research 6 (21) : 4824- 4832.

Musemwa, L and Mushunje, A. 2012. Factors affecting yields of field crops and land utilisation amongst land reform beneficiaries of Mashonaland Central Province in Zimbabwe. Journal of Development and Agricultural Economics 4(4): 109-118, 26