Agricultural Expenditure for Economic Growth and Poverty Reduction in Zimbabwe

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ABSTRACT

A vibrant and an efficient agricultural sector would enable a country to feed its growing population, generate employment, earn foreign exchange and provide raw materials for industries. The agricultural sector has a multiplier effect on any nation's socio-economic and industrial fabric because of the multifunctional nature of agriculture.

The main objective of this study was to investigate how government expenditure on agriculture has affected economic growth in Zimbabwe from 1980-2009. The Log linear growth regression model was employed where gross domestic gross was the dependant variable and the explanatory variables are the factors which affect it which include government agricultural expenditure. The expenditures of government on agriculture were divided into three functions namely extension, credit assistance and R & D.

The regression analyses were performed using Econometric-views 7 (E-views 7) statistical package. Regression was carried out on time series data for the period 1980 to 2009. The data was tested for stationarity and for autocorrelation. Problems of non stationarity of data were corrected by integrating the trending series. Results from the empirical analysis provide strong evidence indicating that agriculture is an engine of economic growth. The results from this study suggest that spending more on agricultural research and development can improve economic growth and ultimately reduce poverty. However, it can also be concluded that insufficient government agricultural expenditure on extension and credit assistance adversely affected economic growth in Zimbabwe, based on the results of the study.

Global experience with pro-poor growth and empirical work spanning India, Benin and Malawi demonstrates the importance of agricultural expenditure for poverty reduction in poor rural areas, while also pointing to the need for complementary non farm sector growth. This study also proposes a simple methodology to estimate the agricultural spending that will be required to achieve the Millennium Development Goal of halving poverty by 2015 (MDG1) in Zimbabwe. This method uses growth poverty and growth expenditure elasticities to estimate the financial resources required to meet the MDG1. The study attempts to address a key knowledge gap by improving estimation of first MDG agricultural expenditure at country level.

Keywords: government expenditure on agriculture, economic growth, poverty, Millennium Development Goals, Zimbabwe

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DECLARATION

I, Alexander Mapfumo do hereby declare that the work contained in this thesis is entirely my own work with the exception of such quotations or references which have been attributed to their authors or sources and that l have not previously submitted it at any university for a degree.

Signature ....

Date April 2012

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ADF	Augmented Dickey-Fuller test
AFC	Agricultural Finance Corporation
AGRITEX	Agricultural, Technical and Extension Service
CSC	Cold Storage Commission
CSO	Central Statistics Offices
DF	Dickey-Fuller test
DW	Durbin-Watson test statistic
FTLRP	Fast Track Land Reform Programme
GDP	Gross Domestic Product
GMB	Grain Marketing Board
GOZ	Government of Zimbabwe
MDG	Millennium Development Goals
MOA	Ministry of Agriculture
MOF	Ministry of Finance
OLS	Ordinary Least Squares
PIB	Pig Industry Board
RBZ	Reserve Bank of Zimbabwe
R&D	Research & Development
SARPN	Southern African Regional Poverty Network
STERP	Short Term Economic Recovery Programme
TMB	Tobacco Marketing Board

CHAPTER 1: INTRODUCTION

1.0 Introduction

The relationship between agriculture and economic growth has being re-examined in the literature, in recent years. Economic growth is fundamental for sustainable development and poverty reduction (Kalakech, 2009). It is enhanced by strengthening the agricultural sector, encouragement of investments, expansion of infrastructure, improvement of education and health services and environmental restoration (Kalakech, 2009). While economic growth may not always lead to poverty reduction, many studies continue to establish that agricultural growth leads to a significant reduction in poverty (Kakwani, 1993; Ravallion & Datt, 1996; Soloaga, 2006; Thorbecke & Jung, 1996).

The study by Diao & Dorosh (2007) revealed that from the 1960s through the 1980s, agriculture was generally recognised as having a central role in world economies. However by the 1990s, interest in agriculture started to deteriorate, with adverse consequences for many African countries which started to face recurrent food crises, economic stagnation and persistent poverty (Hazell, 2005). After 2000, agriculture started to play a major role in the agenda for Africa, though there remains considerable doubt in the international development community about whether it can successfully generate enough growth to reduce poverty (Collier, 2005, Ellis, 2005, Maxwell & Slater, 2003).

Agriculture is the largest sector in terms of its share in GDP and employment for many developing countries (Fan and Saurkar, 2006). More importantly, the majority of the world's poor live in rural areas and depend on agriculture for their livelihood. Agriculture is therefore critical for economic development. In developing countries, spending on agriculture has been seen as one of the most important government instruments for promoting economic growth and poverty reduction (Fan and Saurkar, 2006). In Africa, average government expenditure on agriculture has been increasing gradually at an annual rate of 2.5 percent from 1980-2002 (Fan and Saurkar, 2006).

The main development challenge facing the world is poverty and agricultural growth is seen as the best strategy for poverty reduction (Bird & Prowse, 2008). Furthermore, agriculture is central to the livelihood of most people that live in rural areas whose population accounts for more than half of the world's population. Consequently, according to a report by DFID

(2003), it is estimated that a 1 percent increase in agricultural productivity reduces the percentage of poor people living on less than one dollar a day by between 0.6 and 2 percent and no other economic activity generates the same benefits for the poor.

The Green Revolution in Asia, particularly in India and China demonstrated the importance of the agricultural sector in reducing poverty and serving as an engine for growth. Recent evidence from the International Food Policy Research Institute (IFPRI) showed that promoting agricultural growth may reduce poverty, promote overall economic growth and achieving the first Millennium Development Goal of halving the number of poor people by 2015 in developing countries (Diao *et al*, 2007).

World Bank report (2004) reiterated that poverty has fallen rapidly over the past 40 years, but at different rates around the world. Asia has achieved the highest poverty reduction, particularly China, India and South East Asia (World Bank, 2004). However, little if any progress was made in sub-Saharan Africa, where the number of people living on less than one dollar a day has doubled since 1980 (World Bank, 2004).

Zimbabwe obtained independence in 1980 and inherited an economy that had a more developed manufacturing and commercial agricultural sectors that were highly regulated (Muchapondwa, 2009). The agricultural structure inherited at independence was highly dualistic. Settler farmers dominated most marketed crops with little contribution in the agriculture market by small-scale farming sector.

After independence in 1980, Zimbabwe had impressive progress in reducing poverty as reflected by the reduction of extreme poverty rates from 32 percent in 1980 to around 26 per cent in 1991 due to increase in agricultural support services such as research, extension, credit and marketing on the part of the smallholder farmers (Bird & Prowse, 2008). However this was reversed to the extent that by 2003, some 72 per cent of the population lived below the national poverty line and the living conditions of the population became some of the worst in Africa (Bird & Prowse, 2008).

Several studies have been carried out on the role of government spending in the long-term growth of national economies (Aschauer 1989, Barro 1990, Tanzi & Zee 1997). These studies establish conflicting results about the effects of government spending on economic growth. Many studies also attempted to link government spending to agricultural growth and poverty reduction (Fan *et al*, 2004 & Lopez 2005). A significant number of these studies found that government spending contributed to agricultural production growth and poverty reduction, but different types of spending may have differential effects on growth and poverty reduction (Fan *et al*, 2004 & Lopez 2005).

The potential contribution of agriculture to economic growth and poverty reduction has been a greatly debated subject among development economists. Much of the early work on this issue revolves around the debate on the role of agriculture in promoting economic development in less developed countries in the aftermath of extended periods of colonial rule (Lewis, 1954, Fei & Ranis, 1961; Jorgenson, 1961; Johnston & Mellor, 1961; Schultz, 1964).

1.1 Background information

Agriculture features prominently in the Zimbabwe economy, accounting for about 15 to 20 percent of GDP in Zimbabwe where a majority of the country's population are engaged in this sector (WFP, 2009). It generates a large proportion of foreign exchange earnings, although the share of agricultural exports in the country's total exports declined from 39 percent in 2001 to 14 percent in 2006 (WFP, 2009).

Agriculture provides raw materials for the industrial sector whose growth is closely dependent on expanding agricultural sector. According to Muchapondwa (2009), the agricultural sector is still of great importance to Zimbabwe and any hopes of reviving the economy will necessarily have to include strategies focused on the agricultural sector.

Rukuni, Eicher & Blackie (2006) also reiterated that Zimbabwe's economy has been dominated by agriculture which contributed 15-20% to Gross National Product in most years. It also provides income to over 75% of the population and 95% of all food and beverages have been produced locally. The sector also accounted for 30% of formal employment and more than 40% of total national exports (Rukuni, Eicher & Blackie, 2006).

By 2000, poverty in Zimbabwe was on the rise from as low as 26 per cent in 1991 (the proportion of households living below the extreme poverty line) rose to 35 per cent by 1995, before a dramatic rise to 63 per cent by 2003 (Central Statistical Office, 2003). The Human Poverty Index by UNDP, (2008) was at 17 per cent in 1990, an impressively low figure by

African standards but by 2006 it was estimated to have more than doubled to 40.9 per cent. Similarly the country has been sliding down the UN's Human Development Index ranking from a respectable 52 in 1990, to 108 in 1992, 129 in 1997 and by 2005 it was ranked at 155 of 177 countries (UNDP, 2008).

1.2 Economic growth and agriculture

Economic growth is the positive trend in the nation's total real output or Gross Domestic Product (GDP) sustained over a long period of time (Lipsey & Crystal, 1999). Investment in agriculture has a multiplier effect on the economy. Generally, agricultural growth reduces poverty and is at least twice in reducing poverty than economic growth originating from other sectors of the economy (World Bank, 2008).

Gollin *et al,* (2002) show the importance of agriculture in the early stages of development. Using both cross section and panel data for 62 developing countries for the period 1960 to 1990, the authors found that growth in agricultural productivity is quantitatively important in explaining growth in GDP per worker. This direct contribution accounts for 54 percent of GDP growth. The research showed that agriculture explains more than half of GDP growth between 1960 and 1990.

According to Sherman (1960), in less developed countries, agriculture's contribution to the development of a self generating economy becomes evident if we consider present conditions. Many of these countries are over-populated, at least in relation to the resources that are now developed. With 50 to 80 per cent of the total population depending upon agriculture for a livelihood in less developed nations, it is necessary that more resources be channelled towards the sector to enhance economic performance (World Bank, 2009).

1.3 Contribution of agriculture to economic growth

According to Sherman (1960), improvements in the agricultural sector only may not generate sufficient momentum to raise the entire economy to a higher and self-generating level of production, but it can become the leader in economic growth. Consequently, improvements in economic performance can be initiated by developments in agriculture. Productive labour intensive employment for rapid expansion of farm production can be provided in the early stages of the take off period of development as explained by Rostow (1960). Furthermore, Rostow (1960) stressed that an increase in agricultural productivity is an essential condition for takeoff and development.

In developing countries, an increase in agricultural productivity will mean more adequate food supplies, and use of scarce foreign exchange for other imports (Sherman, 1960). Moreover, in food-surplus countries, more foreign exchange will be available for development to non agricultural sectors of the economy. Eventually, other sectors of the economy would achieve sufficient momentum to provide employment for many of the under employed workers in agriculture. As explained by Sherman (1960), the improvements in agriculture will have gathered sufficient momentum to continue their upward trend by this time and purchases by farm people for production and for better living will provide a growing market for other sectors. In this way simultaneous development in agriculture and in other sectors will result in rapid, self-generating economic growth and will also lead to poverty reduction (Sherman, 1960).

1.4 Poverty Definitions

According to Sen (1999), poverty in its most general sense is the lack of necessities. Examples of necessities are, basic food, shelter, health, and safety based on shared values of human dignity. Needs may be relative to what is possible and are based on social definition and past experience (Sen, 1999). Valentine (1968) explained that poverty is mainly shown by the inequalities which exist in the economy. In other words the basic meaning of poverty is relative deprivation. A social definition of poverty allows community flexibility in addressing pressing local issues, while objective definitions allow tracking progress and comparing one area to another or one country to another.

A broad view of poverty is to take it as multi dimensional deprivation, referring not merely to income and/or consumption levels but also to people's access to public services and to productive assets (including skills and education). However, in practice virtually all reliable information available at national level relates to incomes and/or consumption levels. Consequently, the most common definition of poverty is the statistical measure established by the government as the annual income needed for a family to survive by the use of the poverty datum line. The assessment of the poverty line is based on a combination of consumption and income, with income being defined in cash and kind (CSO, 2003). The poverty line is based on the expenditure necessary to buy a minimum standard of nutrition and other necessities (World Bank, 1990).

Consumption based poverty lines are directed to physical measures of relative well being. The inability to attain minimal standards of consumption to satisfy basic physiological needs is often termed as absolute poverty or deprivation. It is most directly expressed in not having enough to eat (hunger or malnutrition) to which other indicators can be added (World Bank, 2009). Although it is more common for poverty studies to choose per capita consumption as a measure of individual welfare (Deaton 1980), there is little difference between income and consumption as such a high fraction of household total income is made up of the consumption of own-produced goods and the consumption of own collected environmental goods, which appear in both income and consumption accounts. For this study, poverty is defined as the statistical measure established by the government as the annual income needed for a family to survive by the use of the poverty datum line.

1.5 Overview of Poverty in Zimbabwe

After independence, the percentage of the population classified as poor has been increasing. The study by Chimhowu & Woodhouse, (2008) showed that about 72 per cent of the population were already living below poverty line by 2003 and current monitoring reports suggest the country will be one of several African countries that may fail to meet the crucial Millennium Development Goal (MDG), dealing with poverty. A look at the Human Poverty Index (HPI) trends clearly shows the impact of the decade long crisis. From an impressive HPI of 17 per cent in 2000 available data suggest a more than doubling in poverty rates to 40.9 per cent by 2006.

Two major surveys (Income, Consumption and Expenditure Survey and Poverty Assessment Study Surveys) conducted in 1995 showed the proportion of the population classed as poor to be in excess of 60% in Zimbabwe (DFID 1999). However, the absolute figures for those in poverty are crucially dependent on the poverty line chosen. Using the poverty line adopted by the International Development Targets, that is the number of people with incomes under US$1 per day, (DFID 1999) estimate that there were around five million poor people in Zimbabwe which was around 40% of the total population. Given this scenario, it is therefore imperative to determine the expenditure options between agricultural and non agricultural expenditure necessary to meet the first MDG goal, which is to half poverty by half by 2015.

1.6 Role of government on economic growth

Gwartney, Lawson and Holcombe (1998) postulated that government's activities can improve economic efficiency and thereby improve economic growth. Gwartney, Lawson and Holcombe (1998) argued that some government spending will always be desirable in order to promote economic growth and obtain a stable society.

However government activities can also have a negative effect on economic productivity as they grow more and more due to the law of diminishing returns (Gallaway and Vedder, 1998). Further expansion of government activities will have negative impact on the economy. For instance, higher taxes or further borrowing that is required to finance growing government expenditures will negatively affect economic growth. This is because incentives for households to invest take risks and find jobs will decrease as the government takes more and more of their earnings. Moreover borrowing can negatively affect private investment since the government crowds out the private sector. This is because the government would have received funds that could have been invested by the private sector. There is also a possibility that these will raise taxes because the government now has higher interest payments (Gallaway and Vedder, 1998).

1.7 The Zimbabwe agricultural sector

1.7.1 Agriculture before 1980

Arrangements were made to channel more expenditure to white farmers while small scale farmers were excluded**.** These land and resource allocation arrangements were first established under the Land Apportionment Act of 1930, and were furthered by the Land Tenure Act of 1969 (Vudzijena, 1998). During the world depression of the 1930s, large scale farmers were assisted with subsidies meant to support white farmers but small scale farmers (mainly blacks) were excluded from these initiatives (World Bank Report, 1998). Marketing

Boards, which included the Grain Marketing Board (GMB), Tobacco Marketing Board (TMB), Cold Storage Commission (CSC) and Pig Industry Board (PIB), were created but smallholder farmers did not have access to them. For example, small holders did not fall under the jurisdiction of the Maize Control Board (MCB) and they sold their surplus on local markets. According to a study by Manzungu (1999) large scale (white) farmers got prices 40% higher than the small scale (black) farmers.

The need for ensuring food security in the rural areas necessitated a move towards agricultural development of these areas. Training centres were set up to train blacks in better agricultural practices, for example, the Chinamora Industrial Farm (Manzungu, 1999). However, the training did not change the agricultural fortunes of blacks because of limited access to land and other complementary resources (Manzungu, 1999).

Prior to 1980, the large-scale commercial farmers received the lion's share of credit from the government parastatal, Agricultural Finance Corporation (AFC), that is more than 98 percent of credits loaned out (Zimbabwe Government, 1991). Before independence, except for some efforts by local NGOs, the provision of rural finance was non-existent. The smallholder farmer never enjoyed privileges such as tax shelters and credit subsidies, general bailouts and blanket debtor relief that were accorded to large-scale commercial farmers (Rukuni, 1994a).

Smallholders did not benefit much from agricultural research projects. There were two extension services, one for commercial farmers and one for smallholder farmers. A very small number of communal farmers benefited but the ratio of extension officers to small scale communal farmers of 1:1000 was extremely high (Rukuni 1994b).

1.7.2 Agriculture and Economic growth (1980-2000)

After independence in 1980, priority was given to smallholder agriculture sector as a means to achieve economic development (Manzungu, 1999). Moreover these priorities in agricultural finance were changed to include the small-scale farmers. The growth with equity programme (1980-1990) was designed to redress the colonial legacy in favour of communal farmers. The two main features of agriculture at independence in 1980, were the duality of agriculture and the high degree of government intervention in the sector intended to stimulate production.

After independence in 1980, agricultural policy was directed to reducing inequality and to supporting smallholders to reduce poverty (FAO, 2003). The Agricultural Finance Corporation (AFC), which previously provided credit only to large scale commercial farmers, started expanding smallholder credit which was partly responsible for the 45 percent increase in fertilizer purchased by these farmers between 1981 and 1985 (Rukuni, 1994a). The supply response by smallholders was dramatic, and they became the largest suppliers of maize and cotton to formal markets within the first five years (1980-1985) of independence as shown on Table 1.1 (FAO, 2003). The focus on stimulating and supporting smallholder agriculture was also seen as a means towards achieving food self-sufficiency and food security among communal farmers (FAO, 2003).

According to Stanning, (1987), the government's post-independence emphasis on the smallholder sector has done much to redress the imbalance in access to agricultural support services such as research, extension, credit and marketing on the part of the smallholder farmers. This in turn has improved their ability to respond to price incentives.

Table 1.1: Selected Government Expenditure Allocations Relevant to Agriculture and Production 1981/2 – 1985/6 (Z$M)

	1981/2	1982/3	1983/4	1984/5	1985/6
Total Government Expenditure on Agriculture	99.6	153.8	221.4	225.4	319.7
Expenditure on Agriculture as Proportion of Total Recurrent Government Expenditure	3.4%	5.0%	6.5%	5.8%	7.0%
Maize production (tonnes) by smallholders	600 000	595 000	285 000	670 000	1558 000
Cotton production (tonnes) by smallholders	12 000	27 000	32 000	70 000	110 000

Source: Government of Zimbabwe, 1986

With the advent of Economic Structural Adjustment Programme (ESAP) in 1990, trade barriers, price controls, subsidies and production quotas were removed (Manzungu, 1999). In the mid-1990s, the government anticipated ESAP would transform the nation's small-scale, subsistence agriculture into widespread commercial farming and generate annual agricultural growth greater than the rate of population growth. Its aim was to develop the necessary physical and social infrastructure in rural areas, but little of this happened. With budget allocations for rural infrastructure and other capital projects down, farmers lacked the roads and adequate transport systems, as well as the processing, storage and distribution systems, they required in order to be competitive (Saprin, 1999).

The economic structural adjustment programme had two important features: trade liberalization and reduction of government expenditure (Chakaodza, 1993), but it reversed most of the social advances that had been made (Manzungu, 1999). It also affected the productive sector, which was opened to competition. Smallholder agriculture suffered because of the withdrawal of essential support such as credit and state subsidized markets (Manzungu, 1999).

1.7.3 Agriculture in Zimbabwe (2000-2009)

The Fast Track Land Reform Programme (FTLRP) was officially launched in July 2000 culminating in extensive land transfers to local black farmers (Moyo, 2001). The main objectives of the FTLRP are to speed up the identification of not less than five million hectares of land for compulsory acquisition for resettlement, to accelerate the planning and demarcation of acquired land and settler emplacement on land, and to provide limited basic infrastructure and farmer support services (Moyo, 2006). Compulsory acquisition was largely to be made from white commercial farmers, private companies, and absentee landlords. According to Moyo (2006), FTLRP beneficiaries have been issued many different types of temporary licenses which the government intends to convert, in time, to permanent leases. This uncertainty regarding tenure arrangements within the FTLRP has been a source of tenure insecurity among FTLRP beneficiaries (Zikhali, 2008).

Under the FTLRP, the four main commercial field crops—wheat, tobacco, soybeans, and sunflowers—have experienced reduced area plantings and output levels due to low uptake and poor use of land (Moyo 2004). The main crops which are produced by smallholder farmers (maize, small grains, groundnuts, and cotton) have also shown reduced output despite the marginal increase in area planted (FAO, 2006). In communal areas, maize yields halved from approximately 1.3 million tonnes per hectare in 1986 to approximately 0.8 tons per hectare in 2004 (FAO, 2006).

According to Zumbika (2000), the government created the Agricultural Development Assurance Fund (ADAF) as a fund specifically meant for extending loans to smallholder farmers by so doing filling the gap which was left by Agricultural Finance Corporation (AFC). In a bid to reinforce existing support measures in the agricultural sector, the Reserve Bank enhanced its funding activities under the Agricultural Sector Productivity Enhancement Facility (ASPEF). This was geared at ensuring a full support system of the farm mechanisation programme. A cumulative amount of Z$62.215 trillion had been disbursed to 25 477 applicants by 4 January 2008 since 2004 (RBZ, 2008).

The Mechanisation Programme has benefited farmers in both the commercial and communal sectors. The Government, through the RBZ, which took into cognisance the high cost of acquiring machinery on individual farmer basis, took it upon itself to revolutionalise farming by providing the machinery to farmers. The equipment procured includes combine harvesters, tractors, harrows, ploughs, planters and other animal drawn farm implements. As at 4 January 2008, a total of 646 tractors and 28 combine harvesters had been delivered to beneficiaries (RBZ, 2008).

1.8 Problem Statement

The high pay-off input model (Eicher and Staatz, 1984) envisaged that more inputs invested in agriculture will be accompanied by higher output, that is higher expenditure in agriculture will be expected to result in higher contribution of the agricultural sector to economic growth and poverty reduction. However, in Zimbabwe, higher expenditure in agriculture resulted in lower contribution of the agricultural sector to economic growth. Despite increased expenditure on agriculture on extension and credit assistance in Zimbabwe, hunger and poverty continue to be the dominant problem in the country and this makes the attainment of the first Millennium Development Goal of reducing poverty difficult.

The last decade has been characterized by increased expenditure on agriculture yet Zimbabwe is experiencing poor harvests and food insecurity resulting in increased imports of food from neighbouring countries. Also the economic activity has been shrinking. Real GDP is estimated to have contracted in 2007 by more than 6 percent, after declining by about one-third between 1999 and 2006 (World Bank, 2009).

Various agricultural performance indicators provide evidence of the relative deterioration of the agricultural sector since 2000. For instance, the total agricultural production per capita and the food production per capita index fell particularly since 2000 (World Bank, 2009). This partly explains the rampant food shortages that Zimbabwe has witnessed, with consequent increases in domestic food prices and the dramatic increases in agricultural imports that have been observed since 2000 (World Bank, 2009).. However according to Garcia (2007), the government of Zimbabwe has had extraordinarily high expenditure relative to GDP and most of the funds were channelled towards agriculture to support Farm Mechanisation Programme.

Zimbabwe had been faced with a problem of overall increased poverty since independence from as low as 32 percent in 1980 to the extent that by 2003, some 72 per cent of the population lived below the national poverty line and the living conditions of the population became some of the worst in Africa (Chimhowu & Woodhouse, 2008). This was despite the fact that more support was given to farmers since independence as explained in the previous paragraph.

There is an information gap on the contribution of agriculture expenditure on growth and poverty reduction in Zimbabwe. For instance, the study by Bautista & Marcelle (2000) examined quantitatively the income and equity effects of macroeconomic reform measures and potentially complementary changes in agricultural sector policies on poverty reduction. Bautista & Marcelle (2000) used a CGE (computable general equilibrium) model for Zimbabwe with 1991 as base period. The model made use of a 1991 SAM (social accounting matrix) for Zimbabwe as database. The comparative results of counterfactual model simulations illuminate the greater effectiveness of trade policy reform in promoting overall income growth and equity when linked to complementary fiscal and sectoral reforms aimed at reducing poverty. However, few studies were carried out on the contribution of agriculture expenditure on growth and poverty reduction in Zimbabwe.

1.9 Objectives of the study

- To analyse the trend of government agricultural expenditure in Zimbabwe.
- To investigate how changes in government expenditure on agriculture has affected economic growth in Zimbabwe from 1980-2009 (Main objective).
- To analyse the trend of poverty in Zimbabwe.
- To estimate spending towards agriculture for poverty reduction in tandem with the first MDG.

1.10 Research Questions

- Is there an upward trend on government agricultural expenditure in Zimbabwe?
- Do changes in government expenditure on agriculture affect economic growth in Zimbabwe?
- Is there a downward trend in poverty in Zimbabwe?
- What are the annual agricultural expenditures required to meet first MDG?

1.11 Hypotheses

- The trend of governmental agricultural expenditure is upward sloping in Zimbabwe.
- Government expenditure on agriculture does not result in economic growth.
- The trend of poverty is upward sloping in Zimbabwe.
- Increasing agriculture investment leads to poverty reduction in Zimbabwe.

1.12 Significance of the study

Fan and Rao (2003), show that government spending on agriculture has provided a strong contribution to economic growth in Asia. Diao & Dorosh (2003) show that spending on rural infrastructure and productivity enhancing investments in agricultural export crops and livestock has the most promise for growth in income and food consumption in Africa. However no known research has been done on the impact of government agricultural expenditure on economic growth in Zimbabwe.

It is essential for the country to be aware of the returns of the agriculture investments and to be informed about the policies which will improve productivity of the agriculture sector. Moreover it is imperative to know the spending options towards agriculture and non agriculture which will enable the country to meet the first MDG which is to halve poverty by 2015.

1.13 Organisation of the study

The thesis consists of six chapters. Chapter one introduces the study in the broader context. Chapter two reviews literature on the contribution of agriculture towards economic growth and chapter three provides a brief overview of Zimbabwean agricultural sector. This is followed by chapter four, which discusses the study area and methodology to be used. Chapter five presents the results obtained in this study and the discussion of these results. The last chapter gives recommendations and concluding remarks.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

This chapter reviews literature on the contribution of agriculture towards economic growth and poverty reduction. Existing literature on the role of agriculture on economic growth has two main aims, to provide a broad historical perspective on the role of agriculture on economic growth and to draw historical lessons from the experiences of the advanced and present day underdeveloped countries. The customary approach to the role of agriculture on economic growth is formulated in terms of contributions the agricultural sector can make or the functions it can perform during the process of economic growth. Thus it is generally accepted that agriculture development can promote economic growth and reduce poverty of the underdeveloped countries (Chang, 2009).

2.1 Agriculture and economic growth

2.1.1 Agricultural transformation

Understanding how growth in agriculture stimulates and sustains economic growth and development has been the focus of much development thinking during the past 50 years (Chang, 2009). These are described in Lewis (1954) and Johnston and Mellor (1961) and summarised in Timmer (1988). Key functions provided only by growth in agriculture and that enable broader economic growth and development to occur are emphasised by these studies as follows;

- generation of additional demand for goods and services produced outside of the agricultural sector as agricultural based incomes rise therefore the size of agriculture and its multiplier effects is critically important here;
- generation of savings through increased farm incomes which can then be invested in other sectors;
- employment of an available labour force;
- provision of affordable food which allows urban areas to develop and maintain wage rates at competitive levels; and
- provision of a raw material base to support manufacturing, as a result, processing of agricultural commodities has often been the first activity to be industrialised in many countries.

Increased productivity and investment in agriculture are two factors to agricultural transformation. Firstly, increased agricultural productivity (as opposed to increased agricultural production) contributes significantly towards the economy. Broad-based growth and diversification do not happen when agricultural output increases simply by using additional land or labour. Instead, greater value must be added to the land and labour used, i.e. agricultural productivity increases. This is where Africa fails as opposed to the historical success in Asia (Lewis, 1954).

Secondly, investment and growth must begin in agriculture so that the wider economy can go on to outgrow it. Moreover, agriculture must grow rapidly before the transition can occur. Growth and poverty reduction strategies that aim to bypass agriculture will almost certainly fail and will probably leave the population and economy locked in low productivity agriculture and poverty (Johnston and Mellor, 1961).

2.1.2 Government agricultural expenditure and economic growth

Although several studies have outlined the theoretical relationship between agriculture and economic growth, disagreements still persist. The causal dynamic relationship between agriculture and economic growth is an empirical question worthy of further investigation (Awokuse, 2009).

Increase in government expenditure (on agriculture) leads to higher economic growth, in the Keynesian model. Expenditure in agriculture is an injection into the circular flow of income and is expected to benefit the economy through the multiplier process thereby increasing economic growth. Some studies (e.g. Fan, Zhang and Rao, 2004) conclude that the agriculture multiplier is significantly greater than one, especially in developing countries where the multiplier is often between 2 and 3.

The size of the multiplier determines the extent to which changes in agricultural performance influence the wider economy. It is a measure of the extent to which a unit change in income earned in agriculture causes a change in income in the non-farm sector. The size of the multiplier will vary between places and over time, reflecting differences and changes in factors such as the amount of farm income spent on imported goods or saved. Thirtle *et al*,

(2001) present evidence from a number of studies and found multipliers ranging from 1.35 to 4.62.

Agriculture is the largest sector in many developing countries in terms of their shares in GDP and employment (Fan, Zhang and Rao, 2004). More importantly, the majority of the world's poor live in rural areas and depend on agriculture for their livelihood. Therefore, agricultural expenditure is one of the most important government instruments for promoting economic growth and alleviating poverty in rural areas of developing countries.

Fan & Rao (2003) established that government spending on agriculture has provided a strong contribution to economic growth in Africa and Asia. Diao & Dorosh (2003) establish that increased investments on rural infrastructure and productivity enhancing investments in agricultural export crops and livestock have highest impact on growth in income and food consumption in Africa. Diao & Dorosh (2003) also support the view that there are high returns on investments that reduce transaction costs in markets.

Fan, Hazell & Thorat (2000) investigated the relationship between government spending and economic growth in India. They used data for the period 1965 to 1988 using national income as dependent variable and government spending on agriculture, consumption, investment and net exports as independent variables. They established that there is a positive relationship between government spending on agriculture and economic growth.

Agricultural productivity in this study is measured as the contribution of the agricultural sector to economic growth taking into account the funds invested into the sector by the government. It is generally understood as a measure of technological progress that can be attributed to changes in agricultural research and development, extension services, human capital development such as education, commercial infrastructure, as well as government policies and environmental degradation (Ahearn, Yee, Ball & Nehring, 1998).

According to Diao *et al*, (2007), the best prospects for agriculture-led growth remain in the food sector, where domestic demand for food products still represents a large and growing market. Improvements in market efficiency and simultaneous growth in the livestock sectors (and feed demand) can help spur demand further and avert price declines that discourage grain production. Achieving rapid gains in farm incomes, however, will require not only sustained increases in agricultural output, but investments in rural infrastructure to reduce marketing costs, as well as demand enhancing growth in the non-agricultural sector's income to spur demand (Diao *et al*, 2007).

2.1.3 The role of agriculture to the economy

The Dual Sector Model is a theory of development in which surplus labour from traditional agricultural sector is transferred to the modern industrial sector whose growth over time absorbs the surplus labour, promotes industrialization and stimulates sustained development (Lewis, 1954). In the model, the traditional agricultural sector is typically characterized by low wages, an abundance of labour, and low productivity of a labour intensive production process. In contrast, the modern manufacturing sector was defined by higher wage rates than the agricultural sector, higher marginal productivity, and a demand for more workers initially. Also, the manufacturing sector was assumed to use a production process that is capital intensive, so investment and capital formation in the manufacturing sector are possible over time as capitalists' profits are reinvested in the capital stock. Improvement in the marginal productivity of labour in the agricultural sector is assumed to be a low priority as the hypothetical developing nation's investment is going towards the physical capital stock in the manufacturing sector.

Fei & Ranis' (1964) modelled involved subsistence sector with underemployment, disguised unemployment, zero marginal productivity of labour, consistent real wages and fixed land inputs. Labour could be transferred from the subsistence to the modern commercial and industrial sector without reducing agricultural output or increasing supply price of labour. The loss of labour to industry even resulted in the production of an agricultural surplus which could be invested in commerce and industry thus boosting GDP.

Early classical theory viewed economic development as a growth process requiring the systematic reallocation of factors of production from a primary sector characterized by low productivity, traditional technology, and decreasing returns to a modern industrial sector with higher productivity and increasing returns (Adelman, 2001). However, the perceived role of agriculture in growth and development has changed considerably over the last half-century (Adelman, 2001).

Advocates of agriculture-led growth (ALG) (e.g. Schultz, 1964; Timmer, 1995, 2002 and Gollin *et al*, 2002) contend that investment in agriculture and the accompanying creation of infrastructure and institutions in other sectors is a prerequisite for national economic growth. These researchers note that growth in the agricultural sector could be a catalyst for national output growth through its effect on rural incomes and provision of resources for transformation into an industrialised economy.

Work by Gollin *et al,* (2002) shows the importance of agriculture in the early stages of development. Using both cross section and panel data for 62 developing countries for the period 1960 to 1990, the authors find that growth in agricultural productivity is important in explaining growth in GDP. This direct contribution accounts for 54 percent of GDP growth. The research shows that agriculture accounts for more than half of GDP growth between 1960 and 1990. In Uganda (1992-2003), periods of high overall growth coincided with strong performance in agriculture, the sector in which the bulk of the labour force was employed (Nkonya, 2004).

However, the results of a study by Ladau (1983) suggested a negative relationship exists between the share of government expenditure in GDP and the rate of growth of per capita GDP. The negative relationship was found for a sample of 96 countries used in Asia.

2.1.4 Agricultural expenditure as a percentage of GDP

Agriculture expenditure, as a percentage of GDP, measures government spending on agriculture relative to the size of economic growth (Beintema and Stads, 2004). Compared to developed countries, agricultural spending as a percentage of GDP is extremely low in developing countries. The former usually has more than 20 percent, while the latter averages less than 10 percent (Beintema and Stads, 2004).

2.2 Public expenditure, economic growth and poverty

2.2.1 Government spending, agricultural growth and economic growth

The literature regarding government expenditure and economic growth assume a linear as well as a non-linear relationship between government expenditure and economic growth. Several studies used the cross-sectional, cross-country analysis (e.g. Ram, 1987) and time series models (e.g. Fan, Hazell & Thorat, 2000) to capture the dynamic relationship between government expenditure and economic growth. Some studies have shown a positive influence of government expenditure on economic growth in India (Holmes & Hutton, 1990). Interestingly some studies in Asia established no significant relationship between real GDP and government spending (Akpan, 2005 & Kormendi and Meguire (1985). There have also been several studies that have shown a negative relationship between government expenditure and economic growth in developing countries (e.g. Landau 1983, 1986, Barro, 1989, 1990, Devarajan *et al*, 1996; Nurudeen & Usman 2010).

Aschauer (2000) and Milbourne *et al*, (2003) concluded that public investment has a positive and statistically significant impact on economic growth. Both tested the predictions of a neo-classical growth model in which public capital is a complement to private capital, and found that public investment has a positive and statistically significant impact on economic growth. Of the different sectors, investments in transport and communication and in education have the largest impacts on growth (the effects of investments in agriculture, health, housing and industry are not statistically significant).

Fajingbesi & Odusola (1999) empirically investigated the relationship between government expenditure and economic growth in Nigeria. The econometric results indicated that real government capital expenditure has a significant positive influence on real output. Moreover, Fan, Hazell and Thorat (2000) carried out a study on the relationship between government spending, agricultural growth and economic growth in India. The study showed that there is a positive relationship between public spending on agriculture and economic growth. Consumption and investment also showed a positive relationship to GDP.

Furthermore, a study by Easterly and Rebelo (1993) extended the analysis in two directions. First, they included investment by public enterprises as well as that by central government; and secondly, they distinguished between public investments in different sectors. They found that public investment by central government had a positive and statistically significant effect on economic growth in developing countries.

However, Devarajan *et al*, (1996) challenged the findings of studies that have shown a positive influence of government expenditure on economic growth. They distinguished between different types of public expenditure, both by economic classification and by sector. The expenditure data were taken from the IMF Government Financial Statistics, which disaggregates expenditure according to economic classification (capital, current) and functional classification (e.g. defence, administration, transport, health, education). Devarajan *et al*, (1996) also expressed each expenditure category as a proportion of the total budget, rather than the absolute amount, thus taking into account the public budget constraint (each expenditure category can be increased only at the expense of others).

Interestingly, Akpan (2005) concluded that there was no significant association between most components of government expenditure and economic growth in the study carried out in Nigeria. Akpan (2005) used a disaggregated approach to determine the components (that include capital, recurrent, administrative, economic service, social and community service, and transfers) of government expenditure that enhances growth, and those that do not. Furthermore, using data on 47 developing countries, Kormendi and Meguire (1985) found no significant cross-sectional relationship between the growth rate of real GDP and the growth rate of the share of government spending.

Olugbenga & Owoye (2007) investigated the relationships between government expenditure and economic growth for a group of 30 OECD countries during the period 1970-2005. The results showed the existence of a long-run relationship between government expenditure and economic growth. In addition, the authors observed a unidirectional causality from government expenditure to growth for 16 out of the 30 countries, thus supporting the Keynesian hypothesis. Komain & Brahmasrene (2007) examined the association between government expenditures and economic growth in Thailand, by employing the Granger causality test. The results revealed that government expenditures and economic growth are not co-integrated, but indicated a unidirectional relationship, as causality runs from government expenditures to growth. The results illustrated a significant positive effect of government spending on economic growth.

However, a more recent study of the effects of public expenditure on growth has concluded that public investment has a negative and statistically significant impact on economic growth in Nigeria. Nurudeen & Usman (2010) observed that rising government expenditure has not translated to meaningful development as Nigeria still ranks among world's poorest countries. Nurudeen & Usman (2010) employed a disaggregated analysis in an attempt to investigate the effect of government expenditure on economic growth. The results reveal that government total capital expenditure and total recurrent expenditures have a negative effect on economic growth.

It is difficult to draw any firm conclusions from this evidence despite the more pessimistic results of these more recent studies. Two studies examining the robustness of results from cross country growth regressions (Levine & Renelt, 1992 and Sala-i-Martin, 1997) reported that no measure of public expenditure, including public investment, can be said to have a robust effect on economic growth.

2.2.2 Public investment and poverty

Public investment affects rural poverty through many channels, as depicted in Figure 2.1. For example, public investment in agricultural research, rural education, and infrastructure increases agricultural productivity, which directly increases farmers' incomes and in turn reduces rural poverty (Fan *et al*, 2008). Moreover, indirect impacts come from higher agricultural wages and improved nonfarm employment opportunities induced by growth in agricultural productivity. Increased agricultural output from rural investment often leads to lower food prices, again helping the poor indirectly because they are often net buyers of food grains.

Furthermore, public investments in rural education, health, and infrastructure not only have indirect effects on wages, nonfarm employment, and migration through increased productivity, but also directly promote rural wage increases, nonfarm employment, and migration, thereby reducing rural poverty (Fan *et al*, 2009). For example, improved infrastructure access will help farmers set up small rural nonfarm businesses such as food-processing and marketing enterprises; electronics repair shops, transportation and trade, and restaurants.

Fan *et al*, (2008) argued that understanding these different effects provides useful policy insights for improving the effectiveness of national poverty reduction strategies. In particular, an understanding of these effects shows how public investment can be used to strengthen weak links between poverty reduction channels and thus to target public resources more efficiently. More efficient targeting has become increasingly crucial as many developing countries have committed to achieving poverty reduction goals using the Millennium Development Goal (MDG) framework with limited public resources (Fan *et al*, 2008).

Public spending plays a critical role in anti-poverty interventions in terms of influencing the resource allocation by providing physical and social infrastructure which would help to accelerate growth and/or to direct the benefits of growth to the poor (Datt and Ravallion, 2002).

Several studies have estimated the effect of public expenditure, including public investment expenditure, on poverty. Using cross-country data, Gomanee *et al*, (2003) and Mosley *et al,* (2004) have estimated the effects of government expenditure in different sectors on the US$1 a day poverty headcount, holding the level of GDP per capita constant. Gomanee *et al*, (2003) and Mosley *et al*, (2004) found that higher government expenditure on education, agriculture, and housing and amenities (water, sanitation and social security) all reduced poverty, presumably by shifting the distribution of income in a pro poor direction, since the level of aggregate income is held constant in their regressions.

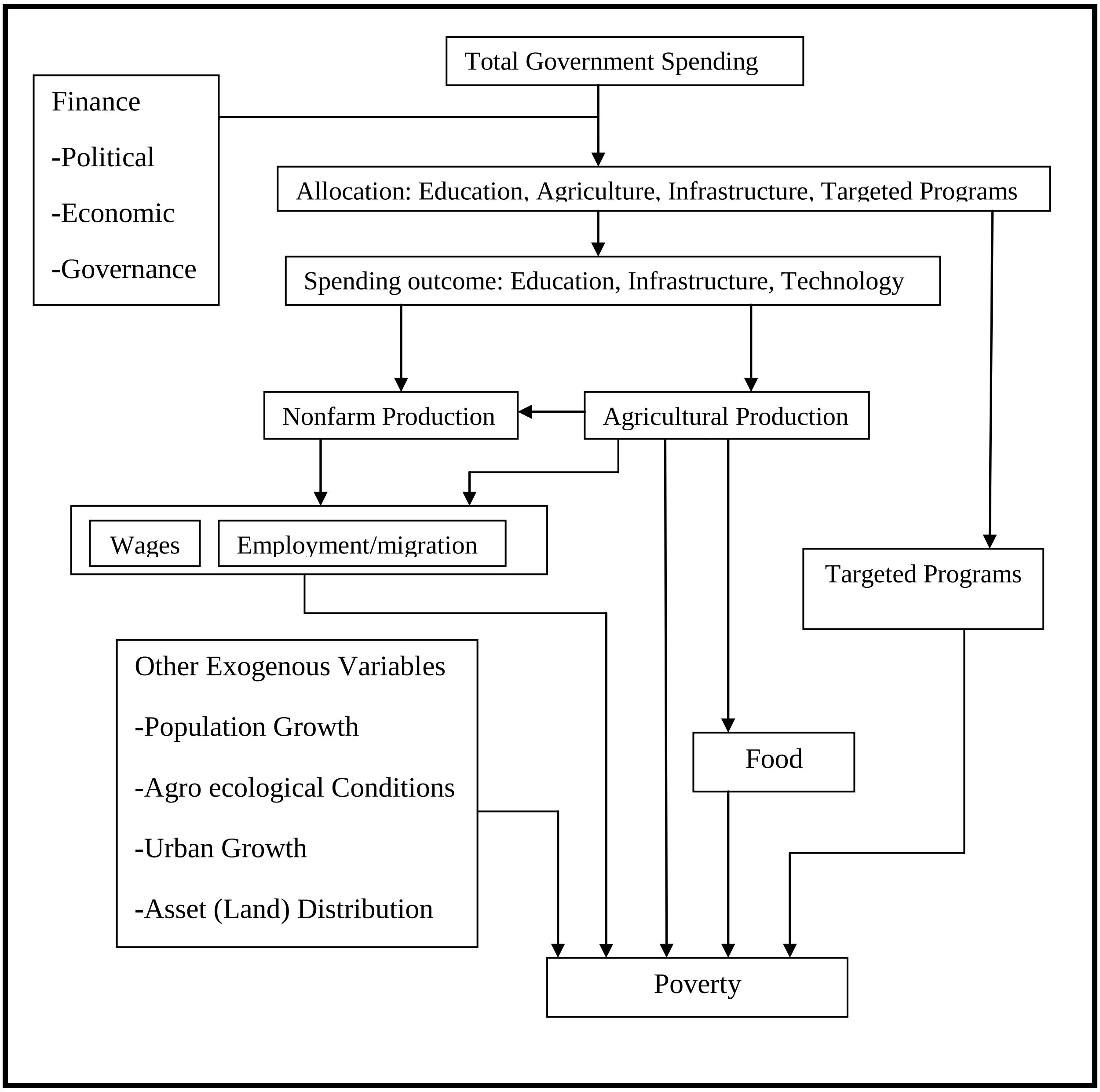

Figure 2.1: Government spending and poverty

Source: Fan *et al*, (2009)

Other studies using cross-state data, particularly in India where state-level data are high-quality and stretch far back in time. Fan *et al,* (1999), for instance, estimated the effect of public expenditure on levels of rural poverty across Indian states, distinguishing between expenditure on rural education, targeted rural development, public health, irrigation, power generation, agricultural R&D, and rural roads. Fan *et al,* (1999) found that agricultural R&D, rural roads, rural education and targeted rural development expenditure all reduced rural poverty. Of these, spending on agricultural R&D and rural roads has by far the largest impacts on both growth and poverty reduction. Fan *et al,* (2002) conducted a similar analysis of the effects of public expenditure on rural poverty across Chinese provinces, distinguishing between expenditure on rural education, targeted poverty alleviation, telecommunications, irrigation, power generation, agricultural R&D, and rural roads. They found that spending on rural education has a positive and largest impact on poverty, followed by spending on agricultural R&D and then by spending on rural roads.

Similarly, Datt and Ravallion (2002) estimated the determinants of differences in the rate of reduction of the poverty headcount across Indian states over the period 1960–94. Datt and Ravallion (2002) concluded that state government development spending had a large and statistically significant effect on poverty reduction, even when controlling for changes in agricultural and non agricultural productivity and a time trend.

2.2.3 Poverty and Public Policy

There are two policy interventions which can be used to ameliorate the conditions of the poor (Ahluwalia, 1990, Bhagwati, 1988, Dreze & Sen, 1989). Indirect strategy is one way of orienting policies to accelerate growth and to direct the flow of growth benefits to the poor. This income generating strategy involves adopting policies that would provide a compatible structure of incentives, and promote efficiency in resource allocation both in static and dynamic terms (Dreze & Sen 1989).

Appropriate strategies for poverty reduction will have to be implemented when the reasons for poverty are identified. The specific policies to reduce poverty should be calibrated keeping in view the particular systems and institutions prevailing in individual countries. However, the common strategy for reducing poverty involves policies and institutional reforms to provide opportunities to the poor, facilitate their empowerment and reduce their vulnerability (World Bank, 2001).

Another way involves direct measures to improve the consumption entitlements of the poor which may also help to accelerate growth (World Bank, 2001). These directly enhance income earning capacity of the poor unlike indirect measures that are intended to accelerate growth and its benefits eventually trickle down to the poor. Interestingly, direct policy interventions to ameliorate the conditions of the poor are not necessarily the most effective way to reduce poverty. In China, the number of poor reduced per 10000 Yuan of expenditure was 6.8 in the case of R&D expenditure, and 3.22 in the case of roads, but just 1.5 in the case of poverty loans (Fan, 2002).. Similarly, the number of poor reduced per million rupee spending was the highest in the case of roads (123.8) and R&D expenditures (84.5), but only 17.8 in anti-poverty programs (Fan, 2002).

Some studies show that in many countries, particularly East Asian economies such as Taiwan, South Korea, Indonesia, Malaysia, and China illustrates the potential for extraordinary successes in alleviating rural poverty by a judicious choice of the two approaches (Datt and Ravallion, 2002). Impressive gains in alleviating poverty in these countries were attributable mainly to significant public investment in rural infrastructure and human capital. In these countries, rural transformation was achieved by improving the quality of physical and social infrastructure, improving agricultural productivity and expanding rural non-farm activities.

2.2.4 Government spending on agricultural research and economic growth

Agricultural progress in modern times, typically measured by growth in total factor productivity, has been driven more by technical advance than by any other factor (Mundlak, 2000).

In Pakistan, Khan and Akbari (1986) found a strong relationship between agricultural output and outlays on agricultural research and extension. They established a 32 percent rate of returns on such investment. Moreover, Evenson and Bloom (1990) also provided strong statistical evidence that Pakistan's agricultural research system has been productive. They argued that high rates of return on investment in agriculture sector are indicative of not only the success of the research investment, but also the relatively low amount of investment when compared to other countries.

Block (1994) compared estimates of total factor productivity for Sub-Saharan Africa between 1963 and 1988. Three different methods of aggregating agricultural output were used: purchasing power parity, official exchange rates and wheat units. In Block`s (1994) findings, one third of the growth in agricultural total factor productivity in Sub-Saharan Africa was due to research expenditures.

Fan, Zhang and Zhang (2002) carried out a study to compare the impact of the specific rural public investments on reducing poverty and inequality. They calculated the marginal returns of various investments to growth in agricultural and nonfarm production and reduction of rural poverty and regional inequality. These returns were calculated for China as a whole and for three different economic zones. Government expenditures that had the largest impact on growth and poverty reduction include agricultural research and development and rural infrastructure (Fan, Zhang and Zhang, 2002). IFPRI's research on Uganda confirms that investment in agricultural research and development offers the greatest potential for enhancing productivity and reducing poverty (Fan, Zhang, and Rao 2004).

Judd, Boyce and Evenson (1991) examined the role of public expenditures in agricultural research and extension on agricultural output in Africa. Their study shows that between 1959 and 1980, real spending on research and extension programmes increased by factors of four to seven and that research intensities more than tripled for the lowest income developing countries. They show a decrease in the disparity between countries over time.

However, lack of resources has severely constrained public support for agricultural research in many developing countries (Beyene, 2008). Even when they have financial resources for agriculture, developing countries tend to use them on things that will have more immediate impacts, such as fertilizer subsidies and marketing expenditures. Of course, spending more money on research and development (R&D) does not necessarily guarantee better results. For one thing, even when the money is ostensibly used for R&D, it is often in practice spent on recurrent expenditures (such as wages and supplies) rather than on genuine investment, as in the case of Ethiopia (Beyene, 2008).

Interestingly, the experience of India shows that financial constraints need not totally restrain research and development (Vyas, 2008). Despite spending relatively small amounts of resources in agricultural R&D, India has managed one of the most comprehensive and successful publicly organised agricultural research programmes in the developing world (Vyas, 2008).

2.2.5 Agricultural growth and poverty reduction

Datt and Ravallion (1996) showed that rural sector growth in India reduced poverty in both rural and urban areas, while economic growth in urban areas did little to reduce rural poverty. Furthermore, Warr (2001) provided evidence that growth in agriculture in a number of South East Asian countries significantly reduced poverty; however, this was not matched by growth in manufacturing. Gallup *et al*, (1997) showed that every 1% growth in per capita agricultural

Gross Domestic Product (GDP) led to 1.61% growth in the incomes of the poorest 20% of the population.

Several other studies reveal similar results, but emphasise the important qualification that the degree to which agricultural growth reduces poverty is usually conditional upon the initial distribution of assets, particularly, land and the initial level of inequality (Bourgignon & Morrison, 1998; Timmer, 1997; de Janvry and Saddoulet, 1996). The importance of equitable access to productive assets is highlighted by the fact that without this access the poor have less economic flexibility, and as a consequence they have to accept low paid jobs and therefore tend to suffer from poor health and low levels of education and training. This further consolidates them in the poverty trap, and prevents the community from building the social capacity necessary to implement public participation in economic development (Timmer, 1997).

Thirtle *et al*, (2001) concluded from cross country regression analysis that, on average, every 1% increase in labour productivity in agriculture reduced the number of people living on less than a dollar a day by between 0.6 and 1.2%, in terms of the role of agricultural productivity in reducing poverty. No other sector of the economy shows such a strong correlation between productivity gains and poverty reduction.

Moreover, Juana & Mabugu (2005) quantified the smallholder agriculture's true contribution to the economy in general and poverty reduction in particular. The study used the traditional impact analyses to measure the incidence of a sector specific policy on the economy (Juana & Mabugu, 2005). The results provide evidence that investment in smallholder agriculture should be seen as investment in the entire economy since they produced about 85 percent of agricultural output. The study clearly shows that smallholder agriculture promotes sustainable development and the inclusion of rural communities especially the poorest in economic activities will lead to reduction of poverty in Zimbabwe.

2.3 Agricultural development

Agricultural development makes a critical contribution to overall economic growth in many developing countries (World Bank, 2006). As farmers' incomes rise, so does their demand both for farm inputs and services, and for non-farm goods. Increased agricultural production also leads to increased demand for processing facilities.

According to Braun, Haen, and Blanken (1991), the goals of increasing market integration of traditional agriculture and creating more opportunities for farmers to produce various agricultural products that can provide more marketable surpluses are always part of a development strategy oriented towards growth. The key to poverty reduction also lies in stimulating rapid and sustainable growth in the agricultural sector. Understanding alternative agricultural growth options and their linkages with poverty reduction and prioritizing agricultural investments are the two key components of an agricultural development strategy.

Diao *et al,* (2007) examined the implications of three broad alternative agricultural development strategies (focusing on traditional exports, non-traditional exports and food staples) in East and Southern Africa for overall economic growth in a general equilibrium framework. Much of the earlier work on agricultural growth has focused on the means to boost the supply of agricultural products, while recent studies have paid more attention to the demand side and the role of markets.

2.3.1 Historical lessons on agricultural development

After having experienced a major crisis of free-market capitalism during the Great Depression, there was a general shift towards more state-led models of economic management by the end of World War II in United States of America (Chang, 2009). In line with this, agricultural policies also became more state-oriented all over the world.

The United States of America (USA) had strong government financed programmes in research, extension, and irrigation; it set up a series of financial institutions providing subsidised loans to farmers (Chang, 2009). The developing countries in Asia and Africa that became independent in the two decades following World War II also adopted state-led models of agricultural development (Chang, 2009).

It was believed that, if left alone, the market institution would not be able to supply socially optimal quantities of many necessary agricultural inputs – land, water, transport, seeds, fertilizers, pesticide, animal feeds, and so on – nor would it be able to provide the means to attain stability in rural income – credit, insurance, stable prices, and so on (Chang, 2009). It was argued that the state needed to provide these inputs directly to farmers.

Habakkuk (1966) stressed the historical lesson on the early stages of development of the European countries. The implication of historical experience is not that export sectors did not still have an important role in economic development but only that they are unlikely to promote vigorous economic growth without extensive change in agrarian structure. All the successful nineteenth century industrializations were accompanied in their early stages by an increase in agricultural output and there are no cases where unresponsiveness of domestic agriculture was made good by imports of agricultural products.

2.3.2 Contribution of backward and forward linkages to economic development

According to Johnston & Mellor (1961), backward and forward linkages allow market-mediated, input-output interactions between the agricultural and industrial sectors so that agriculture can contribute to economic development (Johnston and Mellor, 1961). These linkages are based on the agricultural sector supplying raw materials to industry, food for industrial workers, markets for industrial output, and the foreign exchange needed to import capital goods.

Johnston & Mellor (1961) emphasized the existence of production and consumption linkages, both within agriculture as well as between agriculture and non agriculture. In particular, agricultural production generates forward linkages such that agricultural outputs are supplied as inputs into non-agricultural production. Growth in agriculture contributes to rapid rises in agro-processing and processed food marketing, which not only provides new engines of growth but an opportunity to substitute for imports. Agriculture also creates backward production linkages through its demand for intermediate inputs such as fertilizers and marketing services. Both of these production linkages are likely to deepen as an economy modernizes, but decline in relative importance alongside agriculture’s share of production.

Martin and Mitra (1996) reiterated that there is a significant correlation between rates of growth in agriculture and in non-agriculture). In Kenya from 1987 to 1988 (for example), the rate of growth in non-agriculture (although trending downward at 0.26 percentage points per year), was increased by 30 percent of the growth in agriculture in the same year, and by 10 percent of the agricultural growth in the previous year (Martin and Mitra, 1996). Moreover, Stern (1996) found a similar and significant relationship between growth in the agricultural and non-agricultural sectors during 1965– 1980 for a large number of developing countries.

In contrast to the Agricultural Led Growth (ALG) arguments, proponents of the opposite viewpoint contend that the agricultural sector does not have strong forward linkages to other sectors and lack adequate innovative structure necessary for fostering higher productivity and export growth (Lewis, 1954; Fei & Ranis, 1961; Jorgenson, 1961). Moreover, other researchers argued that multiplier links in Africa are lower than in other parts of the world, and this has important consequences for wider economic development. However, Fan, Zhang and Rao, 2004 suggest a more optimistic estimate, with multipliers in excess of 1, indicating that the sector has considerable potential for stimulating broader economic growth.

2.4 Success stories in agriculture

2.4.1 Success story of technological change in agriculture in Asia

The Green Revolution was the technological response to a world-wide food shortage which became threatening in the period after World War II (Moore and Parai, 1996). High Yield Varieties (HYVs) seeds have brought real and substantial increases in production due to their ability to respond with higher yields to increasing application of fertilizer and, in part, to their ability to produce two, sometimes even three, crops a year. Production of rice and wheat in Asian countries increased by 75% between 1965 and 1980, with only a 20% increase in the area planted to these crops. In Indonesia, rice yield in 1960 was 1.3 tonnes per hectare (t/ha). By 1994 it had risen to 4.3 t/ha. In India, production more than doubled between 1960 and 1993 (Moore and Parai, 1996).

The introduction of High Yield Varieties (HYVs) spread rapidly. By the mid-1980s, approximately 50% of the wheat of Asian countries cultivated was HYVs. In 1983, China cultivated 95% of its rice area and Latin America sowed 82% of its wheat area to high yielding varieties (Moore and Parai, 1996). In India, with less than 100 ha of land sown to HYVs in 1965, over 50 million hectares had been converted by 1980. The HYV IR36 rice plant, developed by the International Rice Research Institute (IRRI), is planted on about 111 million hectares worldwide, making it the most widely grown variety of any crop (Moore & Parai, 1996). It is clear that the benefits of HYV seeds are significant. As intended, these seeds have decreased the reliance of developing countries on grain imports, in spite of population increases, though these have delayed and to some extent neutralized the benefits (Figure 2.2). These ‘miracle seeds’ have probably averted famines and the starvation of millions of human beings.

The Green Revolution Strategy for increasing food production in Asia was based on the intensification of the lowlands through massive investments in irrigation infrastructure and in crop research (Prabhu and Mark, 1994). It was presumed that lowland intensification would lead to sustainable output growth over the long term. Indeed output of grains increased over time as depicted by Figure 2.2 in India; gaps show non availability of data.

Rapid productivity gains, achieved largely through the technological advances of the Green Revolution, in Asia, provided a route out of poverty by directly increasing producers’ incomes and labourers’ wages, by lowering the price of food and by generating new livelihood opportunities as success in agriculture provided the basis for economic growth (Moore and Parai, 1996).

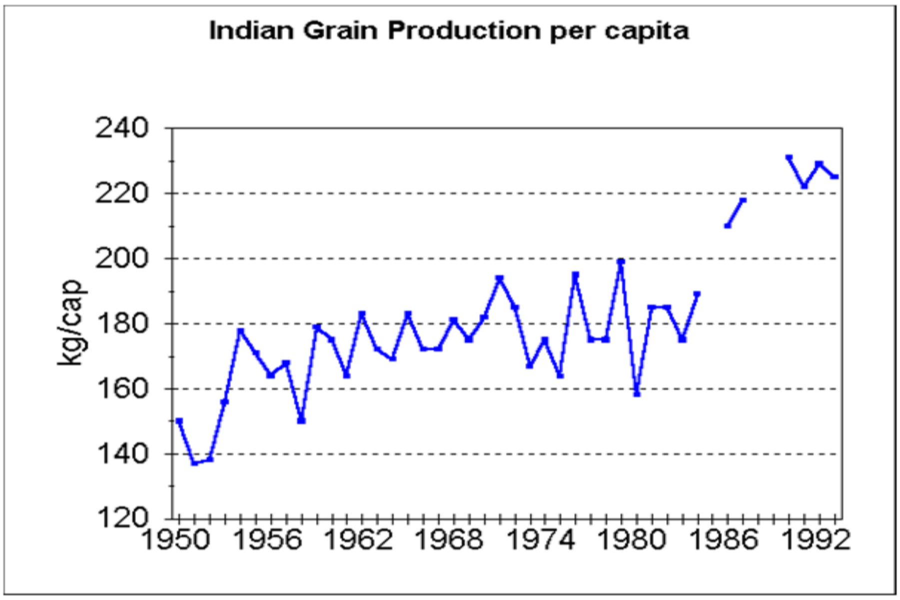

Figure 2.2 Indian grain production per capita, 1950 to 1992

Source: Moore & Parai, (1996)

The case of Tamil Nadu (Box 1) illustrates that given the size of agriculture and the impact of multipliers, the sector is crucial for promoting broader economic growth and has greater spill over effects than any other sector.

Box 1: Agricultural development and its links in Tamil Nadu, India

In North Arcot District, Tamil Nadu, 11 villages were surveyed in the early 1970s at the start of the Green Revolution, and again in the early 1980s. During this time, there had been almost complete adoption of high-yielding rice varieties, with much greater use of fertiliser and irrigation resulting in a modest, but sustained 60% increase in rice output between 1963 and 1980.

However, even more remarkable was that the poor were about twice as well off in the early 1980s as in the early 1970s. Real wage rates rose by 20% for men and 10% for women. This was not due to increased labour demand in farming (labour use fell as mechanisation cut jobs). In fact, members of farming households with increased incomes no longer offered themselves as casual labour, so the labour supply reduced at the same time.

The main point, however, was the strength of growth links. For every rupee generated in increased farm output, R 1.87 was created in the off-farm economy, with about half in the demand for inputs, marketing and processing of crops, and half in meeting consumer demand.

Source: Hazell & Ramasamy (1991), page 57

Rosset *et al*, (2000) showed that Asia's progress in freeing millions from poverty over the past 40 years can be attributed to the region's success in increasing agricultural productivity. It was also important that wider circumstances, policies and measures allowed agricultural productivity to occur, and ensured its impact on the wider economy. However, the Asian experience stands in sharp contrast to Africa, where agricultural productivity has been stagnant, rates of economic growth declining and poverty is on the rise as illustrated on Box 2 below.

Box 2: Africa and Asia: a contrasting picture of agricultural performance

Between 1961 and 2001, per capita production of cereals rose by over 50% in the developing world as a whole. But this overall picture masks great regional differences. Most of this (probably 80%) came from expanding the area farmed: cereal yields increased by just 50%, from around 0.8 to 1.2 tonnes per hectare, and soil fertility fell dramatically. This contrasts sharply with Asia, where cereal output tripled from 309 to 962 million tonnes over the same period. This was far above the increase in population, and mostly came from higher yields, which rose from an average of 1.2 to 3.3 tonnes per hectare. The farmed area increased by just 40% over the same period.

Source: International Food Policy Research Institute (IFPRI), 2002, page 35

2.4.2 Successful agro-based economy: Brazil

Agriculture is a major sector of the Brazilian economy and is critical for economic growth and foreign exchange earnings (USDA, 2009). Brazil is investing more and more in agriculture to make the best use of its huge agricultural potential as illustrated on Table 2.1 below. Around 28 percent of its GDP was derived from agribusiness, so it is crucial to direct investments towards the sector`s competitiveness (World Bank, 2006). Brazilian agribusiness has substantially evolved in recent years. Total grain production has risen from about 58 million tonnes in the 1990/91 harvest to around 120 million tonnes in 2005/06, mainly through productivity gains. In 2008, the agribusiness sector (including production agriculture, processing, and distribution) accounted for 25 percent of Brazil’s GDP, of which crop production and related inputs accounted for 18 percent, while livestock and related inputs accounted for 7 percent (USDA, 2009).

Brazil is a top producer and exporter of beef, broilers, coffee, soya beans and oilseeds, sugar, and sugar-based ethanol (Awokuse, 2009). Awokuse`s (2009) current study shows that agriculture has made a significant contribution to Brazilian economic growth.

Government credit and tax-incentive programs have spurred crop production and construction of processing facilities. Over the last few years, Brazil has dramatically increased financial support to its agricultural sector. Credit from the federal government for production is the dominant source of financing for agricultural producers (USDA, 2009).

Table 2.1: Government Agricultural expenditure and economic growth in Brazil (1994-2003)

Year	**Government agricultural expenditure (Real $ billions)**	**GDP (Real $ billions)**
1994	19.4	418.8
1995	18.6	431.0
1996	18.9	424.0
1997	18.7	420.3
1998	19.7	422.7
1999	23.1	430.5
2000	24.5	430.9
2001	25.4	438.5
2002	29.6	477.1
2003	33.4	508.3

Source: USDA, 2009

Stimulated by high international commodity prices, Brazil's agricultural exports exploded from 2003 to 2008, reaching a record $71.8 billion in 2008, making Brazil the third largest agricultural exporter (behind the United States and the European Union). Agricultural shipments accounted for 36 percent of the country's total exports in 2008 (USDA, 2009).

According to Mario *et al.* (2006), the development of Brazil`s agriculture has had significant spillovers to the rest of the economy. In 2003, the value of the economic activity generated in the industrial and services sectors that were directly linked to agriculture were more than two times larger than the Gross Domestic Product (GDP) of the agricultural sector.

Investment in technological improvements helped to position Brazil among the world`s leaders in new technologies for tropical agriculture. The impact of research and development on total factor productivity gains was substantially larger than the impact of rural credit (Mario *et al*. 2006). Mario *et al,* (2006) also noted that the remarkable development of Brazil`s agriculture has had significant spillovers in the rest of the economy.

2.5 Conclusion

Quite a number of researchers have come to different conclusions on how government expenditure on agriculture or how agricultural output contribute to GDP. Other scholars have taken the view that agriculture expenditure is positively related to economic growth (e.g. Fan, Hazell & Thorat, 2000) while others have shown that a negative relationship exists (Landau 1983). Some also argue that without growth in the non agricultural sector, overall gains to economic growth will be limited.

Advocates of agriculture-led growth (ALG) contend that investment in agriculture and the accompanying creation of infrastructure and institutions in other sectors is a prerequisite for national economic growth and poverty reduction (Schultz, 1964 and Timmer, 1995, 2002). These researchers note that growth in the agricultural sector could be a catalyst for national output growth through its effect on rural incomes and provision of resources for transformation into an industrialised economy.

CHAPTER 3: AN OVERVIEW OF THE AGRICULTURE SECTOR OF ZIMBABWE

3.0 Introduction

Chapter three provides a brief overview of Zimbabwean agricultural sector. The importance of agriculture in the Zimbabwean economy hardly needs any emphasis. Since agriculture provides raw materials for the industrial sector, the growth of the latter and services too are closely dependent on expanding agricultural production. The majority of the Zimbabwean people depend on agriculture for both employment and economic benefits (FAO, 2001). This is because the majority of Zimbabweans live in rural areas and derive their livelihood from agriculture.

In 1980, Zimbabwe inherited a relatively sophisticated and diversified economy by sub-Sahara-African standards, with a developed agricultural sector and inter-sectoral linkages (FAO, 2001). Agriculture, mining and manufacturing sectors accounted for about 15 per cent, 8 per cent and 25 per cent of GDP respectively at independence (FAO, 2001). Moreover, exports were also diverse, based on a variety of agricultural and mineral products. The Zimbabwe economy has, however, experienced an unsteady pattern of growth since independence and the performance of the economy has been declining (FAO, 2001).

3.1 Agriculture in Zimbabwe

According to Mlambo and Zitsanza, (2001) the agricultural sector plays an important role in the development of the Zimbabwean economy, through its impact on the overall economic growth, households' income generation and food security. Zimbabwe produces a diversity of crops and animals ranging from maize, soyabeans, sunflower, barley, wheat, groundnuts, sorghum, coffee, cotton and tobacco to cattle, sheep, goats, pigs and chickens (Rukuni 1994a). Horticultural crops like flowers, fruits and vegetables are also produced for foreign markets. Approximately 33 million hectares of the total land area are reserved for agriculture out of 39,6 million hectares while the rest is reserved for national parks, forests and urban settlements (MLARR, 2001).

The Zimbabwean agricultural sector was dualistic, comprising large and small scale-farmers. Until 2000 the large scale sector comprised about 4000 large scale farmers with sophisticated production systems and occupying 11 million hectares of land primarily located in the areas of high agricultural and economic potential (Tekere and Hurungo, 2003). The communal and small-holder farmers on the other hand occupy areas of lower natural potential in agriculture in terms of rainfall, soils and water for irrigation (Sithole, 1996). Communal farmers generally produce for home consumption while the large-scale farmers produce for commercial purposes. The main agricultural produce from the communal or smallholder farmers include maize, groundnuts, cotton, beans, vegetables, meat and milk while commercial farmers concentrate on cash crops such as tobacco and horticultural products particularly cut-flowers (Juana & Mabugu, 2005).

3.1.1 Production trends of major food crops in Zimbabwe

There was a strong negative trend in aggregate grain production in the country from 1980 to 2002 as shown on Figure 3.1. Grain crops in Zimbabwe include maize, sorghum, pearl millet, finger millet and wheat. The fluctuations in production reflect the vulnerability of Zimbabwe to climatic changes. In 1991/1992 and 1994/1995 agricultural seasons, production was lower than the preceding seasons due to drought. The 1997/1998 production was destabilised by Cyclone Eline that affected the Eastern and Southern parts of Zimbabwe resulting in reduction in crop yields especially sugar, maize, seed cotton and wheat.

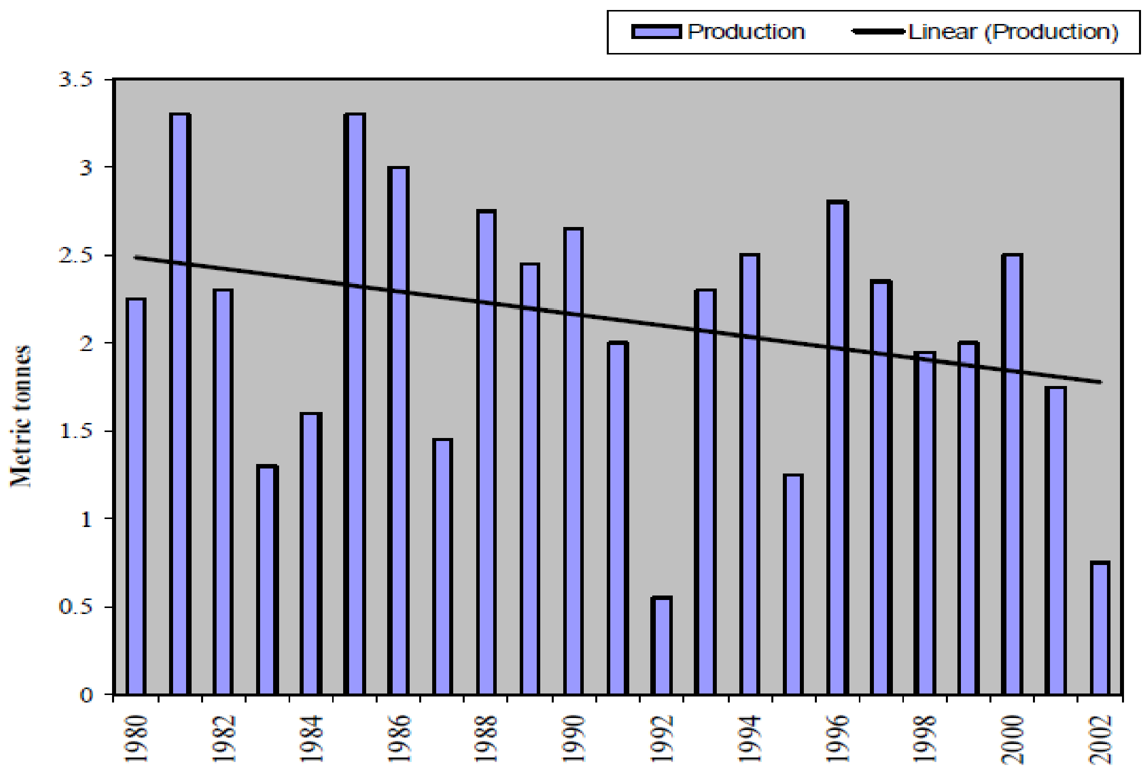

Figure 3.1: Aggregate grain production per ha in Zimbabwe 1980 to 2002

Source: USDA, 2003 (Food Security Assessment, February 2003).

3.1.2 Agricultural trade in Zimbabwe

Agricultural products being exported by Zimbabwe ranges from crops, cereals to meat products (FAO, 2003). The major agricultural exports include tobacco, cotton, tea, coffee, beef, sugar, horticultural products and maize depending on the rainfall pattern. Imports have been growing because of the increased shortages of cereals caused by drought, population growth, increased urbanization and the shift of production from cereals to cash crops (FAO, 2003).

The agricultural sector has been the largest single source of export earnings, contributing 40% to 45%of total exports from 1980 to 1990 (World Bank, 1991). Tobacco is the major single largest foreign currency earner even in serious drought years, such as in 1992 as shown on Table 3.1.

Table 3.1: Principal agricultural exports: 1990-2000 (Z$ million)

Commodity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Flue-Cured Tobacco	718	185	2071	2240	2856	3818	6662	6342	9918	22668	23947
Horticulture	84	192	214	328	238	859	822	2475	2258	2796	2567
Cotton Lint	211	216	139	182	482	393	663	1314	3525	3709	4906
Sugar	160	169	34	460	763	659	1106	1032	1390	1644	1725
Beef	18	37	77	157	164	211	200	274	755	1107	1767
Coffee	147	80	59	33	102	230	263	435	725	562	722

Source: Moyo S (2001)

Tobacco exports increased significantly following the economic structural adjustment programme (ESAP) in 1991 that offered incentive for investment in tobacco production (World Bank, 1991). Similarly, horticulture and beef exports increased in the post-ESAP as farmers diversified from maize production. The expansion in cotton production and the liberation of the textile and lint market led to increase in lint exports.

3.2 Economic growth, agriculture and poverty

According to Mudimu (2003), the economy of Zimbabwe has been characterized by low and volatile growth, foreign exchange shortages, large structural budget deficit and stagnant employment, since the mid 1980s to 2000. These factors, among others, contributed to increase in poverty and vulnerability to food insecurity.

Average GDP growth during 1980-90 only matched the population growth rate of 3.4 per cent (World Bank, 1991). However, it declined from 1990 to 2000 as shown by Table 3.2. The percentage decrease in 2002 was estimated at 15 percent. The decline was mainly caused by the poor performance of main economic sectors such as agriculture and mining.

Table 3.2: Real Gross Domestic Product and Agricultural Product: 1991-2001 (Constant 1990 Prices)

Year	Gross Domestic Product (Z$ million)	Agricultural Production (Z$ million)	Agriculture Sector Contribution to GDP (%)	Annual GDP Growth (%)	Annual Agriculture Sector Growth (%)
1991	19349	3188	16.5	3.2	1.0
1992	19973	3221	15.3	-5.4	-23.2
1993	18884	2474	7.4	1.7	27.1
1994	19212	3145	15,0	5.6	7.3
1995	20293	3375	19,0	-1.0	-7.6
1996	20084	3119	15.3	8.5	19.8
1997	21799	3737	22.2	2.6	2.6
1998	22365	3834	19.1	1.5	4.9
1999	22711	4023	19.5	4.9	6.3
2000	23829	4277	19.4	-4.1	1.6
2001	22855	4345	20.0	1.7	4.3

Source: World Bank (2003)

Table 3.2 shows that there is strong positive relationship between the performance of the agricultural sector and the rest of the economy. Over the period 1991-2001, the agricultural sector grew by an average 4.7 percent per annum. During the drought years between 1992 and 1995, the real growth rate for the sector declined by –23.3 percent and –7.6 percent respectively. Reduced agricultural output in the two years corresponded to negative GDP growth rates of –5.4 percent and –1.0, respectively. Unfortunately, due to the unstable political climate in Zimbabwe, it was difficult to obtain data after 2001. Moreover Figure 3.2 shows that GDP growth is driven by the performance of the agriculture and manufacturing sectors. These two sectors of the economy underperform when drought occurs to drag GDP growth down with them. Figure 3.2 clearly shows the fluctuations in their contributions to GDP. After 2000 they were mainly negative due to the introduction of FTLRP, political instability and adverse weather conditions (World Bank, 2009).

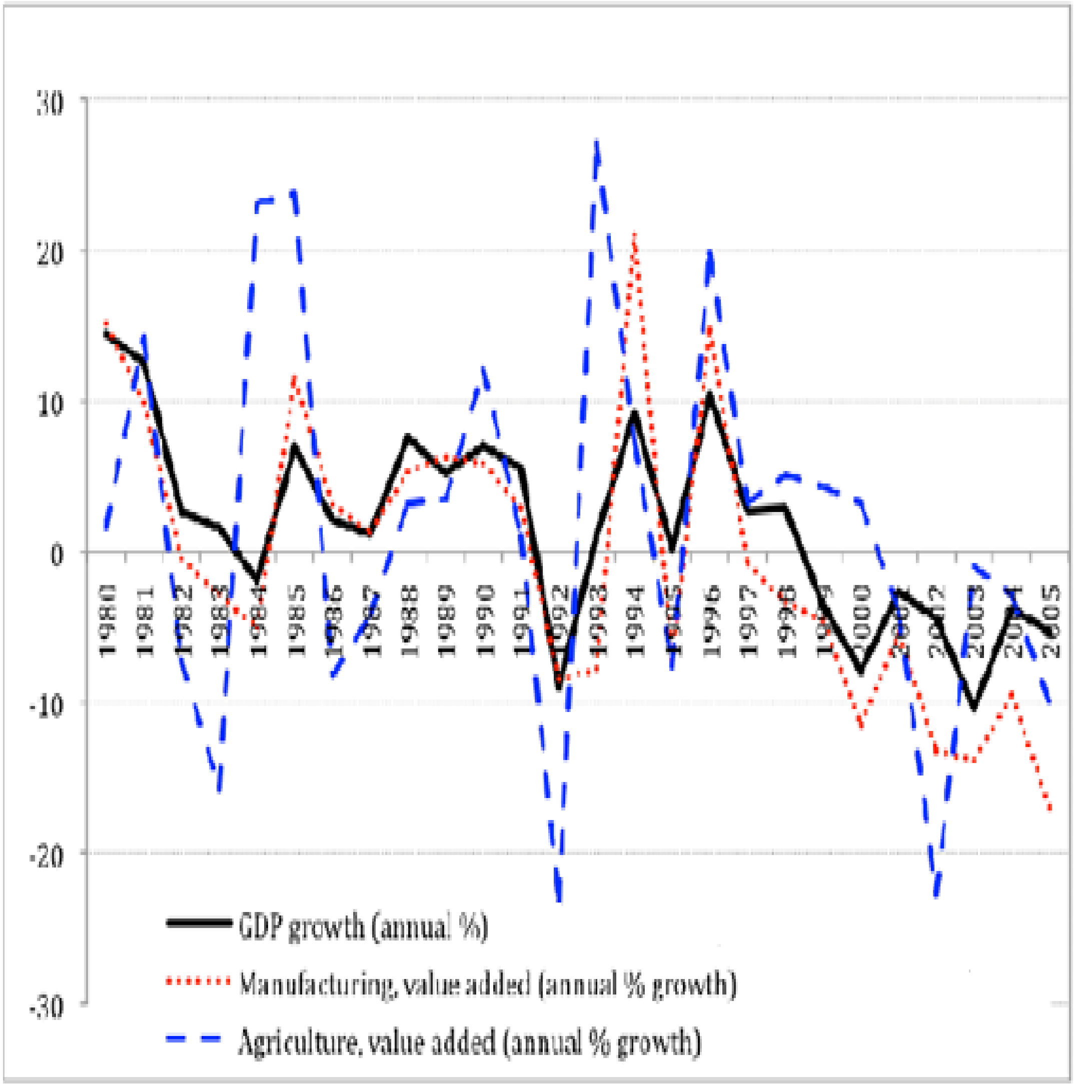

Figure 3.2: Key Economic Trends 1980-2005 in Zimbabwe

Source: World Bank (2009)

3.3 Public credit assistance on agriculture

The funds channelled towards smallholder farmers through Agricultural Finance Corporation, (AFC), a financial lending parastatal, from 1982 to 1999, have been generally on the rise. The value of loans made available to small holder farmers increased from $15 200 million in 1982 to $35 000 million in 1999 (Zumbika, 2000) as shown in Table 3.3. This meant more resources were being made available to smaller holder farmers over the mentioned period.

Table 3.3: Real value of loans granted by AFC to smallholder farmers (1982-1999)

Year	Number of loans	Real value of loans ($000)
1982	37 710	15 200
1983	46 019	19 200
1984	92 962	42 100
1985	88 463	51 400
1986	93 961	58 900
1987	91 094	78 200
1988	82 644	65 200
1989	65 841	52 500
1990	49 883	43 800
1991	35 609	34 700
1992	34 373	47 030
1993	20 979	56 350
1994	17 844	83 790
1995	13 190	114 855
1996	12 736	116 870
1997	5 869	121 305
1998	353	30 696
1999	496	35 000

Source: Zumbika (2000) (Exchange rate (Z$) per US$1--2.2873 at 1990 base year value)

Moreover the statistics obtained from Agribank, a financial lending parastatal, in Table 3.4 shows that more funds were channelled towards small holder farmers. The real value of loans made available to small holder farmers increased from $1 521 million in 2000 to $1 986 million in 2008 (Agribank, 2008). However there was massive decline in number of loans since 1984 due to arrears which were being faced by AFC that were a result of non payment of loans by farmers. This emanated from the problems which were being faced by farmers such as unpredictable markets, barriers and bottlenecks in inputs provision (Bond, 1998).

Table 3.4: Real value of loans granted to smallholder farmers by Agribank (2000-2008)

Year	**Real value of loans ($000)**
2000	1 521 000
2001	1 687 000
2002	1 691 000
2003	1 785 000
2004	1 711 000
2005	1 814 000
2006	1 786 000
2007	1 851 000
2008	1 986 000

Exchange rate (Z$) per US$1--19.6833 at 2000 base year value

However, links between investment, productivity, economic growth and employment are far from automatic (Easterly, 1997). According to Easterly (1997), there is no theoretical or empirical justification for assuming a short-run proportional relationship between expenditure or investment in agriculture and growth.

3.4 Agricultural Research in Zimbabwe

Zimbabwe's agricultural research has been aimed at developing high-yielding varieties (Rukovo *et al*, 1991). Public research was largely aimed at the needs of the commercial sector before independence. Moreover, research efforts tended to concentrate on individual components of crop production, that is plant breeding, plant nutrition, cropping techniques and plant protection, but with hardly any emphasis on farming systems research. The main target group was the large scale commercial farmers though small scale farmers benefited from some research efforts (World Bank, 1991).

When Zimbabwe attained independence, there was a shift in the focus of government research to the small scale sector, although with a decline in the total allocation to research from 10.8 per cent prior to independence to on average 7.9 per cent of agricultural expenditure in the 1980s (Rukovo *et al*, 1991). As a result, most of the activities, in particular the on-farm research, suffered seriously because of shortages of funds (World Bank, 1991). Consistent government support for agricultural research has declined since independence because it was difficult to successfully sell the importance of agricultural research to senior policy-makers (Tawonezvi, 1994). Many experienced personnel also left, leading to the "slow erosion of one of Zimbabwe's national treasures, its public agricultural R & D system" (Eicher 1995).

3.5 Agricultural Extension

The extension services at independence were not properly organised to meet the policies of the new government (Rukuni, 1994a). There were public extension systems for large scale commercial farmers and another for small-holders of which neither was adequately equipped to service both agricultural sectors. These two systems were unified in 1981 to form the Department of Agricultural, Technical and Extension Services (Agritex). Its new focus was on the provision of technical and extension services to the smallholder sector in order to redress past inadequacies, and to provide service to resettlement areas that were being established.

According to Rukuni (1994a), government's financial support to extension increased in real terms but there were some considerable fluctuations in real terms. Most of the increase was attributable to wages and salaries and subsidies mostly for extension services (World Bank, 1991). In order to enhance research-extension linkages the two departments of research and extension were unified in 2000 to form the Department of Agricultural Research and Extension (AREX). AREX was born after the amalgamation in 2002 of research and extension functions in the former departments of Agritex and Research and Specialist Services. Makhado (2003) noted that this coincided with the peak of the Fast Track such that its capacity and its relevant experience could not meet the research and extension demands created by the influx of new farmers.

3.6 Fast Track Land reform in Zimbabwe

The unbalanced access to land compelled the government of Zimbabwe to adopt fast track land reform programme in 2000 as explained in section 1.7.3. The main long-standing objectives of this program were 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, for example (Kinsey, 1999).

According to Chimhowu & Woodhouse, (2008) the key elements of the Fast Track Land Reform were:

- Compulsion. Once land was targeted it was speedily acquired. Often farms were invaded and occupied before the legal processes even got under way and there was little recourse to the courts of law for protection under private property laws.
- Simultaneous resettlement in all provinces meant that this was done at a scale never seen before.
- Demarcation and resettlement on acquired land. Technocrats were encouraged to use alternative field methods to allow for quick demarcation and resettlement. This was often a big ask for most planning professionals who for years had worked in a system that allowed them to take as much time as was required to get it right.
- Limited basic infrastructure and support. This was resettlement on a shoestring budget and so the settlers moved onto land before the social and economic infrastructure was in place. This made the initial process of getting started quite difficult.

3.7 Poverty in Zimbabwe

The available data suggest that poverty in Zimbabwe is predominantly rural (Alwang *et al,* 2001). For instance poverty incidence in rural areas was 31 percent in 1990-91 as compared to urban areas with 10 percent in 1990-91 (World Bank 1995). This is not surprising given that up to 70 per cent of the population still reside in rural areas. They are mostly smallholder farmers living off the land. Alwang *et al,* (2001) established that there are about 1.12 million smallholder farms occupying nearly 75 per cent of all agricultural land. A major cause of the poverty in rural areas is low incomes from farm livelihood activities due to a combination of productivity challenges and poor market returns (Alwang *et al*, 2001).

3.7.1 Zimbabwe towards poverty reduction

Zimbabwe signed up to the Millennium Development Goals (MDGs) in September 2000 which is a strategy to achieve sustainable development (UNDP, 2008). Zimbabwe's priorities under first MDG was to halve poverty by 2015 and the need to consolidate land reform into agrarian reform that embraces issues of productive resources, provision of inputs, market access and infrastructure (UNDP, 2008). The country`s priority under this goal was to halve by 2015 the proportion of people with income levels below the Consumption Poverty Line and also halve by 2015, the proportion of people living in poverty as measured by the Human Poverty Index (HPI). However, little progress has been made on Goal One of reducing poverty (UNDP, 2008).

Economic growth translates into better lives for a majority of Zimbabweans and also that development efforts are crafted in a way that ensures that the benefits of economic growth will improve the welfare of those living in poverty. Zimbabwe's first MDG is to reduce consumption poverty from 80% (in 2002) to 40% by 2015, and food poverty from 68% to 34% over the same period (UNDP, 2008).

3.7.2 Prioritising Agriculture in Zimbabwe to reduce poverty

According to Alwang *et al*, (2001) there has always been a link between productivity growths in agriculture, aggregate GDP growth and welfare in Zimbabwe. What happens to agriculture has influenced manufacturing and has impacted directly and indirectly on welfare. It is clear then that an agriculture-led strategy, by raising rural incomes, could be the most direct way to address poverty, and could indirectly enhance employment growth.

Some main reasons for the prioritisation of the agricultural sector in Zimbabwe include that the majority of Zimbabweans still reside in communal and original resettlement areas and this is where most of the poor are to be found. There are over 700,000 families in these areas and nearly half of them reside in regions 1-3 where agro-ecological potential is high enough to engage in arable agriculture (Chimhowu & Woodhouse, 2008).

3.8 Conclusion

At independence in 1980, the agricultural sector was characterized by duality and a racially skewed land ownership pattern (Shaw 2003). Smallholder farmers had limited access to both credit and extension services before independence. This compelled the government to give more support services to smallholder farmers in the form of credit assistance and extension and to adopt fast track land reform programme in 2000 to reduce land ownership imbalances.

Zimbabwe signed up to the Millennium Development Goals (MDGs) in September 2000 which is a strategy to achieve sustainable development (UNDP, 2008). The first MDG for Zimbabwe is to reduce consumption poverty from 80% to 40% and food poverty from 68% to 34% from 2002 to 2015 (UNDP, 2008). Poverty in Zimbabwe is predominantly rural given that in 1990-91 rural poverty was 31 percent as compared to urban areas with 10 percent (World Bank, 1995).

CHAPTER 4: STUDY AREA AND METHODOLOGY

4.0 Introduction

This chapter describes the study area and the methodological issues. The natural resources of an area are among the major determinants of its production potential. These natural resources together with human and capital resources (socio-economic factors) dictate the viability of the agricultural enterprise and the economic development of the area (Sebotja, 1985).

4.1 Study area

The study was carried out in Zimbabwe which is a land locked country in Southern Africa. The location of the study area is shown on Figure 4.1 below. The country has a total land area of 39, 6 million hectares.

Figure 4.1: Map of Zimbabwe

Source: www.state.gov (2002)

4.1.1Population of Zimbabwe

The population of Zimbabwe at independence was 7.3 million people (CSO, 2002). It reached 10.4 million in 1992, and 11.6 million in 2002 (CSO, 2002). The population structure in 2002 is illustrated in Figure 4.2 below. It indicates that there is a dominance of young people which has been a familiar characteristic since independence. This indicates a high dependency ratio problem which has adverse effects on income distribution and living standards.

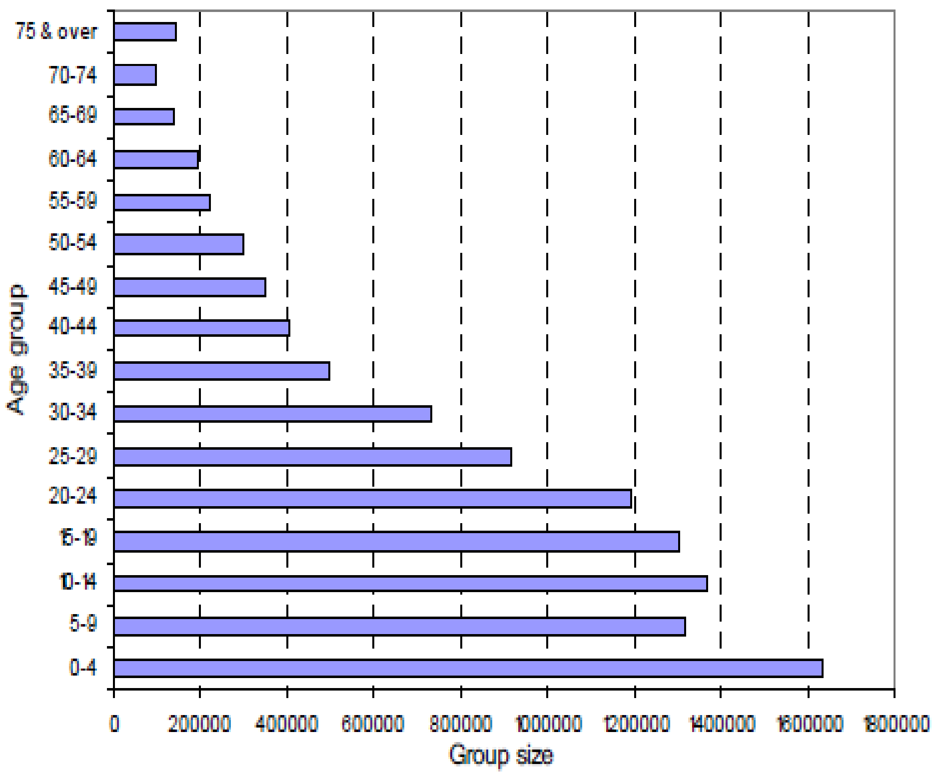

Figure 4.2: Population structure, 2004

Source: Statistics from the CSO (2002)

4.1.2 Population density

With an area of 390.580 square kilometres, Zimbabwe has a population density of 30 persons per square kilometre. The distribution of the population by province for 2002 indicates that Harare has 16% of the total population and is the most populous province. Manicaland and Midlands provinces are next with 13% each, followed by Masvingo with (11%), Mashonaland East (10%), Mashonaland Central (9%), Matebeleland North (6%), Bulawayo (6%) and Matebeleland South (6%). Figure 4.3 shows the distribution of population densities in Zimbabwe.

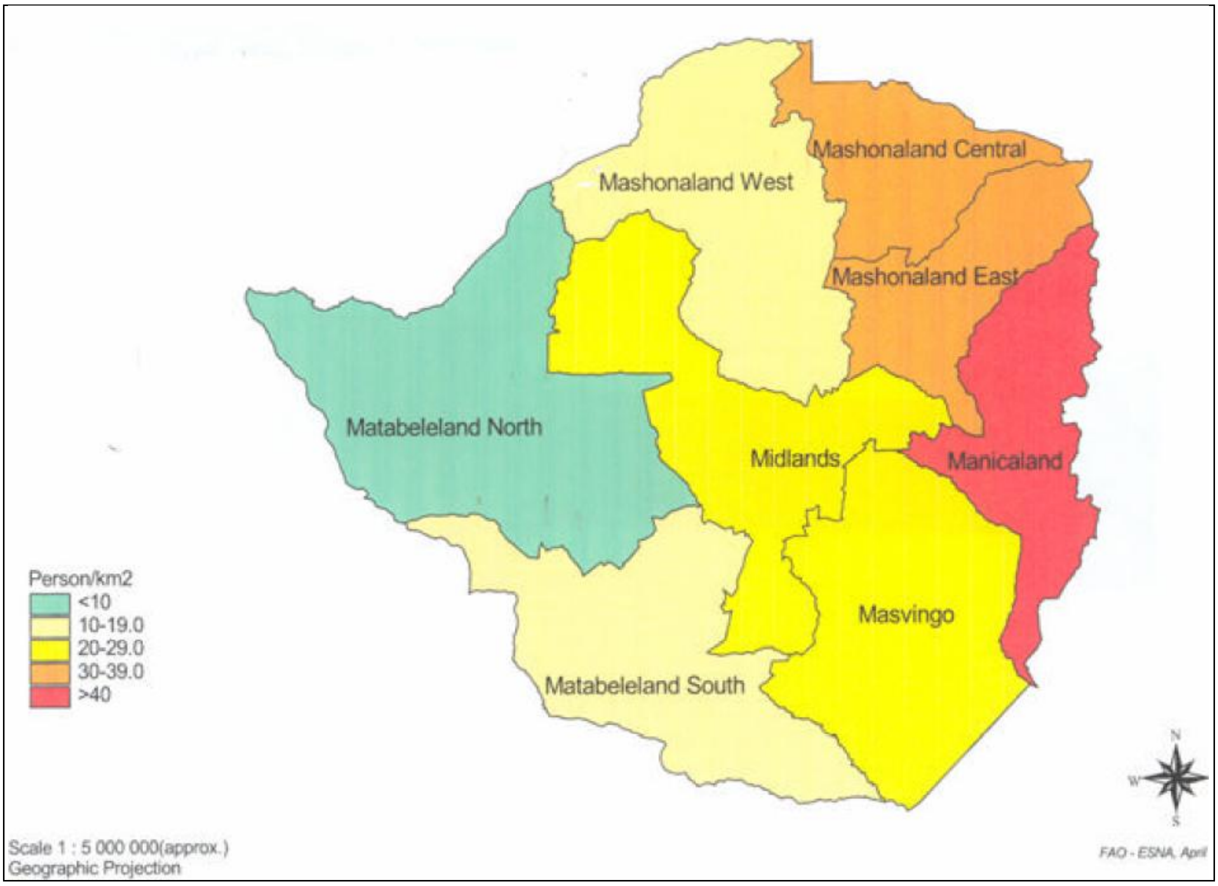

Figure 4.3: Population density by region

Source: FAO (1999)

4.1.3 Rainfall Pattern and Soils in Zimbabwe

The reliability of rainfall increases with altitude, and from south to north. Coefficients of variability range from >40% in areas south of Bulawayo to <20% in some parts of the Highveld and Eastern Highlands (Mushunje, 2005). Rainfall is highest on the Highveld with an average annual precipitation of up to 1 020 mm (40 inches) while the Middleveld receives 410 mm to 610 mm (16 to 24 inches) and the Lowveld receives less than 400 mm (12 inches).

Zimbabwe's soils are mostly sandy. Heavier loamy and clay soils are found in patches across the country. Granitic sandy soils are most common in communal areas. These are often highly leached and thus depleted of base nutrients (Muir, 1997). Sandy soils are ideal for tobacco production but are liable to rapid nutrient depletion when cultivated intensively for low value food crops (that support only limited inorganic fertiliser usage).

The land in Zimbabwe is divided into five natural regions on the basis of soil type and climatic factors (refer to Figure 4.4). The bulk of Mashonaland (West, East and Central), Midlands and Manicaland Provinces are under regions I, II and III, while Matabeleland (North and South) and Masvingo Provinces are under natural regions IV and V. The three Mashonaland Provinces constitute the breadbasket of the country. Zimbabwe's farming sector can produce, and has produced in the past, exportable surpluses of maize and certain other food crops. But severe constraints on prime land use have resulted in less than full capacity utilization of its natural resources.

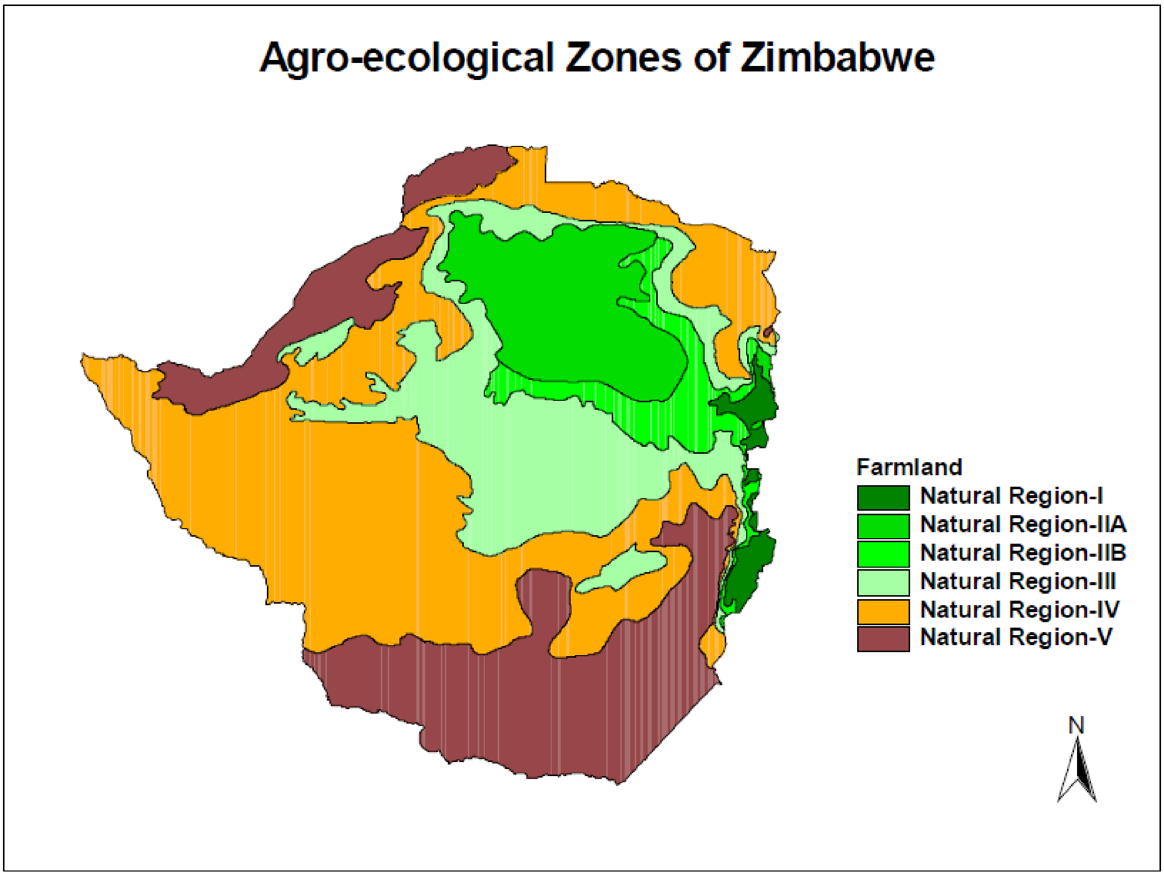

Figure 4.4: Agro-ecological zones in Zimbabwe

Source: FAO (1999)

About 38 per cent of the country was deemed to have natural farming potential (Bell & Roberts 1991). Region I was seen as suitable for specialized and diversified farming, especially activities related to forestry, fruit and intensive livestock production. Region II was deemed suitable for diversified farming that includes production of flue-cured tobacco, maize, cotton, sugar, beans, coffee, sorghum, groundnuts, seed maize, barley and related horticultural crops. It was also seen to have potential for irrigated winter wheat, poultry, beef and dairy production. Most parts of Natural Region III with suitable terrain were seen as being marginally suitable for semi-intensive farming especially the production of grains and livestock. The largest number of rural residents is found in Natural Region IV (NRIV) (just over 2.5 million in 2002), and it is also clear that the largest number of rural poor is found in this natural region (Central Statistical Office, 2003).

Moreover, the Central Statistical Office (2003) also found that the highest incidence of rural poverty to be in Matabeleland North (88.2 per cent of households), followed by Matabeleland South (86.6 per cent) and Masvingo (84.0 per cent). As Table 4.1 suggests, poverty follows types of farming system and consequently natural or regional agro-ecological conditions.

Table 4.1: Poverty by Natural Region

Natural Region	Prevalence (%) of	
	Poverty	Extreme Poverty
I	62.4	36.2
II	71.6	41.2
III	77.3	51.4
IV	81.6	57.2
V	79.5	55.7

Source: Central Statistical Office, (1998)

4.1.4 The principal economic activities in Zimbabwe

The key sectors in Zimbabwe are agriculture, mining, manufacturing and tourism (FAO, 2003). Major minerals are asbestos, platinum, nickel, copper, coal and chrome. The export of gold accounted for US$231 millions in 1997, compared to US$532 million for tobacco (main export crop) and US$642 million for manufactured goods (Muir, 1997).

According to Mhone (2000), the Zimbabwean economy exhibits segmentation and co-existence of a regulated formal sector alongside a loosely regulated non-formal sector (consisting of the communal subsistence sector and the informal sector) typical of most post-settler colonial states in Southern Africa in 2000. Segmentation refers to the existence of an urban and a rural segment of the economy. The urban economy is mostly characterised by manufacturing and value addition while the rural sector is mostly about raw material production especially agriculture (World Bank, 2009). Agriculture contributed 18% to Gross Domestic Product in comparison to other sectors such as mining, manufacturing, electricity, construction and services which contributed five percent, twenty seven percent, three percent, three percent and 47 percent respectively to the GDP in 2005 as illustrated on Figure 3.1 below (Juana and Mabugu, 2005).

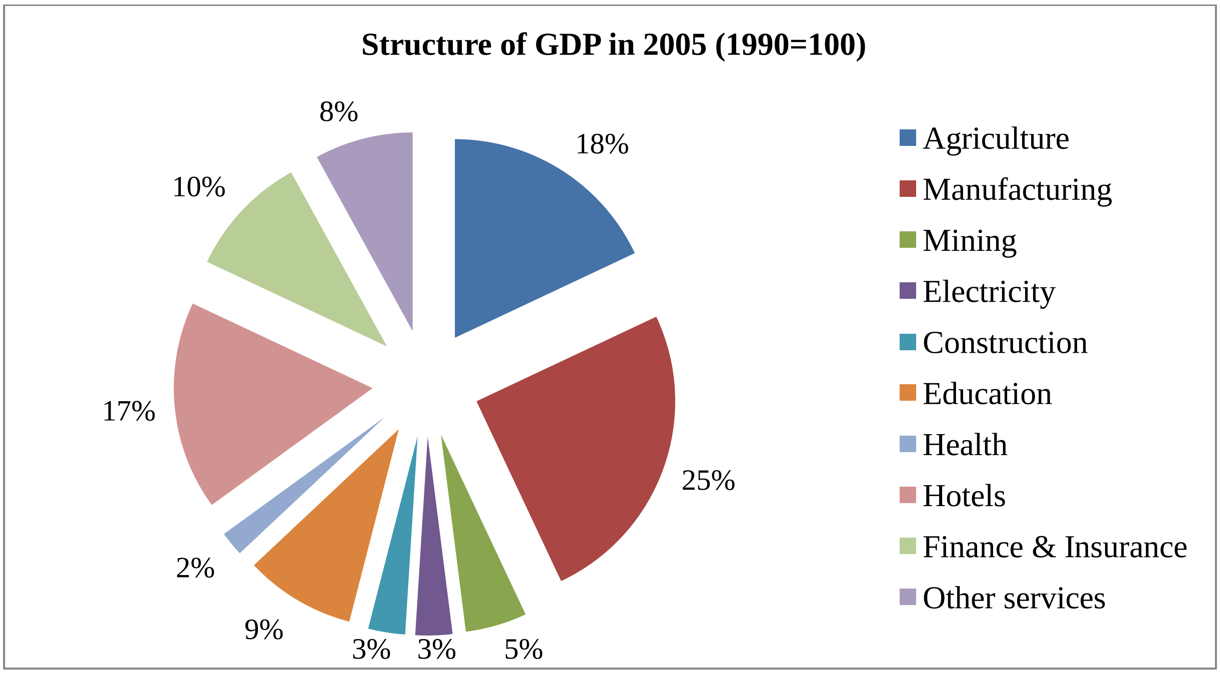

Figure 3.1: Structure of GDP in 2005

Source: Juana & Mabugu (2005)

Tourism was noted as one of the most important sectors of the Zimbabwe economy. Tourism was one of the fastest growing sectors of the economy since 1980 but since the year 2000 it experienced a slump due to political and other macro-economic instabilities (FAO, 2003).

Economic performance is hampered by deteriorating infrastructure, constraining investment and eroding competitiveness (FAO, 2003). Roads, air transport, rail network and electricity, in particular need attention. Urban water supplies are also inadequate. Distance to markets and poor road infrastructure act as a disincentive to the productivity of the rural farmers (World Bank, 2003).

4.2 Data sources and type

The study was carried out using secondary data. All the data was drawn from the Central Statistics Offices (CSO), Ministry of Finance (MOF) and Ministry of Agriculture (MOA) of Zimbabwe. In this study annual time series data was used covering the period from 1980 to 2009. The variables under consideration are real Gross Domestic Product, real government agricultural expenditure on extension, real government agricultural expenditure on research and development, real government agricultural expenditure on credit assistance, real government expenditure on non agriculture, real investment expenditure, real consumption expenditure and a dummy for FTLRP. All other variables are expressed in monetary terms except FTLRP for which a dummy variable is going to be used. Poverty data was obtained from CSO where official statistics data is obtained in Zimbabwe. Gross Domestic Product (GDP) is a dependent variable, whereas, others are explanatory variables.

4.3 Model specification

4.3.1 Analysing the impact of government agricultural expenditure on economic growth

Fan, Hazell and Thorat (2000) carried out a study on the relationship between government spending, agricultural growth and economic growth in India. They used data for the period 1965 to 1988 using consumption, investment, net exports and government spending on agriculture variables. Fan, Hazell and Thorat (2000) used the following regression model;

$$\text{Log GDP} = \beta_0 + \beta_1 \text{ Log GA} + \beta_2 \text{ Log GNA} + \beta_3 \text{ Log I} + \beta_4 \text{ Log C} + \beta_5 \text{ Log XM} + u$$

Where β_0 is a constant, β_1, β_2, β_3, β_4 and β_5 are parameters. Log GDP is the logarithm for Gross Domestic Product. Log GA, Log GNA, Log I, Log C and Log XM are the logarithms for government expenditure on agriculture, government expenditure on non agriculture investment expenditure, consumption expenditure and net exports expenditure respectively. The error term (u) is used to capture errors and misses in the relationships. The study shows that there is a positive relationship between public spending on agriculture and economic growth. Consumption, public spending on non agriculture, net exports and investment also showed a positive relationship to GDP.

Eyo (2008) used a production function to assess the effect of the macroeconomic policies on agricultural output growth. The method of data analysis used was the multiple regression analytical technique (Ordinary Least Square Procedure). Consequently, the model postulates that the index of agricultural production is a function of the indicators of the macroeconomic environment, namely; foreign exchange rate (F), nominal interest rate (N), credit to the agricultural sector (A), world prices (W), government expenditure on agriculture (G), rate of inflation (L), private investment in agriculture (P) and time (T).

Consequently, Y = f (F, N, A, W, G, L, P, T)

The implicit form of the model is given as:

$$Y = a + b_1 F + b_2 N + b_3 A + b_4 W + b_5 G + b_6 L + b_7 P + b_8 T + u$$

Where

Y = Index of agricultural production

F = Foreign exchange Rate

N = Nominal Interest rate on loans

A = Credit to Agricultural sector

W = World Prices of agricultural produce per tonne

G = Government Expenditure

L = Inflation Rate in Percentage

P = Foreign private Investment

T = Time trend representing technological change overtime.

a = Intercept

$b_1 – b_8$ = Coefficients,

u = Stochastic disturbance term.

For this study a modified log linear growth model used by Fan, Hazel and Thorat (2000) will be adopted. This is because it is the most appropriate model to ascertain the relationship between government agricultural growth and economic performance in the country since it shows the relationship of the resources (expenditure) used by government on functions of agriculture and its contribution to the overall economy (GDP). However data for exports and imports had too many gaps, for instance the data for the years 1980 to 1985 and 2003 to 2009 was not available and therefore the variables were omitted in the model. The log linear regression model is as follows:-

$$\text{Log GDP} = A_0 + A_1 \text{Log AE Ext} + A_2 \text{ Log AE R\&D} + A_3 \text{ Log AE CA} + A_4 \text{ Log NAE} + A_5 \text{ Log I} + A_6 \text{ Log C} + A_7 \text{ Log FTLRP} + u$$

Where Log GDP is the logarithm for Gross Domestic Product (GDP), A_0 is a constant and $A_{1,}$ $A_{2,}$ $A_{3,}$ $A_{4,}$ A_5, A_6 and A_7 are parameters to be estimated. Log AE ext, Log AE R&D, AE CA, Log NAE, Log I and Log C are the logarithms for government agricultural expenditure on extension, government agricultural expenditure on research and development, government agricultural expenditure on credit assistance, government expenditure on non agriculture, investment expenditure and consumption expenditure respectively. FTLRP is the dummy variable for Fast track land reform programme and the letter *u* represents an error term. The regression analyses was performed using Econometric-views 7 (E-views 7) statistical package.

4.3.2 Variables used in the model

Gross Domestic Product (GDP) is the total of all expenditures on final goods and services produced per period of time usually a year (Lipsey & Crystal, 1999). Data for GDP was obtained from CSO.

Government agricultural expenditure (AE) is the amount of money which is allocated to the agricultural sector by the government (MOF, 2009). Government agricultural expenditure is composed of government expenditure on extension (AE Ext), research and development (AE R&D) and credit assistance (AE CA). The overall impact of government agricultural expenditure on GDP is expected to be positive since it is an injection into the circular flow of income. However literature shows that the relationship is mixed. It can be positive, negative or constant.

Government expenditure on non agriculture (NAE) encompasses the amount of money which is allocated to other sectors besides agriculture. In Zimbabwe, these sectors include mining, manufacturing, health, education, services, electricity, construction and tourism. The overall impact of government expenditure on non agriculture on GDP is expected to be positive if increased expenditure is as a result of increase in taxes. However if the increase in expenditure non agriculture sector is as a result of diversion of taxes from agriculture (with higher elasticity of production than non agriculture sector) then the overall impact will be negative.

Investment expenditure (I) is expenditure on capital goods. It includes gross private investment, which is the value of output retained by the business sector, additions to the stock of residential housing and net change in business inventories. Increase in investment expenditure is expected to increase GDP through the multiplier since it is an injection into the circular flow of income. However investments affect production over time, and growth is a gradual process.This means that there is a lag experienced between investment and the eventual economic benefits. A positive relationship between investment expenditure and GDP is expected.

Consumption expenditure (C) is expenditure on goods and services purchased by consumers for consumption uses. If individuals increase their levels of consumption spending at each level of disposable income, the level of aggregate expenditure increases. If the amount of consumption expenditure decreases, then GDP decreases, assuming they are not saving or investing in the other sectors. Therefore consumption expenditure is expected to be positively related to GDP (Lipsey & Crystal, 1999).

The dummy variable of Fast track land reform programme (FTLRP) was included to capture the changes in land ownership patterns in the country. The details of the FTLRP have already been well-covered in Chapter 1 and 3. However data on actual transfers are still not available in a form that can be easily obtained and analyzed at the national level. A dummy variable, which assigns a zero (0) value to periods prior to the implementation of FTLRP in 1980 to 1999 and a value of 1 to the period from its inception (2000) to date, was incorporated to cater for FTLRP.

The error term (u) is used to capture errors and misses in the relationships. The error term is justified on omissions of the influence of innumerable chance events and measurable errors. A constant (A_0) is included since this ensures that the model will be unbiased that is the mean of the residuals will be exactly zero (Gujarati, 1995).

4.4 Data analysis techniques

4.4.1Ordinary Least Squares (OLS)

The method of Ordinary Least Squares (OLS) was used in the determination of the regression coefficient and other statistical parameters required in analysis. This method gives Best Linear Unbiased Estimates (BLUE) that is efficient (Gujarati, 1995). Simple log linear regression model was used to analyse the time series data which was collected. Interpretation of parameters will also be essential to analyse the contribution of government expenditure on agriculture, consumption expenditure and investment expenditure to GDP.

4.4.2 Standard Errors (SE)

A standard error is the standard deviation of the dependant variable about the estimated regression line and it is often used as a summary measure of the goodness of fit of the estimated regression line (Gujarati, 1995). The accuracy of a model depends on how close the explanatory values are to the actual values of the dependent values. If the model is doing a good job in predicting the actual values, the error will be relatively small (Gujarati, 1995). If we have correctly modelled the data, what are left over are simply the erratic fluctuations (errors) in a time series that have no definable pattern. Often these fluctuations are caused by outside events that in themselves are not predictable (Gaynor & Kirkpatrick, 1994). If the variables; real agriculture expenditure by the government, real consumption expenditure and real investment expenditure correctly explains the changes in real Gross Domestic Product then the standard error will be relatively small.

4.4.3 Coefficient of determination

Coefficient of determination is a measure which was employed to ensure the goodness fit of the regression equation to the data. The better the fit of the line, the closer the R^2 will be to 1. In other words, if the regression line provides a perfect fit, the variance in the data will be completely explained (Gaynor & Kirkpatrick, 1994). If the variables real agriculture expenditure by the government, real consumption expenditure and real investment expenditure correctly predicts the changes in real Gross Domestic Product then R^2 will be close to 1.

4.4.4 Test Statistic (t- Statistic)

The t-statistic was used to determine whether the estimated coefficients of individual explanatory variables used are statistically significant or not. A statistic is said to be statistically significant if the value of the test statistic lies in the critical region, that is absolute value of more than 2 (Gujarati, 1995). In this case the null hypothesis is rejected. By the same token, a test is said to be statistically insignificant if the value of the test statistic lies in the acceptance region. In this case the null hypothesis is not rejected. If the level of significance is set at 0.05, then the null hypothesis can be rejected if the t-value computed exceeds 2 in absolute value as depicted by the rule of thumb (Gujarati, 1995).

This means that if the t- value computed for a variable such as real government expenditure on agriculture exceeds 2 then the variable will be significant in explaining changes in real Gross Domestic Product at 5% level of significance.

4.4.5 Probability value (p- Value)

The p-value was used to compliment the t-statistic. It has the advantage that it gives the level of significance of estimated coefficients of variable in explaining GDP. In significance testing, the probability value (sometimes called the p value) is the probability of obtaining a statistic as different or more different from the parameter specified in the null hypothesis as the statistic obtained in the experiment (Gaynor & Kirkpatrick, 1994). If the probability value is below the significance level then the null hypothesis is rejected. Traditionally, the null hypothesis is rejected if the probability value is below 0.05 (Gujarati, 1995).

If the p- value of a variable such as real government expenditure on agriculture is less than 0.05 then the variable will be significant to predict variations in real Gross Domestic Product at 5% level of significance.

4.4.6 Autocorrelation

To determine if the fitted model in this study fully describe the pattern of relationship between the explanatory variables (government expenditure on agriculture, investment expenditure and consumption expenditure) and the dependent variable (GDP) there is need to test for autocorrelation. It is defined as the correlation between members of series of observations ordered in time. The Classical Linear Regression Model (CLRM) assumes such a relationship is not present in a disturbance term, that is expectation (u_i, u_j) = 0 for all $_i$ not equal to $_j$. If the expectation is equal to zero, there is autocorrelation. The problem with autocorrelation is that the estimators though unbiased are no longer efficient as they no longer have minimum variance. The large variance means that tests for significance are no longer powerful and will give large confidence interval. It will be tested using the Durbin Watson *d* *statistic* Test (Gujarati, 1995). It is therefore necessary to determine if the time series is stationary because time series data usually follow a particular trend (Gujarati, 1995).

In their derivation, Durbin and Watson (1950), the DW statistic in the neighbourhood of the value 2 indicates the absence of serial correlation. The closer *d* is to zero, the greater the evidence of positive serial autocorrelation. However if DW statistic is closer to 4, then there is greater evidence of negative serial autocorrelation (Gujarati, 1995).

4.4.7 Unit root tests

It is important to determine if the time series is stationary because time series data usually follow a particular trend and therefore the need to de-trend it otherwise spurious results will be obtained (Gujarati, 1995). Non-stationarity of time series data means that predictions based on them have little stability over time and therefore of little predictive value. If the series are non-stationary, standard econometric techniques can lead to misleading results.

According to theory, a standard normal distribution is one that has a zero mean and variance of one (Davidson and MacKinnon, 2004). The violations of this normality condition identified as non-stationary series are purely random series. Khatri (1994) considers that the two most important questions to ask when working with time series data that are prone to the non-stationarity are; what is their order of integration, and what is the required transformation for stationarity? Plotting the actual values of the variables against time shows how the variables are trending.

A stochastic process is said to be stationary if its mean and variance are constant over time and covariance between the two time period and not actually the time at which the covariance is computed. If a time series is stationary, its mean, variance and auto variance at various lags remain the same no matter at what point we measure them. This study used the unit root test to establish the stationarity of the time series in question. A stochastic process can be written as;

$Y_t = p\, Y_{t-1} + u_t$; where $-1 < P < 1$. Subtracting Y_{t-1} from both sides

$Y_t - Y_{t-1} = (p-1)\, Y_{t-1} + u_t$

$\Delta Y_t = \partial\, Y_{t-1} + u_t$ where $\partial = p-1$ we therefore estimate the last equation and test the null hypothesis that $\partial = 0$, that is $p = 1$. If this is the case, then a unit root is present and the series is non stationary. If ∂ is negative, then we have stationary time series. Finally, the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and/or Perron-Phillip tests are applied to the data to either support or refute indications provided by the foregoing procedures. To correct for stationarity, we transform the equation by taking the first differences (Gujarati, 1995).

This study uses values of GDP, government agricultural expenditure, consumption expenditure and investment expenditure data from 1980 to 2009 which is time series data and therefore the need to test for stationarity for the variables. In this study the Augmented- Fuller Tests was used to test each individual series.

According to Gujarati (2003), the Dickey-Fuller test, as with other unit root tests, has its own weaknesses. Even if the test seems to give a precise answer about stationarity or non stationarity, this is not the case. The test is weak in its inability to detect a false null hypothesis. Brooks (2002) and Gujarati (2003) show that unit root tests have low power if the process is stationary but with a root close to the non stationary boundary. This lack of power means that the Dickey-Fuller test fails to detect stationarity when the series follows a stationary process (Thomas, 1997). This could occur either because the null hypothesis was correct or because there is insufficient information in the sample to enable rejection. There are several ways of solving this problem, including the use of cointegration.

4.4.8 Cointegration

Granger and Newbold (1987) argued that if there is a long run relationship between two variables then no matter how much they fluctuate over time the difference between the two series must remain relatively constant. The tests for cointegration are similar to those used to test for the order of integration, but they are based on the residuals. OLS ensures that the co integrating regression will give residuals having the smallest possible sample variance, so the critical values must be adjusted (Granger & Newbold, 1987).

Brooks (2002) explained that all the series of interest should be integrated of the same order, preferably $I(1)$. The reason for this is that if the series display level stationarity, or are $I(0)$, standard regression and statistical inference could be carried out, since there would be no problem of spurious regressions. On the other hand, if they are integrated of different orders the norm used to difference all the variables to be included in regressions. The remaining cases of both $I(1)$ or both $I(2)$ variables is the case of interest here, because an estimation of regressions based on first differenced variables could result in the problem of misspecification and loss of long run information embodied in the data. However, Harris (1995) shows that it is not necessary for all the variables in the model to have the same order of integration, especially if theory suggests that such variables should be included. Thus, a combination of $I(0)$, $I(1)$ and $I(2)$ can be tested for cointegration.

The majority of the cases shows that if two variables that are $I(1)$ are linearly combined, their combination would also be $I(1)$ (Granger & Newbold, 1987). More generally, if variables with differing orders of integration are combined, the combination would have an order of integration equal to the largest (Brooks, 2002). The exception to this rule is when the series are cointegrated. Brooks shows that a linear combination of $I(1)$ variables will only be $I(0)$, in other words stationary, if the variables are cointegrated. Although both variables may be trending upward in a stochastic fashion, they may be trending together. As Gujarati (1995) puts it “the movement resembles two dancing partners, each following a random walk, whose random walks seem to be in unison”. Therefore, synchrony is intuitively the idea behind cointegrated time series. In other words, cointegration means that despite being individually non stationary, a linear combination of two or more time series can be stationary.

There are various practical economic implications for cointegration. Many time series are non stationary individually, but move together over time, that is, there are some influences in the series which imply that the two series are bound by some relationship in the long-run. Brooks (2002) further shows that a cointegrating relationship may also be seen as a long term or equilibrium phenomenon, since it is possible that cointegrating variables may deviate from the relationship in the short run, but their association would return in the long-run. This concept is particularly important in this study where we seek to identify and distinguish those variables that have a long term relationship with the real exchange rate.

There are several ways of testing for cointegration. The tests can be categorised into two broad categories: those that are residual based, such as the Engle-Granger approach and those that are based on maximum likelihood estimation on a VAR system, such as the Johansen method. The former category of the tests for cointegration suffers from numerous problems, such as the usual finite sample problem of a lack of power in unit root and cointegration tests, inability to perform any hypothesis tests about the actual cointegrating relationships and their inability to detect more than one cointegrating relationships that may exist in a model (Harris, 1995 & Brooks, 2002). Seddighi *et al*, (2000) show that if there is more than one cointegrating relationships, the Engle-Granger approach would produce inconsistent estimates. Thus, in light of these problems of Engle-Granger approach, cointegration in this study will be tested using Johansen methodology.

4.4.9 Testing for cointegration using Johansen's methodology

Johansen's methodology takes its starting point in the vector autoregression (VAR) of order *p* given by

$$\mathbf{y}_t = \boldsymbol{\mu} + \mathbf{A}_1 \mathbf{y}_{t-1} + \cdots + \mathbf{A}_p \mathbf{y}_{t-p} + \boldsymbol{\varepsilon}_t , \qquad (1)$$

where $\mathbf{y}_t$ is an nx1 vector of variables that are integrated of order one (commonly denoted I(1)) and $\boldsymbol{\varepsilon}_t$ is an nx1 vector of innovations. This VAR can be re-written as

$$\Delta\mathbf{y}_t = \boldsymbol{\mu} + \boldsymbol{\Pi}\mathbf{y}_{t-1} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_i \Delta\mathbf{y}_{t-i} + \boldsymbol{\varepsilon}_t \qquad (2)$$

where

$$\boldsymbol{\Pi} = \sum_{i=1}^{p} \mathbf{A}_i - \mathbf{I} \text{ and } \boldsymbol{\Gamma}_i = -\sum_{j=i+1}^{p} \mathbf{A}_j . \qquad (3)$$

If the coefficient matrix Π has reduced rank $r<n$, then there exist nxr matrices α and β each with rank r such that $\Pi = \alpha\beta'$ and $\beta' y_t$ is stationary. r is the number of cointegrating relationships, the elements of α are known as the adjustment parameters in the vector error correction model and each column of β is a cointegrating vector. It can be shown that for a given r, the maximum likelihood estimator of β defines the combination of y_{t-1} that yields the r largest canonical correlations of Δy_t with y_{t-1} after correcting for lagged differences and deterministic variables when present. Johansen (1995) proposes two different likelihood ratio

tests of the significance of these canonical correlations and thereby the reduced rank of the Π matrix: the trace test and maximum eigenvalue test, shown in equations (4) and (5) respectively.

$$J_{trace} = -T \sum_{i=r+1}^{n} \ln\left(1 - \hat{\lambda}_i\right) \tag{4}$$

$$J_{max} = -T \ln\left(1 - \hat{\lambda}_{r+1}\right) \tag{5}$$

where

T is the sample size and $\hat{\lambda}_i$ is the *i*:th largest canonical correlation. The trace test tests the null hypothesis of *r* cointegrating vectors against the alternative hypothesis of *n* cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of *r* cointegrating vectors against the alternative hypothesis of *r* +1 cointegrating vectors. Neither of these test statistics follows a chi square distribution in general; asymptotic critical values can be found in Johansen and Juselius (1990) and are also given by most econometric software packages.

4.5 Estimation of spending towards agriculture for poverty reduction

To estimate required growth and spending on agriculture and non agriculture, a simple simulation model used by Fan *et al*, (2008) was adopted. For this study, to estimate required agricultural growth rates, the model starts by decomposing a typical growth elasticity of poverty into the effects of agricultural and non agriculture growth. Unable to obtain any reliable data or estimates in Zimbabwe, the multiplier effect or linkage between agriculture and non-agricultural expenditure have been ignored in this study. The decomposition of growth elasticity of poverty into the effects of agricultural and non agriculture growth can be represented for the country as follows:

$$\frac{dP}{P}=\left(\frac{dY}{P}\frac{Y_{ag}}{dY_{ag}}\right)\frac{dY_{ag}}{Y_{ag}}s_{ag}+\left(\frac{dP}{P}\frac{Y_{ng}}{dY_{ng}}\right)\frac{dY_{ng}}{Y_{ng}}s_{ng} \text{..........................(1)}$$

where

P = poverty rate

Y_{ag} = agricultural GDP

Y_{ng} = non-agricultural GDP

S_{ag} = share of agriculture in GDP

S_{ng} = share of non-agriculture in GDP.

Equation (1) can be rewritten as:

$$\dot{P}=\{\varepsilon_{ag}*g_{ag}\}*S_{ag}+\{\varepsilon_{ng}*g_{ng}\}*S_{ng} \text{ .... (2)}$$

where

$\dot{P}$ = change in poverty for each year

ε_{ag} = elasticity of poverty reduction with respect to (w.r.t.) agricultural GDP growth

ε_{ng} = elasticity of poverty reduction w.r.t. non-agricultural GDP growth

g_{ag} = agricultural GDP growth rate

g_{ng} = non-agricultural GDP growth rate

S_{ng} = share of non-agriculture in GDP.

The contributions of agricultural and non-agricultural growth on poverty reduction, weighted by their respective shares in total GDP are represented by equation 2. The first and second terms measure the direct and independent effects of agricultural and non-agricultural growth on poverty reduction. The third term measures an indirect effect whereby additional reductions in poverty, which result from non-agricultural growth, are solely generated by the multiplier effect or linkage with agricultural growth. Partitioning the expected reduction in poverty among each of the terms in equation (2) and solving for the required agricultural growth rate (as the unknown) yields the following equation:

$$g_{ag} = \{\dot{P} - \dot{P}_{ng}\} \Big/ \{\varepsilon_{ag} * S_{ag}\} \text{ ....} \qquad (3)$$

where $\dot{P}_{ng}$ = the rate of poverty reduction emanating from a given non-agricultural growth rate, which is calculated from the second term in equation (2), i.e. $\dot{P}_{ng} = \varepsilon_{ng} * g_{ng} * S_{ng}$

Equation (3) represents the agricultural growth rate that is required to reduce poverty annually from its own direct effect. The level of public expenditure needed for agriculture to grow is calculated in equation (3) and once the required agricultural growth rates are known, the corresponding annual changes in expenditure needed to achieve these growth rates can be calculated as:

$$\dot{E}_{ag} = g_{ag} \;/\; \delta_{ag} \text{ ....} (4)$$

where

$\dot{E}_{ag}$ = the annual growth rate in agricultural expenditures,

δ_{ag} = elasticity of agricultural growth w.r.t. agricultural expenditure growth which is calculated as $\frac{dY_{ag}}{dE_{ag}} * \frac{E_{ag}}{Y_{ag}}$

The annual agricultural expenditures required between 2011 and 2015 can be easily calculated from the data on actual agricultural expenditures in 2010 for Zimbabwe from equation (4).

4.6 Conclusion

This chapter was devoted to a detailed discussion on the possible models to be employed to find answers to research questions, drawing ample lessons from theory and international experience. Against that background, the chapter enumerated the key variables which have emerged from previous scientific research, conferences, seminars and workshops. In view of the empirical decision to apply the cointegration techniques and error correction mechanism as a way of overcoming the inherent instability in economic time series, the chapter developed the model structure within the cointegration framework.

CHAPTER 5: RESULTS AND DISCUSSION

5.0 Introduction

This chapter presents the findings and analyses of results. The regression analyses were performed using Econometric-views 7(E-views 7) statistical package. Regression was carried out on time series data for the period 1980 to 2009. The data was tested for stationarity and for cointegration. Problems of non stationarity of data were corrected by integrating the trending series.

5.1 Descriptive Results

5.1.1 Real government agricultural expenditure on extension (AE-Ext)

Figure 5.1 shows the trend of real government agricultural expenditure (Z$) on extension. It shows that real government agricultural expenditure on extension was generally trending upwards due to increases in wages and salaries for extension services (World Bank, 1991). There was a sharp increase in real government agricultural expenditure on extension during 1980 to 1988 but aggregate grain production was fluctuating over the period as explained in 3.1.1**.** A notable decline, however, was experienced during ESAP (1990 to 1994) when support to agriculture declined considerably and also between 2007 and 2008 due to economic hardships.

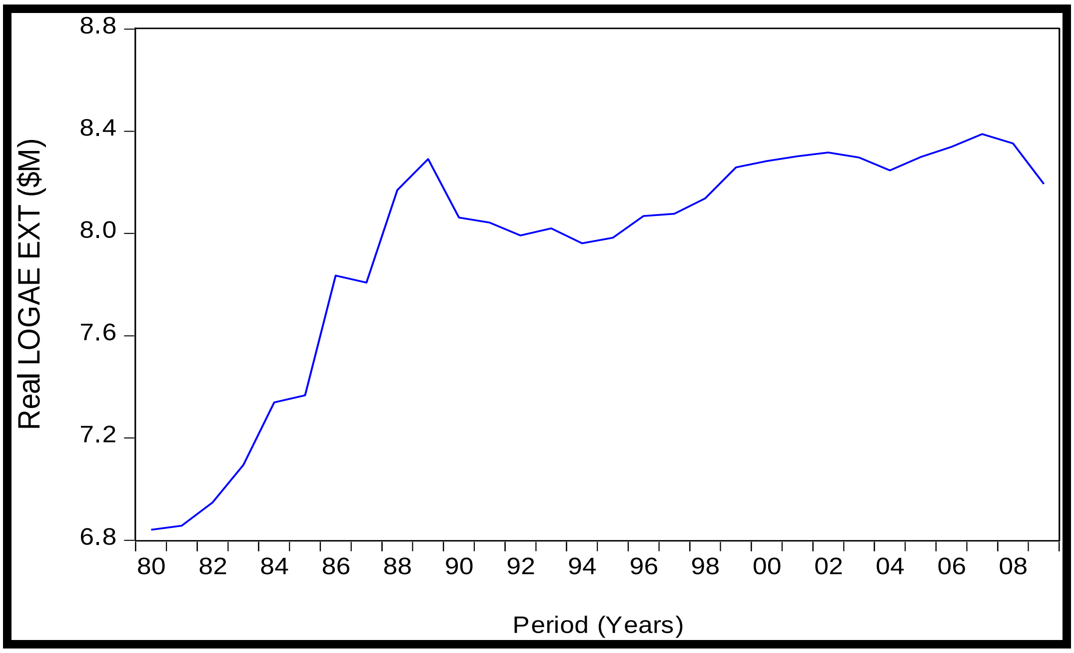

Figure 5.1: Trend of real agriculture expenditure on extension by government in Zimbabwe (1980-2009)

5.1.2 Real government agricultural expenditure on credit assistance (AE-CA)

Real government agricultural expenditure on credit assistance, illustrated on Figure 5.2, fluctuated over the period 1980 to 2009. Just like government agricultural expenditure of extension, it also generally exhibits an overall upward trend. It had two sharp declines, one from 1990 to 1994, during ESAP period and another one in 1998 as result of arrears which were being faced by AFC (Bond, 1998).

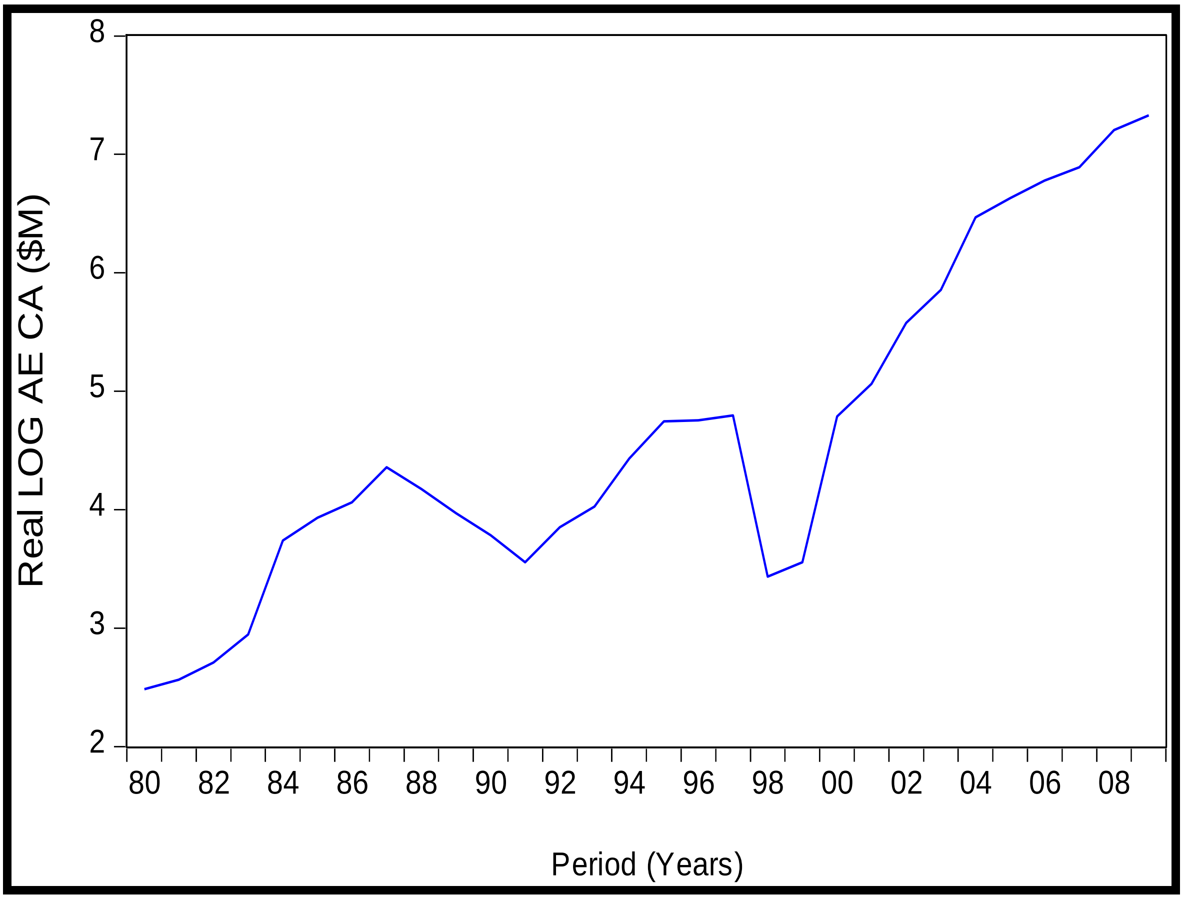

Figure 5.2 Trend of real agriculture expenditure on credit assistance by government in Zimbabwe (1980-2009)

5.1.3 Real government agricultural expenditure on research and development (AE R&D)

Over the period 1980 to 2009, real government agricultural expenditure on research and development, illustrated on Figure 5.3, was fluctuating but its overall trend is downward sloping. Literature also supports this overall trend, for instance Rukovo *et al*, (1991) explained that there was a shift in the focus of government research to the small scale sector, accompanied by a decline in the total allocation to research from 10.8 per cent prior to independence to on average 7.9 per cent of agricultural expenditure in the 1980s.The sharp declines were realised when the Zimbabwean economy was faced with economic difficulties mainly in 1992 (due to drought), 2002 (due to drought) and 2008 (economic crisis).

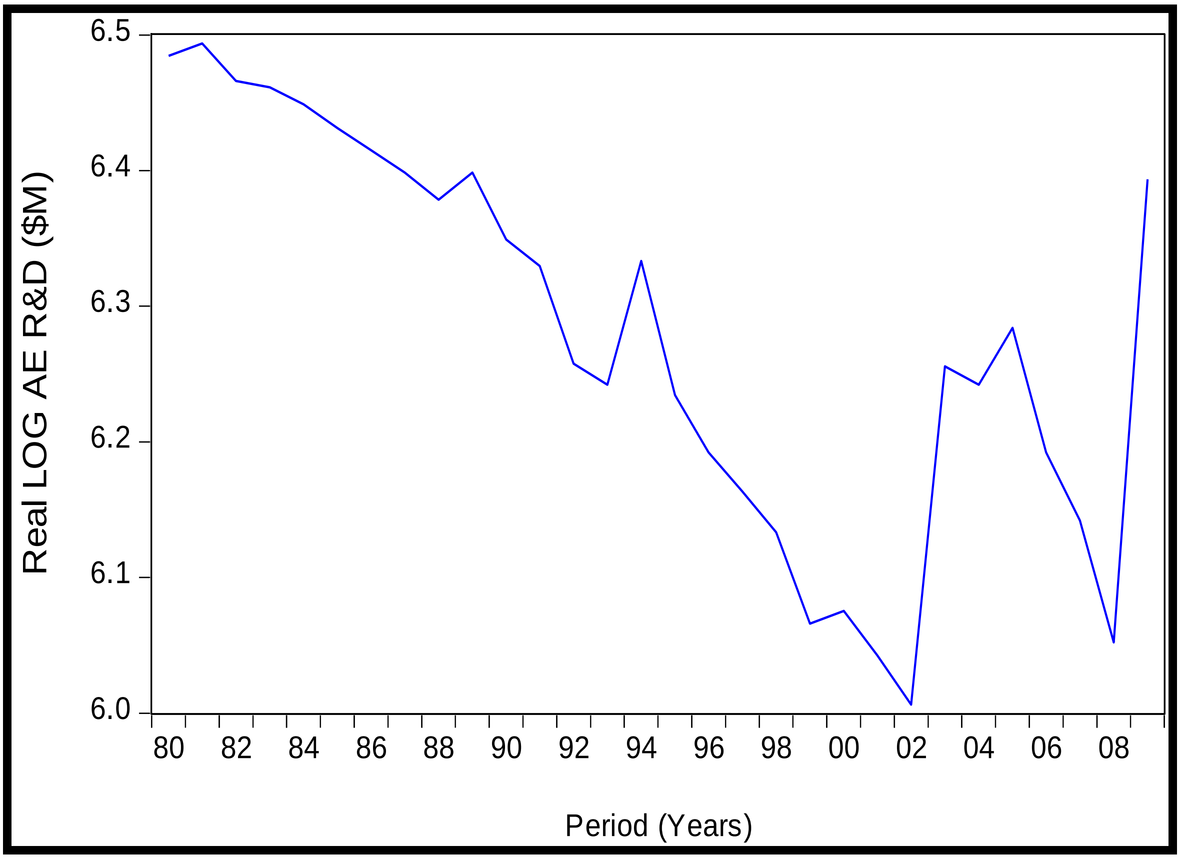

Figure 5.3 Trend of real agriculture expenditure on research and development by government in Zimbabwe (1980-2009)

5.1.4 Overall real agriculture expenditure by the government (AE)

The trend of overall real agriculture expenditure by the government using data collected from CSO is illustrated on Figure 5.4. It shows that real agriculture expenditure generally increased from 1980 to 2009 which can be attributed mainly to an increase in government agricultural expenditure on credit assistance as illustrated on Figure 5.1 and increase in government agricultural expenditure on extension as illustrated on Figure 5.2. From 1980 to 1990, real agricultural expenditure generally increased mainly due to the growth with equity programme explained in chapter one. However, as a result of the introduction of ESAP in 1990, the amount of money allocated to agriculture declined since it was one of the conditions of the programme. After the abolition of ESAP in 1995 agricultural expenditure steadily increased from 1994 until 2004. The steady increase was also sustained as a result of

Agribank issuing more loans to smallholder farmers since 2000, and the introduction of the Farm Mechanisation Programme by the RBZ in 2006.

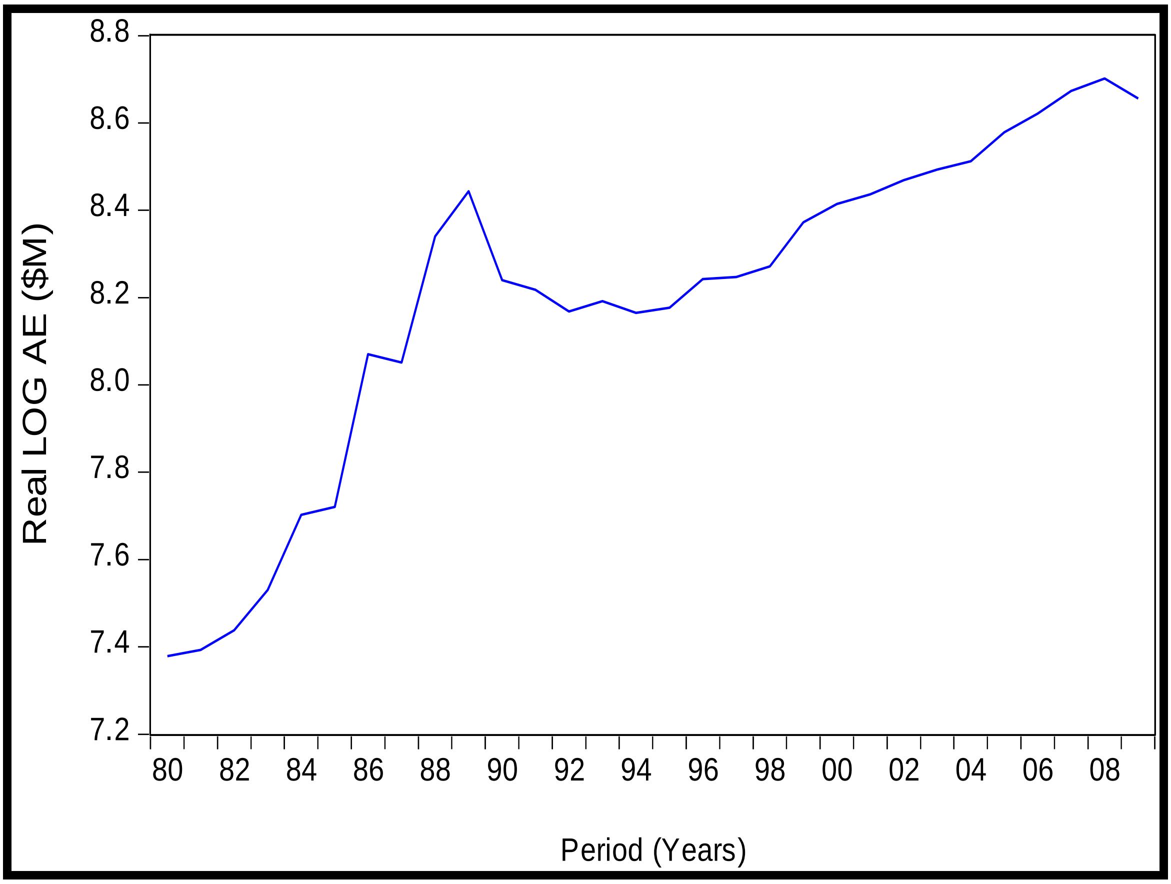

Figure 5.4 Trend of real agriculture expenditure by government in Zimbabwe (1980-2009), base year 1990

5.1.5 Real GDP

Figure 5.5 shows that the trend of real GDP steadily increased from 1980 to 1990 during the period when growth with equity programme was being enforced. However after the introduction of ESAP in 1990, real GDP sharply declined. The decline was also aided by the 1992 drought after which GDP steadily increased and the abolition of ESAP in mid 1990s also made recovery better. However, real GDP sharply declined from 2000 up to 2008 due to droughts and the introduction of FTLRP in 2000**.** This may be the result of disruption of organised large-scale commercial farming due to the displacement of experienced white farmers. The black farmers who took over the farms lacked infrastructure and knowledge for farming. Others also left the farms idle after claiming ownership (WFP, 2009).

However, real GDP then sharply increased in the year 2009. This may be as a result of political stability which was experienced due to the formation of the Global Political Agreement. As a result of the new political dispensation, the general mood of the country is now more optimistic, with a promise that more progressive development initiatives that address the existing economic problems will be addressed comprehensively. A recovery programme, the Short Term Economic Recovery Programme (STERP) officially launched in March 2009, is now in place to re-energise the economy (World Bank, 2009).

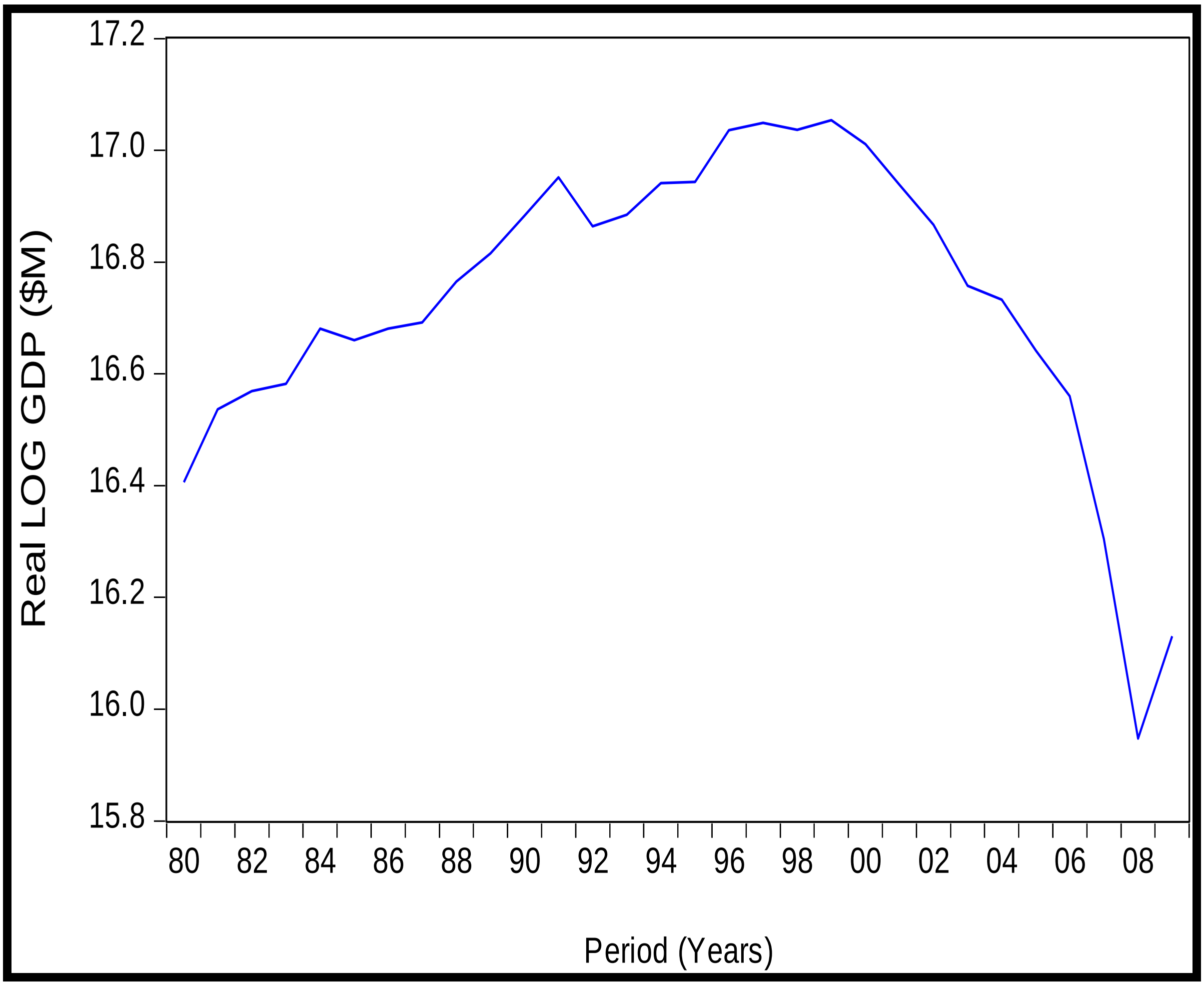

Figure 5.5 Trend of real GDP in Zimbabwe (1980 to 2009).

5.1.6 Real government expenditure on agriculture, investment expenditure and consumption expenditure

Figure 5.6 shows that real government expenditure on agriculture, non agriculture expenditure, investment expenditure and consumption expenditure were trending upwards for the period 1980 to 2009. Consumption expenditure was increased more than other variables but after 2004 it declined most following the economic hardships the country was experiencing. However government agricultural expenditure increased more than the other variables hence the main aim of this study to investigate how this has affected economic performance of the country on average. Real government non agricultural expenditure unlike, other variables, steadily increased from 1980 to 1990, then remained constant and experienced a steady decline from 2000 to 2009.

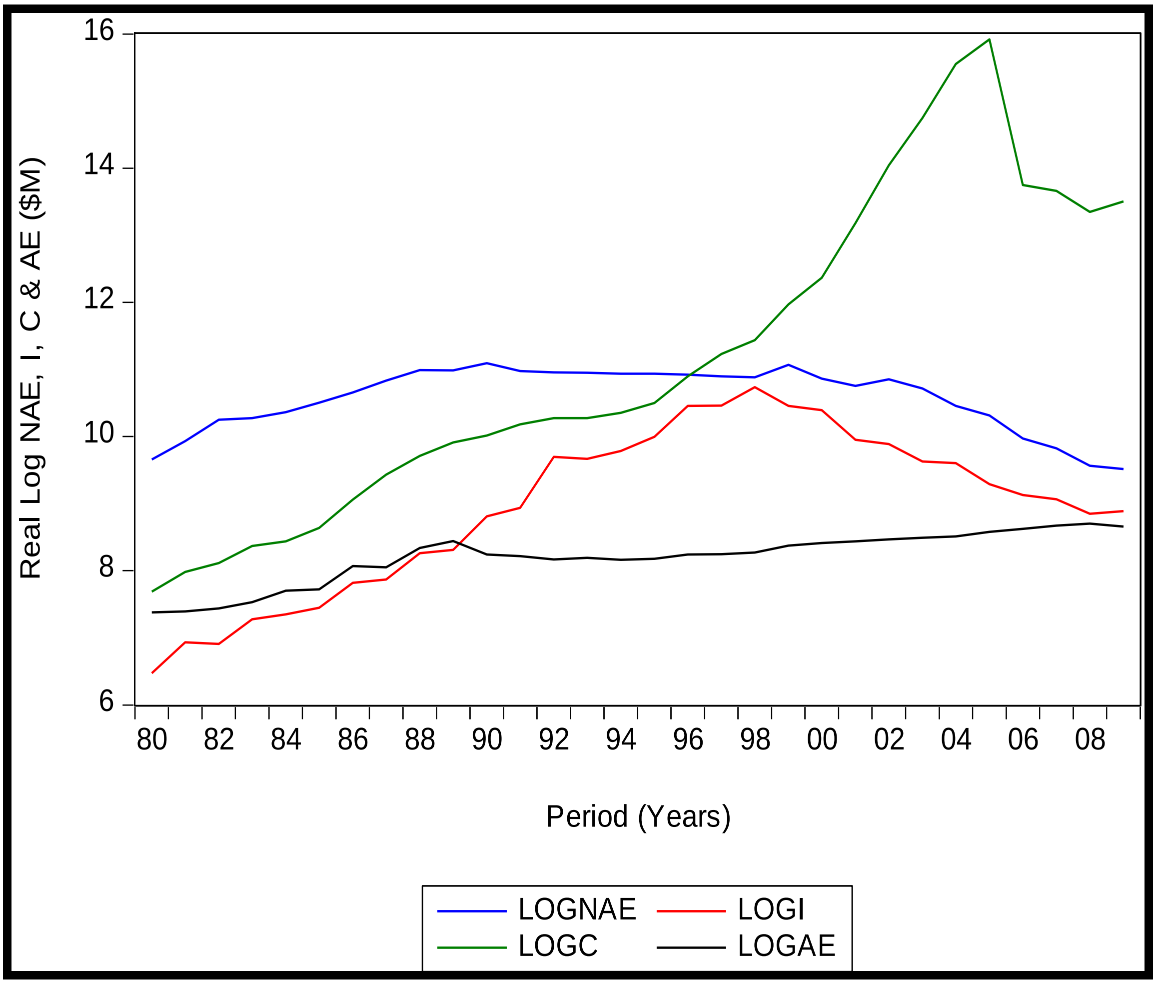

Figure 5.6 Trends of government agriculture expenditure, consumption expenditure, non agriculture expenditure and investment expenditure in Zimbabwe (1980-2009)

5.1.7 Poverty in Zimbabwe

The trend of poverty is illustrated on Figure 5.7 using data collected from CSO. It shows that poverty generally increased from 1980 to 2003 (though it has been fluctuating) which means that the standard of living of Zimbabweans has been falling over the period. Poverty was very high when the agricultural sector did not perform well due to the droughts of 1992, 1995 and 2002.

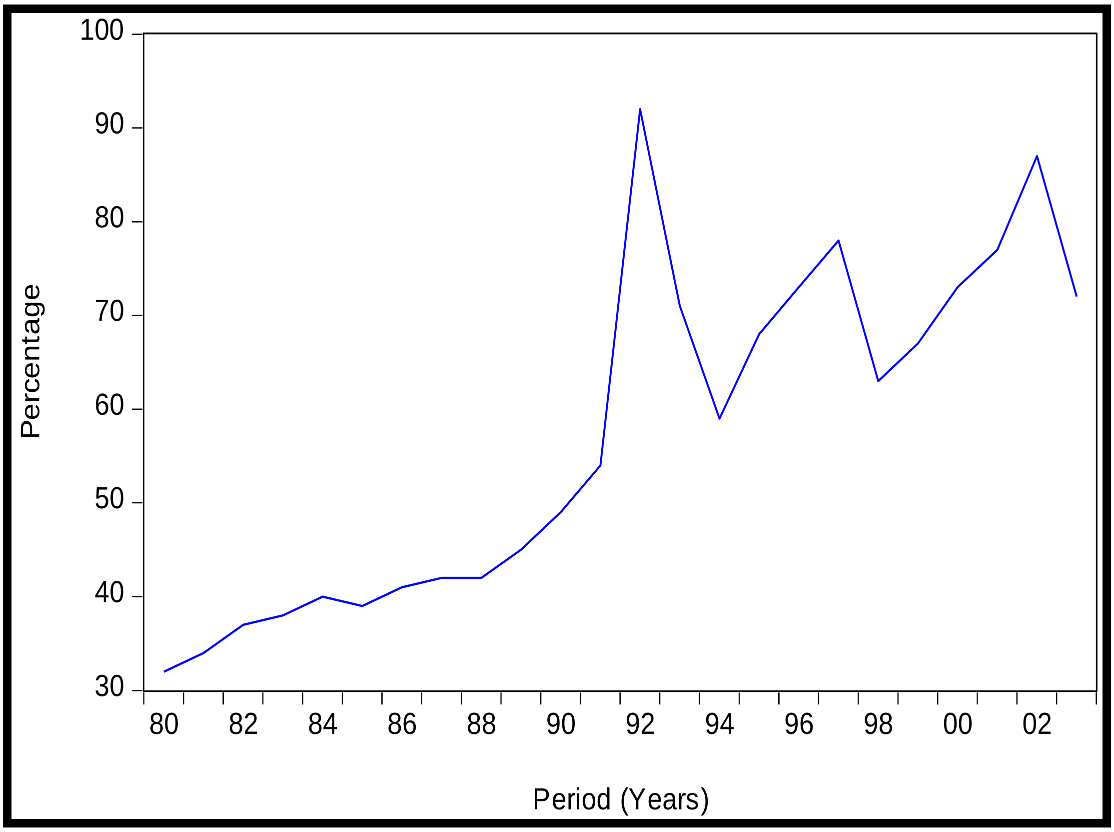

Figure 5.7 Trend of poverty in Zimbabwe (1980 to 2003).

5.2 Empirical Results

5.2.1 Estimation of the Variables in Levels (Short run relationship)

Ordinary Least Squares estimation of the variables was carried out to ascertain how well the resulting model mirrors the system it is intended to model. This provided insight into the nature of the data in terms of their stationarity or otherwise. This information can be gleaned from whether or not the coefficients of the estimated variables are significant.

Table 5.1 presents the results of the OLS regression in which real GDP was set as the dependent variable and the rest of the variables were defined as the explanatory variables.
The detailed results obtained from the regression are shown on Appendix A. The whole model is scrutinised according to R^2. Both R^2 and adjusted-R^2 show quite significant outcomes at 94% and 92%, respectively. The adjusted R^2 of 0.918342 implies that about 92 % of the variations in GDP are explained by the explanatory variables. The Durbin-Watson Statistic of 1.747415 is close to the optimum level of 2 (E-Views, 1997) and shows that there

is no autocorrelation between real GDP and the explanatory variables as explained on 4.4.6. However it is reasonable to suspect that the variables are non-stationary and cointegrated since only real government non agricultural expenditure and real investment expenditure showed high significance at 1%.

Table 5.1: Results of the OLS regression to estimate short-run equation (Error correction)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
C	10.68555	1.712285	6.240520	0.0000
LOGAEEXT	-0.199412	0.090863	-2.194649	0.0396
LOGAECA	-0.047059	0.034773	-1.353333	0.1903
LOGAERD	0.314506	0.244562	1.285998	0.2124
LOGNAE	0.447630	0.070557	6.344249	0.0000
LOGI(-1)	0.129937	0.035875	3.621959	0.0016
LOGC	0.004299	0.023693	0.181462	0.8577
FTLRP	-0.088382	0.093028	-0.950057	0.3529
R-squared	0.938757	Mean dependent var		16.74203
Adjusted R-squared	0.918342	S.D. dependent var		0.269359
S.E. of regression	0.076971	Akaike info criterion		-2.061815
Durbin-Watson stat	1.747415	Prob(F-statistic)		0.000000

5.2.2 Unit root tests

After estimating the short run equation by OLS regression as shown above, it is important to determine if the time series is stationary because time series data usually follow a particular trend and economic theory requires that they be subjected to differencing or de-trending procedures otherwise spurious results will be obtained (Gujarati, 1995). The values of real government agriculture expenditure, consumption expenditure, non agriculture expenditure and investment expenditure in Zimbabwe plotted against time in Figure 5.6 shows that the variables have general direction in which they are moving and therefore the need to correct them for non stationarity.

Stationarity of the time series was tested using the Augmented Dickey-Fuller Test (ADF). If the absolute value of the ADF is less than the absolute critical value, the test accepts the null hypothesis that the variable is not stationary. If the calculated ADF test statistic is greater than critical t-values, reject the null hypothesis. The Unit Root tests were conducted on the 8 variables which are shown on Table 5.2 below.

According to the detailed results on Appendix B to I, the test statistics over the entire range at levels were less than the critical values for the ADF at 90% level of confidence except government agricultural expenditure on extension. This confirms that the (time series) variables are non-stationary as predicted by economic theory. It is therefore possible to accept the null hypothesis of non-stationarity of economic growth data. As is well known, the non-stationary data series are poor candidates for reliable regression Statistical Properties of Variables since they yield spurious results that are useless for predictive purposes, it was therefore necessary to correct them for non stationarity.

Table 5.2: Unit root tests

Variable	**ADF test statistic**	**DW**	**Order of Integration**	**Decision**
Log GDP	-3.75*	1.72	I(1)	Stationary
Log AE CA	-4.30*	1.94	I(1)	Stationary
Log AE EXT	-2.73***	2.10	I(0)	Stationary
Log AE R&D	-4.87*	1.57	I(1)	Stationary
Log NAE	-3.25**	2.39	I(1)	Stationary
Log I	-15.56*	2.13	I(2)	Stationary
Log C	-3.98*	2.03	I(1)	Stationary
FTLRP	-5.29*	2.00	I(1)	Stationary

*, ** and *** stand for level of significance at 1%, 5% and 10% respectively

The Unit Root tests showed that all other variables except government agricultural expenditure on extension required to be differenced in order to become stationary since the absolute calculated ADF test statistics were less than critical t-values. After taking the first difference GDP, government expenditure on GDP, government agricultural expenditure on credit assistance, government agricultural expenditure on research and development, government non agricultural expenditure, consumption expenditure and a dummy of fast track land reform programme become stationary. Investment expenditure required second differencing to become stationary at 99% level of confidence since it was not stationary after first difference. Both GDP, government agricultural expenditure on credit assistance, government agricultural expenditure on research and development, consumption expenditure and a dummy of fast track land reform programme becomes stationary at 99% level of confidence after first differencing. Government agricultural expenditure on extension variable was also stationary at 90% level of confidence. This means that all the mean, variance and auto covariance at various lags remain the same no matter at what point we measure them.

5.2.3 Johansen cointegration tests

After the foregoing tests to establish the order of integration of the eight variables being considered for the present model, the next step is to find out whether or not there is cointegration (Johansen, 1995). This process involves determining the presence of any cointegrating relationships among the variables in the model. This is particularly important to confirm or refute a long-term relationship among the variables (Johansen, 1995). This approach avoids the ‘spurious regressions’ (Granger & Newbold, 1987) that are common when using trended data.

The series for all the variables in the model used were tested for cointegration using the trace tests and maximum eigenvalue tests as explained on 4.4.9. Although the trace test indicate that the 5 cointegrating variables and the maximum eigenvalue tests indicates that there are 4 cointegrating variables, on Table 5.3, both indicates that the real GDP and the explanatory variables are cointegrated at 95% level of confidence. The detailed results obtained from the cointegration tests are shown on Appendix J.

Table 5.3: Johansen cointegration tests

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None *	0.993151	358.8582	159.5297	0.0000
At most 1 *	0.944467	219.3145	125.6154	0.0000
At most 2 *	0.799152	138.3726	95.75366	0.0000
At most 3 *	0.770729	93.42677	69.81889	0.0002
At most 4 *	0.571790	52.18699	47.85613	0.0185
At most 5	0.423835	28.43903	29.79707	0.0711
At most 6	0.264332	13.00091	15.49471	0.1148
At most 7 *	0.145588	4.405572	3.841466	0.0358

Trace test indicates 5 cointegrating variables at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.993151	139.5437	52.36261	0.0000
At most 1 *	0.944467	80.94189	46.23142	0.0000
At most 2 *	0.799152	44.94585	40.07757	0.0131
At most 3 *	0.770729	41.23978	33.87687	0.0055
At most 4	0.571790	23.74796	27.58434	0.1438
At most 5	0.423835	15.43812	21.13162	0.2594
At most 6	0.264332	8.595333	14.26460	0.3214
At most 7 *	0.145588	4.405572	3.841466	0.0358

Max-eigenvalue test indicates 4 cointegrating variables at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

5.2.4 Long run relationship

Table 5.4 Results of long run estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.97208	0.908777	12.07347	0.0000***
LOGAEEXT	-0.213348	0.047566	-4.485332	0.0002***
LOGAECA	-0.043440	0.019247	-2.257029	0.0353**
LOGAERD	0.269084	0.127834	2.104955	0.0481**
LOGNAE	0.456308	0.038847	11.74629	0.0000***
LOGI(-1)	0.128505	0.018752	6.852854	0.0000***
LOGC	0.004903	0.012532	0.391286	0.6997
FTLRP	-0.080825	0.048626	-1.662184	0.1121
R-squared	0.937114	Mean dependent var		16.74937
Adjusted R-squared	0.915104	S.D. dependent var		0.271337
S.E. of regression	0.079059	Sum squared resid		0.125006
Durbin-Watson stat	1.623354	Long-run variance		0.001619

* ($P<0.10$) =10 percent significance level ** ($P<0.05$) =5 percent significance level *** ($P<0.01$) =1 percent significance level

Table 5.4 shows results of long-run estimates in which real GDP was set as the dependent variable and the rest of the variables were defined as the explanatory variables. The detailed results obtained from the regression are shown on Appendix K. The whole model is scrutinised according to R^2. Both R^2 and adjusted-R^2 show quite significant outcomes at 93.7% and 91.5%, respectively. The adjusted R^2 of 0.915104 implies that about 92 % of the variations in GDP are explained by the explanatory variables (real government agricultural expenditure on extension, real government agricultural expenditure on credit assistance, real government agricultural expenditure on research and development, real government non agricultural expenditure, lag for real investment expenditure, real consumption expenditure and a dummy variable for FTLRP).

The Durbin Watson Statistic of 1.623354 ($1.5 < DW > 2.5$) is close to the optimum level of 2 (E-Views, 1997) and shows that there is no autocorrelation between real GDP and the explanatory variables as explained on 3.4.7. The functional form of the equation is therefore expected to be near optimal on the basis of the results. Furthermore, a plot of the distribution of the residual terms of the dependent variable (GDP) suggest a fairly normal curve, which also shows a reasonably good fit for the estimated model (see Figure 5.8).

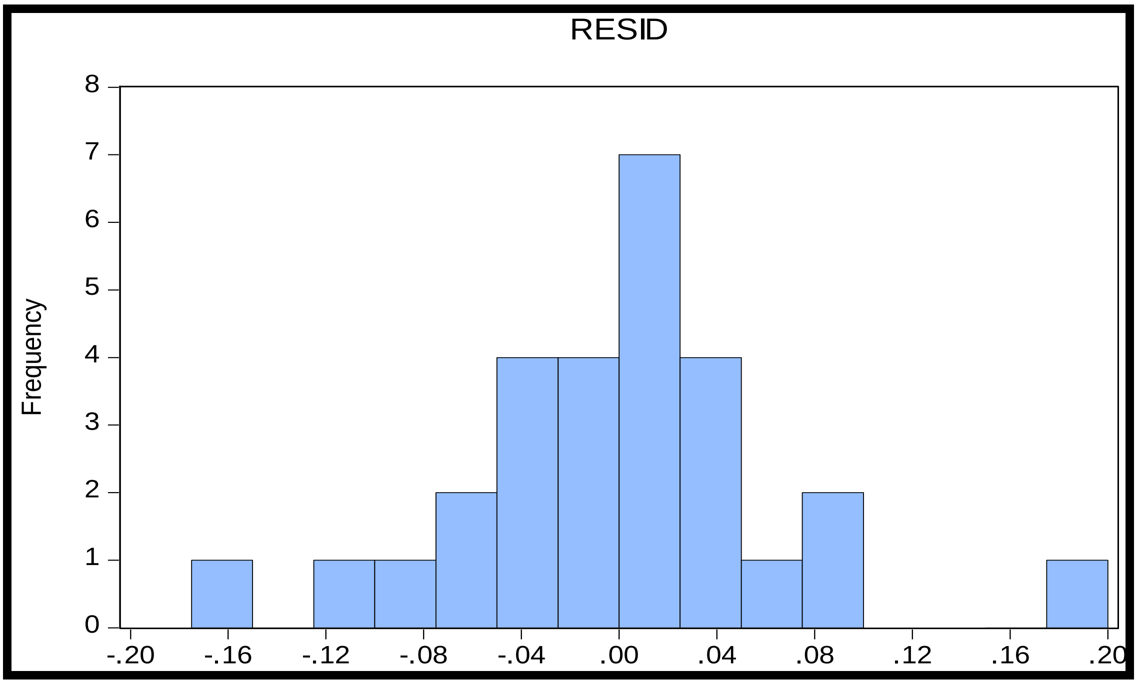

Figure 5.8: Test of the normality of the distribution of the residual terms of the dependent variable

The results on Table 5.4 show that there is a negative relationship between real GDP and government agricultural expenditure on extension. This means that increase in government agricultural expenditure on extension translated to a decline in real GDP over the period 1980 to 2009. The coefficient of -0.213348 means that for every one percent increase in real government agricultural expenditure on extension, real GDP decreases by 0.21% on average using the data from 1980 to 2009. This may have occurred due to deterioration of quality of extension since a rising proportion of the budgets for extension (up to 70 percent) went to salaries and wages, thereby causing reduced interaction with farmers. The p-value for real government agricultural expenditure on extension is 0.0002. It shows that the variable is significant at all levels. This shows that the variable real government agricultural expenditure on extension is significant in explaining real GDP since the absolute value of t-value exceeds 2. The variable is said to be statistically significant since the test statistic lies in the rejection region.

The variable for government agricultural expenditure on credit assistance was found to be negatively related to economic growth and statistically significant at 95 percent confidence level. This might be due to the fact that most farmers who received loans for farming purposes diverted funds to speculative purposes and therefore agricultural output declined (WFP, 2009). The results could also be attributed to natural disasters such as cyclone Eline which was experienced in 2000 and changes in climatic conditions such as droughts which were experienced in 1992, 1995 and 2002 undoubtedly affected not only agriculture but the entire economy. Moreover farmers, the research scientists and experts in related industries were driven away by the political and economic difficulties, especially due to FTLRP; as a result the remaining farmers lack expertise. However these results contradict the findings by Eyo (2008) which shows that public credit to the agricultural sector was statistically insignificant in explaining agricultural growth and ultimately economic growth.

A positive relationship between real GDP and government agricultural expenditure on research and development was obtained. The coefficient of 0.269084 means that for every one percent increase in real government agricultural expenditure on extension, real GDP increases by 0.27% on average. The variable real government agricultural expenditure on research and development is significant in explaining real GDP since the absolute value of t-value exceeds 2. The research stations around the country have done well in research and development to serve agriculture over the years. As with any industry it was realised long back that there is need to continually innovate and develop new ways in agriculture. From seed and equipment to techniques, research stations have played a key role and need to be supported by the state.

Real investment expenditure showed a positive relationship with real GDP. It has a coefficient of 0.209728 meaning that a one percent increase in real investment expenditure increases real GDP by 0.2097 %. This is supported by Fan and Rao (2003) who said that for economic growth to be achieved, investments in agriculture need to be complemented with policies and investments to spur non agricultural growth. Moreover, the study by Fan, Hazel and Thorat (2000), showed that investment has a positive relationship to economic growth.

Investment has proved to be a statistically significant variable with a t-statistic of 8.439656 which is greater than 2 (following the rule of thumb). This suggests that investment is essential in trying to increase GDP since it was found to be statistically significant at 99 percent confidence level. Consumption also was found be positively related to GDP due to the fact that the country was faced with economic hardships and therefore devoted most income to be alive. However this variable was found to be statistically insignificant since the t-statistic is less than 2. This is in contradiction with the findings of Fan, Hazel and Thorat (2000) in India since they found the variable to be significant.

The dummy variable for FTLRP shows that it is negatively related to economic growth but the variable indicates that it is statistically insignificant since the variable has a t-statistic absolute value of 1.66 which is less than 2 (following the rule of thumb) hence no meaningful inferences could be drawn from the relationship. These results contradict those found by Pender *et al*, (2001) in Ethiopia, who concluded that land redistribution in the Amhara region had promoted more intensive crop production which led to improved living standards of the occupants thereby positively contributing significantly to the Ethiopian economy.

5.2.5 Estimation of spending towards agriculture for poverty reduction

Using growth elasticities and projected growth rates, it can be simulated whether Zimbabwe will be able to halve the number of poor by 2015. Firstly, elasticities of poverty reduction with respect to agricultural GDP growth and poverty reduction with respect to non agricultural GDP growth from equation 2 in 4.3.3 were calculated using a simple log linear model with Econometric Views 7. The results are shown on Table 5.5 below in which rate of poverty was set as the dependent variable and agricultural GDP and non agricultural GDP were defined as the explanatory variables. The agricultural GDP per worker series is the ratio of total GDP for the sector divided by the estimated number of economically active workers claiming agriculture as their main source of income (Cervantes D & Dewbre J, 2010). Non agricultural GDP per worker was defined as the difference between total national and agricultural GDP divided by the difference between total national and agricultural employment (Cervantes D & Dewbre J, 2010). Detailed information of the results is shown on Appendix L.

Table 5.5 Review of elasticities of poverty reduction

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.337878	0.723559	5.995200	0.0001
LOGAG	0.068200	0.030975	2.749648	0.0679
LOGNAG	-0.094590	0.028706	-2.611268	0.0331

From table 5.5, it can be deduced that the elasticity of poverty reduction with respect to agricultural GDP growth, ε_{ag} = 0.068 and elasticity of poverty reduction with respect to non agricultural GDP growth, ε_{ng} = -0.0945. Substituting the results into equation 3 in 4.3.3 yields the required agricultural growth rate, g_{ag} = 0.308. Furthermore, elasticity of agricultural growth with respect to agricultural expenditure growth (δ_{ag}) can be calculated using a simple log linear model with econometric views 7, and the results of which are shown on Table 5.6 below and the detailed information of the results is shown on appendix M.

Table 5.6 Review of elasticity of agricultural growth with respect to agricultural expenditures

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.26840	1.533442	6.696311	0.0000
LOGEAG	0.572402	0.189356	3.022891	0.0063

Thus, δ_{ag} = 0.572, means that for every one percent increase in real agricultural growth, real agricultural GDP increases by 0.57% on average. Substituting g_{ag} and δ_{ag} into equation 4 on 4.3.3 will result in the annual growth rate in agricultural expenditures, $\dot{E}_{ag}$ to be equal to 0.538. This means that the annual growth rate expected in agricultural expenditures required between 2011 and 2015 to half poverty in Zimbabwe is 54 percent. Therefore the annual agricultural expenditures required in 2011 give US $ (1.54 * 97.2 M[1]), which translates to US $149.69 M.

This also means that the agricultural expenditures required in 2012 will be given by US $(1.54 * 149.69M) which will amount to US $230.69M. As a result the agricultural expenditures which will be required for 2013 give US $ (1.54 * 230.69M), translating to US $355.26M. For 2014, the annual agricultural expenditures required give US $ (1.54 * 355.26), whose total will be US $547.10M. Finally the annual agricultural expenditures required in 2015 will be given by US $ (1.54 * 547.10M), which translates to US $842.53. Therefore the agricultural expenditures required between 2011 and 2015 gives US $ (149.69 M + 230.69M + 355.26M + 547.10 + 842.53), which translates to US $2.125 billion.

These results are slightly higher than the results of annual growth rate required in agricultural expenditures of 50 percent in spending by Fan S *et al*, (2008). This indicates a worsening situation and therefore renders it very difficult to meet the first MDG to halve poverty by 2015. Using results from Fan S *et al*, (2008), other countries such as Lesotho, Niger, Kenya, Madagascar, Guinea Bissau and Burundi will require at least 10 percent growth in agriculture, while Ghana has an achievable level of 9.5 percent.

[1]Using data on budgeted agricultural expenditures in 2010 for Zimbabwe (MOF, 2009).

Moreover, given that Madagascar had the most difficult level of 33 percent in the study by Fan S *et al*, (2008), it will prove to be an almost impossible task for Zimbabwe to to meet the first MDG to halve poverty by 2015.

5.3 Conclusion

This chapter presented descriptive and empirical results. It also examined the statistical properties of the variables included in the model. The ordinary least squares (OLS) regression was run on the data in levels to determine the extent to which the estimates could predict the relationships being explored. It was found that the model had a strong regression R^2 and the model was free from autocorrelation.

However, since the study made use of values adjusted for inflation in all cases, the data has sufficient stability to permit some tentative interpretation which can be a basis for evaluating the subsequent regressions and error correction. From the results, it was clear that long-run relationships existed between the real GDP and the set of explanatory variables included in the model.

An important result is that, the real GDP had a significant relationship with the functions of government agricultural expenditure in the long run reflecting the importance of these variables in respect to their contribution to the economy. Another interesting finding is the negative and weakly significant relationship between real GDP and the dummy for FTLRP, suggesting that the expectation that this can be an effective tool for improving the contribution of the agricultural sector to economic growth in developing countries is probably misplaced.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

The main thrust of this study was to assess the impact of government expenditure on three functions of agriculture on economic growth in Zimbabwe. It was to find out whether an increase in expenditure on functions of agriculture by the government increases or decreases GDP. Another aim was to estimate spending towards agriculture for poverty reduction in tandem with the first MDG. In some areas agriculture may not have the potential to drive much growth, and even where such potential exists, widespread and significant poverty reduction will only be achieved when initial agricultural expenditure stimulates rapid growth which will ultimately lead to poverty reduction. This requires significant economic structural change and depends heavily upon growth multipliers in the local economy.

6.1 Conclusion

The potential contribution of agriculture to economic growth has been a subject of much controversy among development economists in recent decades. While some contend that agricultural development is a precondition to industrialization, others strongly disagree and argue for a different path. Despite much debate and quantitative analyses of the contribution of agriculture to economic growth and development, there is lack of consensus on this issue.

Results from the empirical analyses provide strong evidence indicating that agriculture is an engine of economic growth. Based on the results of this study, it can be concluded that government expenditure on functions of agriculture affect economic growth significantly, though differently. Real government agricultural expenditure on extension and real government agricultural expenditure on credit assistance negatively affected economic growth while real government agricultural expenditure on research and development positively affected economic growth.

Poverty reduction is a priority for all African countries (Fan, Zhang and Rao, 2004). Pro poor growth requires attention on productive sectors such as agriculture, infrastructure and ICT. Growth must be focused on sectors on which the poor depend on for their livelihood and use the factors of production they possess such as labour and land. It is imperative, as we move forward in our efforts to achieve the first MDG, that support should be prioritized to the set of sectors needed for rapid and sustained poverty reduction in Zimbabwe, such as agriculture. The results of the study have policy implications for improved decisions regarding investment policies for agriculture, so that they contribute more effectively to development and poverty reduction in Zimbabwe. In order to achieve the MDG1, the results in this study indicate that Zimbabwe will need 54 percent annual growth rate in spending towards agriculture. The estimated spending towards agriculture for poverty reduction in tandem with first MDG was found to be very high which makes it almost impossible for the Zimbabwe government to meet the first MDG indicating that the country needs to accelerate their expenditure, particularly in the agricultural sector and efficiently use these resources.

6.2 Policy Recommendations

After obtaining the results from econometric estimation, it becomes obvious that there is need for a comprehensive, holistic framework that significantly increases the contribution of agriculture to economic growth and poverty reduction at the expense of other sectors.

The variable for government agricultural expenditure on credit assistance was found to be negatively related to economic growth. Management of loans and farming implements need to be improved so that resources will not be misused. The repayment of loans should be enforced so that farmers will be obliged to use resources productively, which will reduce the burden on the already strained budget of the government. This will improve the contribution of real government agricultural expenditure on credit assistance to economic growth which will ultimately benefit the Zimbabwean economy.

Furthermore, resources should only be made available to productive farmers. Therefore the government should strengthen the legal framework for loan recovery so that serious and productive farmers will be capacitated so as to improve the performance of agriculture and consequently the whole economy. This will enable real government agricultural expenditure on credit assistance to positively contribute to economic growth in Zimbabwe.

A positive relationship between real GDP and government agricultural expenditure on research and development was obtained. However there is need for increasing technical knowhow of farmers in order to increase productivity. The Zimbabwean government needs to provide more support for agricultural research and education. Government needs to capacitate the Department of Agricultural Research and Extension Services (AREX) to ensure that they are able to deal with challenges faced by farmers. AREX should also be readily accessible to farmers.

Given the findings of this study that real government expenditures on agricultural research and development had the largest impact on growth it is critical that the Zimbabwean government allocate more funds to AREX at the expense of other sectors so that extension services will ultimately be improved. AREX should also prioritise and spread the benefits of new technologies with the greatest potential to reduce poverty through their contribution to economic growth and employment creation.

Furthermore, expenditure on agriculture research should also be improved to set up research policy which is user-determined. More funds should be made available to allow farmers to give an input on their current problems and challenges which will determine the direction of research. Farmers unions should also be encouraged by AREX to encourage farmer to farmer training which will benefit inexperienced farmers from the practical knowledge possessed by experienced farmers. On-farm research needs to be encouraged so that farmers and researchers will be able to constantly work together and promote closer liaison between them.

Moreover, agricultural research must be effectively funded and research priorities must respond to demand and reflect agriculture's role in poverty reduction. However AREX should also learn from the experience of India which has managed one of the most comprehensive and successful publicly organised agricultural research programmes in the developing world with financial constraints (Vyas, 2008). Therefore the organisation needs to do their best with the available resources. AREX should strive to search for better technological products and services support including improved seed, better methods, improved animal husbandry, processing and value addition so that the contribution of real government agricultural expenditure on research and development to economic growth will improve considerably.

The general trend of real agriculture expenditure by government is upward and the overall trend economic growth is downward sloping in Zimbabwe. This implies that real agriculture expenditure did not contribute positively towards economic growth. For agriculture's contribution towards economic growth to be improved policy makers need to promote irrigation development in the semi-arid areas and also in areas where it rains sufficiently so that farmers can still irrigate an extra crop, produce fruits and vegetables or cultivate rice which uses a lot of water. Future increases in food production may come largely from irrigated areas since Zimbabwe has been prone to droughts in recent years such as 2002, 2005 and 2008. This may lead to an increase in agricultural output and consequently the contribution of agriculture to economic growth and also lead to poverty reduction.

Moreover, the government should also promote community based rural development. Community driven development approaches will be critical to build social capital in the poorest areas as well as to expand savings mobilization and promote productive investments in agriculture. Therefore, the government should direct support to self-help groups, village committees, savings and loans groups and others that can provide the initiatives to move organizations to a higher level and access to new markets in agriculture.

Given that the general trend of real agriculture expenditure by government is upward sloping while the overall trend economic growth is downward sloping in Zimbabwe for agriculture's contribution towards economic growth to be improved, the government needs to shift its role from direct intervention and overregulation to creating the enabling environment for private sector participation and competition for agribusiness. Improving incentives for investment in agriculture includes removing price controls, rationalising labour regulations and the tax regime (i.e. adoption of the value added tax system), and improving access to key infrastructure (e.g. roads, electricity, markets). As a result, increased agricultural output will be achieved resulting in agricultural growth, poverty reduction and ultimately lead to improvement in aggregate economic output.

The government should also strengthen non agricultural growth. Rising incomes will fuel demand for higher-value fresh and processed agricultural products in domestic markets and globally, which open new opportunities for agricultural diversification to higher value products (e.g. horticulture, livestock), agro-processing and related services. This will make agriculture more profitable and will also give farmers an incentive to invest non farm income into agriculture and will lead to an increase in agricultural output. This will ultimately lead to improved contribution of agriculture to economic growth.

For agriculture to contribute positively to economic growth, farmers should not always wait for government to capacitate them. Farmers can team up with private sector to obtain more funding. Farmers should also use money obtained from non farming activities to boost their agricultural activities and to obtain training on farming techniques. Moreover, farmers can also form producer organisations so that they become linked to markets and increase their incentive to produce more output profitably. This will increase agricultural output and will increase the contribution of the agricultural sector to the economy.

Optimal land utilisation and increased productivity in agriculture are poverty elimination strategies in a country like Zimbabwe which is dominated by agriculture. This study showed that FTLRP did not improve the output of the economy therefore there is room for improvement in the agricultural sector. If the Zimbabwean government is serious about reviving agriculture, there is a need to bring back or retain the expertise that is necessary for the success of agriculture.

Although the estimated spending towards agriculture for poverty reduction in tandem with the first MDG was found to be very high, which makes it almost impossible for the Zimbabwe government to meet the first MDG; the government nevertheless needs to continue channelling resources to the sector within its means to significantly reduce poverty in the country. The efficient use and targeting of these large public expenditures will require a complementary strengthening and reformation of governance and institutions. Therefore, it remains essential that policy makers need to focus on ensuring that the increase in the size of expenditure should be complemented by increase in output from the agricultural sector.

Research is also needed to assess the quality of public expenditure management. It would be useful to review the broad trends, lessons and experience from agriculture public expenditure reviews. This would provide recommendations for policy reforms and suggestions on how government and private sector can work together to ensure public spending devoted to agriculture can be made to contribute positively to economic growth. The review should look at allocative efficiency of public spending allocated to agriculture, efficiency of service delivery for agriculture and specific institutional issues that emerge in relation to the annual budget planning cycle for agriculture. For this to be executed properly, it is essential to put in place the right personnel to administer the whole process of budget allocation and this process should include all the stakeholders across the spectrum.

REFERENCES

Adelman L (2001). *Fallacies in development theory and their implications for policy, In Frontiers of development economics: The future in perspective, Ed*. New York: World Bank.

Ahearn M, Yee J, Ball E & Nehring R (1998). *Agricultural productivity in the United States.* Resource Economics Division, Economic Research Service, U.S. Department of Agriculture. Agriculture Information Bulletin number 740.

Ahluwalia M S (1990). "Policies for Poverty alleviation", *Asian Development Review*, Vol. 8 pp. 111-132.

Alwang J, Ersado L & Taruvinga N (2001). 'Changes in Poverty in Zimbabwe Between 1990 and 1996: Worsening Outcomes Under Adverse Conditions,' *Development Southern Africa*, Vol.18, no. 5, pp. 553 – 579.

Akpan NI (2005). Government Expenditure and Economic Growth in Nigeria: A Disaggregated Approach. *CBN Economic and Financial Review*, Vol.43, no. 1, pp. 12-26.

Aschauer D (1989). Is public expenditure productive? *Journal of Monetary Economics* Vol. 23 pp. 177–220.

Aschauer D (2000). 'Public Capital and Economic Growth: Issues of Quantity, Finance and Efficiency', *Economic Development and Cultural Change,* Vol.48, no. 2, pp. 391–406.

Awokusi T (2009). *Does agriculture matter for growth in developing countries?* University of Delaware. Newark, DE 19717, USA

Barro R J (1989). *'A cross country study of growth, saving, and government'*, NBER Working Paper 2855. National Bureau of Economic Research, Inc.

Barro R J (1990). 'Government spending in a simple model of endogenous growth',
The Journal of Political Economy, Vol.98, no. 5, pp. S103-S125,

Barth J R, Keleher R E, Russek F S (1990). The scale of government and economic activity. *South Econ Journal*, Vol.13, pp. 142–183

Bautista R & Marcelle T (2000). *Macroeconomic and Agricultural Reforms in Zimbabwe: Policy Complementarities Towards Equitable Growth.* International Food Policy Research Institute Trade and Macroeconomics Division. International Food Policy Research Institute Washington, D.C. 20006, U.S.A.

Beintema N & Stads G (2004). Investing *in Sub-Saharan African Agricultural Research: Recent Trends*. IFPRI 2020 conference Brief number 8, Washington, D.C.

Beyene T (2008). Ethiopia case study, a study prepared for the project, 'Applying historical precedent to New Conventional Wisdom on public sector roles in agriculture and rural development'. Rome: FAO.

Bezemer D & Headey D (2008). Agriculture, development and urban bias. *World development*, Vol.36, no. 8, pp. 1342-1364.

Bell M &Roberts N (1991). 'The Political Ecology of Dambo Soil and Water Resources in Zimbabwe', Transactions of the Institute of Geographers, *New Series,* Vol. 16, no. 3, pp. 301 – 318

Bhagwati, J (1988). Poverty and Public Policy, *World Development*, Vol. 16, No. 5. pp. 539-555.

Bird K & Prowse M (2008). *Vulnerability, poverty and coping in Zimbabwe*. United Nations University. UNU-WIDER Research Paper 2008/41.

Block S (1994). A new view of agricultural productivity in Sub-Saharan Africa. *American Journal of Agricultural Economics, 76 August:* Vol.18, pp. 619-624.

Bond P (1998). Uneven Zimbabwe: A study of finance, development and underdevelopment. Africa World Press, inc. Armara, Eritrea.

Bourguignon F & Morrisson C (1998) Inequality and development: the role of dualism. *Journal of Development Economics* Vol.5, pp. 233-257

Braun, Haen, and Blanken (1991), *Commercialization of agriculture under population pressure: Effects on production, consumption, and nutrition in Rwanda*. International Food Policy Research Institute. Washington, D.C.

Bravo C & Lederman D (2005). *Agriculture and national welfare around the world: causality and international heterogeneity since 1960*, Policy Research Working Paper Series 3499, World Bank Policy Research Working Paper No. 3499. Available at SSRN: http://ssrn.com/abstract=654562 or doi:10.2139/ssrn.654562

Bresciani F & Valdes A (2007). *Beyond food production: the role of agriculture in poverty reduction*. Northampton, MA: Edward Elgar and the FAO, 232 pp., ISBN: 978-1-84720-075-4.

Brooks C (2002). Introductory econometrics for finance. Cambridge University Press. Cambridge

Chakaodza A M (1993). *Structural Adjustment in Zambia and Zimbabwe: Reconstructive or Destructive*? Third World Publishing House (Pvt) Ltd, Harare, Zimbabwe.

Central Statistical Office (2002). *Census 2002*. Zimbabwe Preliminary Report. Government Printers. Harare.

Central Statistical Office (2003). *Poverty in Zimbabwe*. CSO.Harare.

Cervantes D & Dewbre J (2010). "Economic Importance of Agriculture for Poverty Reduction", *OECD Food, Agriculture and Fisheries Working Papers*, No. 23, OECD Publishing. doi: 10.1787/5kmmv9s20944-en

Chang H (2009). Rethinking public policy in agriculture: lessons from history, distant and recent. *The journal of Peasant Studies,* Vol. 36, no 3, pp 477-515

Chimhowu A & Woodhouse P (2008). Communal Tenure and Rural Poverty: Land Transactions in Svosve Communal Area, Zimbabwe, *Development and Change* Vol.39, no. 2, pp. 285-308

Collier P (2005). Is agriculture still relevant to poverty reduction in Africa? Speech given to All Party Parliamentary Group on Overseas Development, October 17, 2005, House of Commons, London, U.K. <*http://www.odi.org.uk/speeches/apgood_oct05/apgood_oct17/report.html*>. Accessed May 2011.

Datt G & Ravallion M (1996). *How important to India's poor is the sectoral composition of economic growth?* The World Bank Economic Review 10: 1-25

Datt G & Ravallion M (2002). 'Is India's Economic Growth Leaving the Poor Behind?', *Journal of Economic Perspectives,* Vol.16, no. 3, pp. 89–108.

Davidson R & Mackinnon J (2004), *Econometric Theory and Methods*, Oxford University Press.

Davies R, Ratso, J & Torvik, R (1994). The Macroeconomics of Zimbabwe in the 1980s: A CGE model analysis. *Journal of African Economies* Vol.3, pp.153-198. Development, *American Economic Review,* Vol. 51, no. 4, pp. 566-93

De Janvry A & Sadoulet E (1996). *Growth, inequality and poverty in Latin America: a causal analysis, 1970–94.* Working Paper no. 784, Department of Agricultural and Resource Economics, University of California at Berkeley, California, USA.

Delgado C, Hopkins J & Kelly VA (1998). *Agricultural growth linkages in sub- Sahara Africa*. Research Report 107, International Food Policy Research Institute, Washington DC.

Devarajan S, Swaroop V & Zou H (1996). 'The Composition of Public Expenditure and Economic Growth', *Journal of Monetary Economics,* Vol.37 pp. 313–44.

DFID (2003). Agriculture and poverty, reduction: unlocking the potential. ADFID policy paper

DFID (1999). Zimbabwe: Country strategy paper 1999. London, Department for International Development.

Diao X & Dorosh P (2007). Demand constraints on agricultural growth in East and Southern Africa: A general equilibrium analysis. *Development Policy Review,* Vol.25, no. 3, pp. 275–292.

Diao XP & Dorosh E (2003). *Market Opportunities for African Agriculture. An Examination of Demand Side Constraints on Agricultural Growth*. Discussion Paper 1. International Food Policy Research Institute (IFPRI). Washington, D.C

Dowrick S & Gemmell N (1991). “Industrial catching up and economic growth: a comparative study across the world’s capitalist economics.” *Economic Journal*, Vol.101 pp.263-276.

Dreze J & Sen A (1989). *Hunger and Public Action*, Clarendon Press, Oxford.

Durbin J & Watson G (1950). *Testing for Serial Correlation in Least Squares Regression,* Biometrika, Vol.37, pp. 409-28.

Easterly W (1997). *The Ghost of the Financing Gap.* World Bank Policy Research Working Paper, 1807, August 1997

Easterly W & Rebelo S (1993). ‘Fiscal Policy and Economic Growth: An Empirical Investigation’, *Journal of Monetary Economics*, Vol.32, pp. 417–58.

Eicher C (1995). “Zimbabwe's Maize-Based Green Revolution: Preconditions for Replication.” *World Development*, Vol.23, no. 5, pp. 805-818.

Eicher CK & Staatz JM (1984). *Agricultural Development in the Third World*. The Johns Hopkins University Press.

Ellis F (2005). "Small farms, livelihood diversification, and rural-urban transitions: strategic issues in Sub-Saharan Africa." In *The future of small farms*. Proceedings of a workshop held by the International Food Policy Research Institute/2020 Vision Initiative, Overseas Development Initiative, and Imperial College London, June 26-29, 2005, in Wye, United Kingdom. Washington, D.C.: International Food Policy Research Institute.

Elias V (1985). *Government expenditures on agriculture and agricultural growth in Latin America*. Research Report 50. Washington, D.C.: International Food Policy Research Institute.

Elliott G (1998). "On the Robustness of Cointegration Methods When Regressors Almost Have Unit Roots", *Econometrica*, Vol.66, pp. 149-158.

Evenson RE & Bloom EA (1990). *"Research and Productivity in Pakistan Agriculture."* Agricultural strategies in the 1990's Issues and Policies. Pakistan Association of Agricultural Social Scientists, Islamabad.

E-VIEWS (1997), *E-Views Users' Guide Version 3*, Irvine, California, Quantitative Micro Software.

Eyo OE (2008). Macroeconomic Environment and Agricultural Sector Growth in Nigeria. *World Journal of Agricultural Sciences* Vol.4, no. 6, pp. *781-786, 2008 ISSN 1817-3047*. © IDOSI Publications, 2008

Fajingbesi AA & Odusola AF (1999). *Public Expenditure and Growth.* A Paper Presented at a Training Programme on Fiscal Policy Planning Management in Nigeria, Organized by NCEMA, Ibadan, Oyo State, 137-179.

Fan S, Hazell P & Thorat S (1999) *Linkages Between Government Spending, Growth and Poverty in Rural India*. Research Report 110. Washington, DC.

Fan S, Hazell P & Thorat S (2000). Government Spending, Agricultural Growth and Poverty Reduction in India, *American Journal of African Economics.* Vol.5, no. 4, pp. 133-165.

Fan S & Rao N (2003). *Public spending in developing countries: trends, determination, and impact*, EPTD discussion papers 99, International Food Policy Research Institute (IFPRI).

Fan S & Saurkar A (2006) Public Spending in Developing Countries: Trends, Determination and Impact (mimeo). Washington, D.C.

Fan S & Mogues T & Benin S (2009). *Setting priorities for public spending for agricultural and rural development in Africa,* Policy briefs 12, International Food Policy Research Institute (IFPRI).

Fan S & Johnson M & Saurkar A & Makombe T (2008). *Investing in African agriculture to halve poverty by 2015*. IFPRI discussion papers 751, International Food Policy Research Institute (IFPRI).

Fan S, Zhang X, & Rao N (2004). *Public expenditure, growth, and poverty reduction in rural Uganda*. Development Strategy and Governance Division Discussion

Fan S, Zhang X & Zhang L (2000). *"Growth and poverty in rural China: the role of public investments",* EPTD discussion paper 66, International Food Policy Research Institute (IFPRI).

Fan S, Zhang X & Zhang L (2002). *"Growth, inequality and poverty in rural China*", Research papers 125, International Food Policy Research Institute (IFPRI).

Fei J & Ranis G (1961). "A theory of economic development." *American Economic Review,* Vol.51, no. 4, pp. 533-565.

Fei J & Ranis G (1964) *Development of the Labour Surplus Economy:* Theory and Policy, Homewood, Illinois: Richard A, Irwin, inc

Food and Agriculture Organization (FAO), (2001). *FAO-nutrition country profiles (Zimbabwe).* Food and Agriculture Organisation of the United Nations, Rome.

Food and Agriculture Organization (FAO), (2003). *WTO Agreement on agriculture: The implementation experience*. Trade and Development Studies Centre, Harare.

Food and Agriculture Organization (FAO), 2006. Livestock's long shadow: environmental issues and options. FAOSTAT FAO, Rome. Available online at: http://faostat.fao.org (Accessed 16 March 2010).

Gallaway L & Vedder R (1998). *Government size and Economic Growth.* For the Joint Economic Committee. Ohio

Gallup J, Radelet S & Warner A (1997). *Economic growth and the income of the poor.* CAER Discussion Paper No. 36. Harvard Institute for International Development: Cambridge, MA, USA.

Garcia R (2007). *Zimbabwe Economic Performance Assessment: A Benchmark study.* Nathan Associates Inc. for review by the United States Agency for International Development. Available online on http://www.countrycompass.com/_docs/assessments/Zimbabwe_Economic_Performance_Assessment.pdf.

Gaynor P & Kirkpatrick R (1994). *Introduction to Time Series Modelling and forecasting in business and economics.* McGraw-Hill, New York.

Gollin D, Parente SL & Rogerson R (2002). The role of agriculture in development. *American Economic Review,* Vol.92, no. 2, pp. 160-164.

Gollin D (2004). *Land Reform, 2004* Meeting papers 653, Society for Economic Dynamics. Rome

Gomanee K, Morrissey O, Mosley P & Verschoor A (2003). *Aid, Pro-poor Government Spending and Welfare.* CREDIT Research Paper 3. Nottingham: University of Nottingham, CREDIT.

Government of Zimbabwe (1986). *Socio-Economic Review of Zimbabwe 1980-1985.* Ministry of Finance, Economic Planning and Development, Harare.

Government of Zimbabwe (1995). *Zimbabwe's agricultural policy framework 1995-2020.* Harare. Government Printers, Harare.

Granger CW & Newbold P (1987). Spurious regressions in Econometrics. *Journal of Econometrics*, Vol.2 pp, 111-120.

Gujarati DN (1995). *Basic Econometrics*. Third edition, McGraw-Hill, Inc.

Gujarati DN (2003). *Basic econometrics* (Fourth Edition). New York: McGraw-Hill Inc.

Gwartiney J, Holcombe R &Lawson R (1998). The Scope of government and the wealth of nations. *Cato Journal,* Vol.10, no. 3, pp. 553 – 579.

Habakkuk H (1966). *The Cambridge Economic History of Europe: The Agrarian life of the middle ages,* Cambridge University.

Haggblade S, *et al.* (1989). *Agricultural Growth Linkages in Sub-Saharan Africa,* World Bank.

Harris R (1995). *Using cointegration analysis in econometric modelling.*: Prentice Hall. London.

Hazell P & Ramasamy C with eight others (1991). *The Green Revolution Reconsidered: The Impact of High-Yielding Rice Varieties in South India*. Johns Hopkins University Press for the International Food Policy Research Institute: Baltimore, USA and London, UK.

Herbst J (1990). *State Politics in Zimbabwe.* University of Zimbabwe Publications, Zimbabwe and University of California Press, United States of America.

Holmes J & Hutton P (1990). On the causal relationship between government expenditures and national income. *Rev Econ Stat,* Vol.72, no. 1, pp. 87–95

IFPRI (2002). *"Cutting Hunger in Africa through Smallholder-led Agricultural Growth"*. Technical paper in support of USAID's Agricultural Initiative to Cut Hunger in Africa (AICHA). IFPRI,Washington DC.

Jayne T S, Khatri Y, Thirtle C & Reardon T (1994). Determinants of productivity change using a profit function: smallholder agriculture in Zimbabwe. *American Journal of Agricultural Economics, 76 August*: Vol.8, no. 5, pp. 613-618.

Johnston B F & Mellor J W (1961*).* "The Role of Agriculture in Economic Development." *American Economic Review.* Vol. 51, no. 4, pp. 566-93.

Jorgenson D (1961). "The development of a dual economy." *Economic Journal,* Vol.282, pp. 209-334.

Johansen S (1995). *Likelihood-Based Inference in Cointegrated Vector Autoregressive Models*. Oxford University Press, New York.

Johansen S & Juselius K (1990). "Maximum Likelihood Estimation and Inference on Cointegration – with Applications to the Demand for Money", *Oxford Bulletin of Economics and Statistics* Vol.52, pp. 169-210.

Juana JS & Mabugu RE (2005). Assessment of small holder agriculture's contribution to the economy of Zimbabwe: A social Accounting Matrix Multiplier Analysis. *Agrekon,* Vol.44, no. 3, pp. 344-362.

Judd M A, Boyce J K & Evenson R E (1991). *Investment in agricultural research and extension programmes: a quantitative assessment.* In R.E. EVENSON & C.E. PRAY, eds. Research and productivity in Asian agriculture. Ithaca, USA, Cornell University Press.

Kalakech K (2009). *The Nature of Government Expenditure and its Impact on Sustainable Economic Growth.* Middle Eastern Finance and Economics, *Euro Journals Publishing*, Inc. 2009 Available online on http://www.eurojournals.com/MEFE.htm

Kakwani, N (1993). "Statistical Inference in the Measurement of Poverty". *Review of Economics and Statistics.* 632-39.

Khan MH & Akbari A (1986), *"Impact of Agricultural Research and Extension on Crop Productivity in Pakistan: A Production Function Approach", World Development*, 14(6).

Khatri Y (1994), *"Technical Change and the Return to Research in UK Agriculture 1953-1990",* Unpublished PhD Dissertation, Department of Agricultural Economics and Management, University of Reading

Kinsey, BH (1999). "Land Reform, Growth, and Equity: Emerging Evidence from Zimbabwe's Resettlement Program," *Journal of Southern African Studies*, Vol.25, no. 2, pp. 173–96

Komain J & Brahmasrene T (2007). The Relationship Between Government Expenditures and Economic Growth in Thailand. *Journal of Economics and Economic Education Research.* Available on http://findarticles.com/p/articles/mi_qa5529/?tag=content;col1

Kormendi R C & Meguire P G (1985). "Macroeconomic Determinants of Growth: Cross Country Evidence," *Journal of Monetary Economics,* Vol. 16, pp.141-63.

Landau D (1983). Government expenditure and economic growth: a cross-country study. *South Econ Journal*, Vol.49, pp. 783–792

Landau D (1986). Government and economic growth in the less developed countries: an empirical study for 1960-1980, *Economic Development and Cultural Change:* Vol.18, pp. 34-75.

Levine R & Renelt D (1992). 'A Sensitivity Analysis of Cross-country Growth Regressions', *American Economic Review,* Vol.82, no. 4, pp. 942–63.

Lewis W A (1954). *Economic Development with Unlimited Supplies of Labour*. *The Manchester School.* Vol. 22, pp 3-42.

Lipsey R & Crystal A (1999). *Principles of Economics,* Oxford University

Mano R (2003). *Agricultural commodity marketing challenges and pricing policy strategies.* The technical unit of the Utete Commission. Zimbabwe Government Printers, Harare.

Mano R, Sukume C & Rugube L (2003). *Inputs production and delivery systems.* The technical unit of the Utete Commission. Zimbabwe Government Printers, Harare.

Manzungu E (1999). *Strategies of Smallholder Irrigation Management in Zimbabwe.* PhD Thesis, Wageningen University. The Netherlands.

Manzungu E (2003). *Towards Sustainable Water Resources and Irrigation Development in the Post Fast Track Land Reform Era in Zimbabwe*, (Utete Report, 2003, p 57-66).

Mario Q, Marcos S, ShunlI Y & Carter C (2006). *Agriculture in Brazil and China. Challenges and Opportunities.* Intal ITD. Occasional Paper 44

Martin W & Miltra D (1996). *Productivity Growth and Convergence in Agriculture and Manufacturing, World Bank.* Policy Research Working Paper number 2171.

Maxwell S & Slater R (2003). Food policy old and new. *Development Policy Review,* Vol.18, no. 5, pp. 531–553.

Mhone GCZ (2000). *Enclavity and Constrained Labour Absorptive Capacity in Southern African Economies.* Discussion Paper No. 12, ILO/SAMAT. Harare, ILO/SAMAT.

Milbourne R, Otto G & Voss G (2003). ‘Public Investment and Economic Growth’, *Applied Economics,* Vol.35, pp. 527–40.

Ministry of Finance (MOF) (2009), *Budget Estimates,* Harare

Mlambo K & Zitsanza N (2001). *Economies of scale, capacity utilization and productivity measurement in Zimbabwean commercial agriculture.* African Development Bank Reviews, Volume 9(2) [Online]. Available from: *http://www.afdb.org/knowledge/reviews/reviews_vol9_n2.htm* (Accessed 18 January 2011).

MLARR (2001). People First. *Zimbabwe’ Land Reform Programme.* Department of Information & Publicity. Zimbabwe Government Printers, Harare.

Moore F P & Parai B (1996). Organic Farming in Africa. Unpublished on *www.fao.org/docrep/012/al134e/al134e02.pdf* (Accessed 9 April 2010).

Morgan W (1977). *Agriculture in the Third World,* West View Press.

Mosley P, Hudson J & Verschoor A (2004). ‘Aid, Poverty Reduction and the “New Conditionality”’, *Economic Journal* 114, June: F217–F243.

Moyo S (2001). The Land Occupation movement and Democratization in Zimbabwe: Contradictions of neo-liberalism. Millennium: *Journal of International Studies,* Vol. 30, No. 2, pp 311-330.

Moyo S (2004). *The Land and Agrarian Question in Zimbabwe.* Paper presented at the first annual colloquium (30 September 2004) at the University of Fort Hare.

Moyo S (2006). “The Evolution of Zimbabwe’s Land Acquisition.” In *Zimbabwe’s Agricultural Revolution Revisited*, edited by R. Mandivamba, P. Tawonezvi, C. Eicher, M. Munyuki-Hungwe, and P. Matondi. Harare: University of Zimbabwe Publications.

Muchapondwa E (2009). *Supply response of Zimbabwean agriculture:* 1970–1999, Volume 3 No 1 March 2009. School of Economics, University of Cape Town

Mudimu G (2003). *Zimbabwe food security issues paper Forum for Food Security in Southern Africa.* Department of Agricultural Economics, University of Zimbabwe [Online]. Available from: http://www.odi.org.uk/Food-Security-Forum/docs/ZimbabweCIPfinal.pdf (Accessed 6 August 2010).

Muir K (1997). *Agriculture in Zimbabwe.* Leadership for Environment and Development. Harare.

Mundlak Y (2000). Agriculture and Economic Growth: Theory and Measurement, Harvard University Press. Boston, Mass

Mushunje A (2005). Farm Efficiency and Land reform in Zimbabwe. Unpublished. PhD Thesis. University of Fort Hare, Alice, South Africa.

Mutangadura G (1997). *Meeting Development Objectives with Agricultural Research, Priority Setting in Zimbabwe.* Blacksburg, Virginia. Unpublished on *http://scholar.lib.vt.edu/theses/available/etd-565121059721601/unrestricted/thes971.PDF* (Accessed on 06 April 2010).

Nkonya E (2004). *Strategies for sustainable land management and poverty reduction in Uganda.* International Food Policy Rest Inst

Nurudeen A & Usman A (2010). *Government Expenditure And Economic Growth In Nigeria, 1970-2008: A Disaggregated Analysis.* Department of Economics, University of Abuja, PMB 117, Nigeria

Olugbenga AO & Owoye O (2007). *Public Expenditure and Economic Growth: New Evidence from OECD Countries.* Available online on [http://iaes.confex.com/iaes/Rome_67/techprogram/S1888.HTM]

Owusu-Baah K (2008). Ghana case study, a study prepared for the project, *'Applying historical precedent to New Conventional Wisdom on public sector roles in agriculture and rural development'.* Rome: FAO.

Pal S P (1985). *Contribution of irrigation to agricultural production and productivity*. New Dehli, National Council of Applied Economic Research.

Pender J, Gebremedhin B, Benin S & Ehui S (2001). *Strategies for sustainable agricultural development in the Ethiopian highlands.* EPTD discussion paper no. 77. Environment and Production Technology Division International Food Policy Research Institute 2033 K Street, N.W. Washington, D.C. 20006 U.S.A.

Prabhu R & Mark R (1994). *Green revolution in Asia, Environment and Production Division* International Food policy Research Institute

Ram R (1987). Wagner's hypothesis in time series and cross section perspectives: evidence from real data for 115 countries. *Rev Econ Stat*, Vol.69, no. 2, pp. 359–393

Rao C & Hanumatha H (1994). *Agricultural growth, rural poverty and environmental degradation in India.* New Dehli: Oxford University Press.

Ravallion M & Datt G (1996). "How Important to India's poor is the Sectoral Composition of Economic Growth," *The World Bank Economic Review*, Vol.10, no. 1, pp. 1-25

Reserve Bank of Zimbabwe (RBZ) (2008). *Monetary Policy Statement*. Harare, Zimbabwe.

Reynolds L G (1997). Agriculture in the Development Theory. Yale University Press. New Haven, CT.

Rosset P, Collins P & Moore L (2000). *Lessons from the Green Revolution. Food First.* Institute for Food and Development Policy. Available at www.foodfirst.org/media/opeds/2000/4-greenrev.html

Rostow WW. *The Stages of Economic Growth: A Non-Communist Manifesto* Cambridge University Press (1960)

Rukovo, A, Takavarasha T, Thiele R, Wiebelt M (1991). *The Profile of Agricultural Protection in Zimbabwe*, Kiel Working Paper 457, January 1991.

Rukuni M, Eicher CK & Blackie (2006). *Zimbabwe's Agricultural Revolution, Revisited.* University of Zimbabwe Publications, Harare.

Rukuni M (1994a). *"Report of the Commission of Inquiry into Appropriate Agricultural Land Tenure systems".* Volume Two: Technical Reports. Zimbabwe

Rukuni M (1994b). Evolution of the Agricultural Policy: 1890-1990. In: Rukuni, M. and Eicher, C.K. (Ed.), *Zimbabwe's Agricultural Revolution.* University of Zimbabwe Publications. Harare, pp. 415-39.

Sachs J (1997). Nature, Nurture, and Growth, *Economist*, June 14, pp. 19-27.

Sala-i-Martin X (1997). 'I Just Ran Two Million Regressions', *American Economic Review,* Vol.87, no. 2, pp. 178–83.

Saprin (1999). *Civil Society Perspectives on Structural Adjustment Policies.* Available on *http://www.saprin.org/zimbabwe/zimbabwe_forum1.htm* (Accessed 8 April 2010).

Sebotja I (1985). An Evaluation of the Krokokilheuwel irrigation scheme, Lebowa. An unpublished Honours dissertation paper, University of Fort Hare, Alice.

Seddighi HR, Lawler KA & Katos AV (2000). *Econometrics: a practical approach.* Routledge: London.

Sen A. (1999). *Development As Freedom*. New York: Anchor.

Schultz W T (1964). *Transforming Traditional Agriculture.* New Haven: Yale University Press.

Schultz W T (1968). *Economic growth and agriculture.* New York: Mac Graw-Hill

Shaw W (2003). "'They Stole Our Land': Debating the Expropriation of White farms in Zimbabwe," *Journal of Modern African Studies*, Vol.42, no. 1, pp. 75–89.

Sherman E J (1960). *"Potential Contribution of Agriculture to Economic Growth in Less-Developed Countries"* Annals of the American Academy of Political and Social Science, Vol. 331, Agricultural Policy, Politics, and the Public Interest, Sage Publications, Inc. in association with the American Academy of Political and Social Science

Sithole G (1996). *Analysis of policy reform and structural adjustment programs in Zimbabwe with emphasis on agriculture and trade*. Technical Paper No 36, SD Publication Series, USIAD/Bureau of Africa, Washington DC.

Smith L & Akroyd S (2007). *Review of public spending to Agriculture.* Oxford Policy management. A joint DFID / World Bank study. Washington DC.

Soloaga I (2006). *Agricultural Growth and Poverty Reduction: The Case of Mexico.* International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12-18, 2006.

Stanning J (1987), "Household Grain Storage and Marketing in Surplus and Deficit Communal Farming Areas in Zimbabwe: Preliminary Findings", in Rukuni M, Eicher CK & Blackie (2006). *Zimbabwe's Agricultural Revolution, Revisited.* University of Zimbabwe Publications, Harare.

Stern N (1996). *Growth theories, old and new, and the role of agriculture in economic development. Economic and Development Paper 136*. Food and Agriculture Organisation of the United Nations: Rome, Italy.

Tanzi, V & Zee H (1997). Fiscal policy and long-run growth. *IMF Staff Papers,* Vol.44, no. 2, pp. 179–209.

Tawonezvi PH (1994). Agricultural research policy. In: Rukuni, M and Eicher, C K. (Ed.), *Zimbabwe's Agricultural Revolution.* University of Zimbabwe Publications, Harare, pp. 92-103.

Tekere M & Hurungo J (2003). *The status of agriculture trade and liberalization in SADC countries: The case for Zimbabwe*. Southern African Trade and Development Newsletter No 9 (March 2003). Available at: http://www.tradescentre.org.zw/ newsletters/2003/march/article5.htm.

Thirtle C, Irz X, Lin L, McKenzie-Hill V & Wiggins S (2001). *Relationship between changes in agricultural productivity and the incidence of poverty in developing countries*. Report commissioned by DFID. Department for International Development: London, UK.

Thomas RL (1997). *Modern econometrics: an introduction.* London: Addison-Wesley.

Thorbecke E & Jung H (1996). "A Multiplier Decomposition Method to Analyze Poverty Alleviation" *Journal of Development Economics,* Vol.48, pp. 279-300

Timmer CP (1995). "*Getting agriculture moving: do markets provide the right signals?"* Food Policy 20(5): 455-472.

Timmer P (1997). *How well do the poor connect to the growth process?* Harvard Institute for International Development. United States Agency for International Development.

Timmer C P (2002). *Agriculture and economic development.* In: Gardner, B.L., Rausser, G.C. (Eds.), Handbook of Agricultural Economics. Agriculture and its External Linkages, vol. 2A. Amsterdam: Elsevier Science Publishers.

Thirtle C, Lin L, Piesse J (2003). "The impact of research-led agricultural productivity growth on poverty reduction in Africa, Asia and Latin America." Available online on: (http://www.sciencedirect.com/science/article/pii/S0305750X03001682)

Utete CMB (2003). Report of the presidential land review committee. To His Excellency the President of the Republic of Zimbabwe. Zimbabwe Government Printers.

Valentine, C. A. (1968). *Culture and Poverty*. Chicago: University of Chicago Press.

UNDP (2008), *'Comprehensive Economic Recovery in Zimbabwe'*. A discussion document. UNDP Zimbabwe.

(USDA, 2009). *Agricultural Economy and Policy Report – BRAZIL*. Online on http://www.fas.usda.gov/country/Brazil/Brazil%20Agricultural%20Economy%20and%20Policy.pdf (Accessed 2 May 2010).

Vida A, Xinshen D, Sheu S & Manson N (2009). *Agricultural investment for growth and poverty reduction in Nigeria.* Development Strategy and Governance Division International Food Policy Research Institute (IFPRI) and ReSAKSS- West Africa International Institute of Tropical Agriculture (IITA).

Vudzijena V (1998). Land reform and community based natural resource management in Zimbabwe. *ZERO Regional Environment Organization:* 76-103.

Vyas V (2008). India case study, a study prepared for the project, 'Applying historical precedent to New Conventional Wisdom on public sector roles in agriculture and rural development'. Rome: FAO. *World Developmen*t, Vol.31, no. 2, pp. 1959-1975.

Warr P (2001). *Poverty reduction and sectoral growth, results from South East Asia*. Australia National University: Canberra, Australia.

World Bank (1991). *Zimbabwe Agriculture Sector Memorandum*, Report No. 9429-Zim. Washington, D.C.

World Bank (1995). *Zimbabwe: Achieving shared growth, vol. I (Overview).* Report No. 13540-ZIM. Washington, D.C.

World Bank report No 387 (1998). *The Agrarian Economics of Central and Eastern Europe.* World Bank Discussion Papers. World Bank Publications.

World Bank (2003). *African Development Indicators.* The International Bank for Reconstruction and Development. World Bank Publications.

World Bank (2004). *Global poverty monitoring website.* Available at http://www.worldbank.org/research/povmonitor/index.htm (Accessed 17 April 2011)

World Bank (2006). *Agriculture and economic development*. UNEP and the International Bank of Reconstruction and Development/World Bank, Kenya.

World Bank (2007). *Delivering On Promise of Pro-Poor Growth*, Macmillan.

World Bank (2008). *World Bank Development Indicators.* *www.worldbank.org* (Accessed 7 April 2010)

World Bank (2009). *Country Brief.* The World Bank Group, Available at *www.worldbank/zimbabwe* (Accessed on 5 May 2010).

World Food Programme (WFP) (2009). *"Crop and food security assessment mission to Zimbabwe 22 June 2009"* World Food Programme, Rome

Zikhali, P (2008). *"Fast Track Land Reform, Tenure Security, and Investments in Zimbabwe."* Discussion Paper 08-23 EfD. Washington, DC: Resources for the Future and Environment for Development Initiative.

Zimbabwe Government (1991). *A Framework for Economic Reform (1991-1995).* Ministry of Finance, Harare

Zumbika N (2000). *The Challenges of lending to the poor.* Kaycee Printers, Harare.

APPENDICES

APPENDIX A: RESULTS OF SHORT RUN ESTIMATES

Dependent Variable: LOGGDP
Method: Least Squares
Date: 08/14/11 Time: 18:23
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.68555	1.712285	6.240520	0.0000
LOGAEEXT	-0.199412	0.090863	-2.194649	0.0396
LOGAECA	-0.047059	0.034773	-1.353333	0.1903
LOGAERD	0.314506	0.244562	1.285998	0.2124
LOGNAE	0.447630	0.070557	6.344249	0.0000
LOGI(-1)	0.129937	0.035875	3.621959	0.0016
LOGC	0.004299	0.023693	0.181462	0.8577
FTLRP	-0.088382	0.093028	-0.950057	0.3529

R-squared	0.938757	Mean dependent var	16.74203
Adjusted R-squared	0.918342	S.D. dependent var	0.269359
S.E. of regression	0.076971	Akaike info criterion	-2.061815
Sum squared resid	0.124417	Schwarz criterion	-1.684630
Log likelihood	37.89632	Hannan-Quinn criter.	-1.943685
F-statistic	45.98501	Durbin-Watson stat	1.747415
Prob(F-statistic)	0.000000		

APPENDIX B: UNIT ROOT TESTS FOR GDP

Augmented Dickey-Fuller Test for GDP at level

Null Hypothesis: LOGGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.226031	0.9243
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGGDP)
Method: Least Squares
Date: 08/14/11 Time: 17:01
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGDP(-1)	-0.018778	0.083076	-0.226031	0.8229
C	0.305052	1.391794	0.219179	0.8282

R-squared	0.001889	Mean dependent var	-0.009502
Adjusted R-squared	-0.035078	S.D. dependent var	0.108570
S.E. of regression	0.110458	Akaike info criterion	-1.501893
Sum squared resid	0.329426	Schwarz criterion	-1.407596
Log likelihood	23.77744	Hannan-Quinn criter.	-1.472360
F-statistic	0.051090	Durbin-Watson stat	1.325428
Prob(F-statistic)	0.822880		

Augmented Dickey-Fuller Test for GDP at first difference

Null Hypothesis: D(LOGGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.746750	0.0087
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGGDP,2)
Method: Least Squares
Date: 08/14/11 Time: 17:04
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGDP(-1))	-0.730976	0.195096	-3.746750	0.0009
C	-0.010097	0.020166	-0.500699	0.6208

R-squared	0.350619	Mean dependent var	0.001875
Adjusted R-squared	0.325643	S.D. dependent var	0.128303
S.E. of regression	0.105361	Akaike info criterion	-1.594091
Sum squared resid	0.288627	Schwarz criterion	-1.498934
Log likelihood	24.31728	Hannan-Quinn criter.	-1.565000
F-statistic	14.03814	Durbin-Watson stat	1.717731
Prob(F-statistic)	0.000902		

APPENDIX C: UNIT ROOT TESTS FOR AGRICULTURE EXPENDITURE ON CREDIT ASSISTANCE

Augmented Dickey-Fuller Test for Agricultural expenditure on credit assistance at level

Null Hypothesis: LOGAECA has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.335482	0.9076
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAECA)
Method: Least Squares
Date: 08/14/11 Time: 17:26
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAECA(-1)	-0.020414	0.060850	-0.335482	0.7399
C	0.259385	0.286326	0.905908	0.3730

R-squared	0.004151	Mean dependent var	0.167086
Adjusted R-squared	-0.032732	S.D. dependent var	0.420261
S.E. of regression	0.427084	Akaike info criterion	1.202799
Sum squared resid	4.924815	Schwarz criterion	1.297095
Log likelihood	-15.44058	Hannan-Quinn criter.	1.232331
F-statistic	0.112548	Durbin-Watson stat	1.634694
Prob(F-statistic)	0.739855		

Augmented Dickey-Fuller Test for Agricultural expenditure on credit assistance at first difference

Null Hypothesis: D(LOGAECA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.304306	0.0022
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAECA,2)
Method: Least Squares
Date: 08/14/11 Time: 17:32
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGAECA(-1))	-0.831551	0.193191	-4.304306	0.0002
C	0.141804	0.087463	1.621295	0.1170

R-squared	0.416085	Mean dependent var	0.001650
Adjusted R-squared	0.393627	S.D. dependent var	0.551618
S.E. of regression	0.429545	Akaike info criterion	1.216567
Sum squared resid	4.797221	Schwarz criterion	1.311724
Log likelihood	-15.03193	Hannan-Quinn criter.	1.245657
F-statistic	18.52705	Durbin-Watson stat	1.937833
Prob(F-statistic)	0.000211		

APPENDIX D: UNIT ROOT TESTS FOR AGRICULTURE EXPENDITURE ON EXTENSION

Augmented Dickey-Fuller Test for Agricultural expenditure on extension at level

Null Hypothesis: LOGAEEXT has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.725642	0.0820
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAEEXT)
Method: Least Squares
Date: 08/14/11 Time: 17:12
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAEEXT(-1)	-0.131529	0.048256	-2.725642	0.0111
C	1.089731	0.383365	2.842538	0.0084

R-squared	0.215780	Mean dependent var	0.046660
Adjusted R-squared	0.186735	S.D. dependent var	0.136006

S.E. of regression	0.122651	Akaike info criterion	-1.292468
Sum squared resid	0.406171	Schwarz criterion	-1.198171
Log likelihood	20.74078	Hannan-Quinn criter.	-1.262935
F-statistic	7.429124	Durbin-Watson stat	2.100449
Prob(F-statistic)	0.011127		

APPENDIX E: UNIT ROOT TESTS FOR AGRICULTURE EXPENDITURE ON RESEARCH AND DEVELOPMENT

Augmented Dickey-Fuller Test for Agricultural expenditure on research and development at level

Null Hypothesis: LOGAERD has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.942376	0.3093
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAERD)
Method: Least Squares
Date: 08/14/11 Time: 17:38
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAERD(-1)	-0.217707	0.112083	-1.942376	0.0626
C	1.362946	0.703497	1.937387	0.0632

R-squared	0.122602	Mean dependent var	-0.003139
Adjusted R-squared	0.090106	S.D. dependent var	0.092395
S.E. of regression	0.088134	Akaike info criterion	-1.953448
Sum squared resid	0.209725	Schwarz criterion	-1.859151
Log likelihood	30.32499	Hannan-Quinn criter.	-1.923915
F-statistic	3.772823	Durbin-Watson stat	1.776102
Prob(F-statistic)	0.062590		

Augmented Dickey-Fuller Test for Agricultural expenditure on research and development at first difference

Null Hypothesis: D(LOGAERD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.873454	0.0005
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGAERD,2)
Method: Least Squares
Date: 08/14/11 Time: 17:43
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGAERD(-1))	-1.333837	0.273694	-4.873454	0.0000
C	-0.008734	0.018117	-0.482099	0.6338

R-squared	0.477393	Mean dependent var	0.011871
Adjusted R-squared	0.457293	S.D. dependent var	0.126541
S.E. of regression	0.093221	Akaike info criterion	-1.838931
Sum squared resid	0.225946	Schwarz criterion	-1.743774
Log likelihood	27.74504	Hannan-Quinn criter.	-1.809841
F-statistic	23.75056	Durbin-Watson stat	1.566260
Prob(F-statistic)	0.000047		

APPENDIX F: UNIT ROOT TESTS FOR NON AGRICULTURE EXPENDITURE

Augmented Dickey-Fuller Test for non agriculture expenditure at level

Null Hypothesis: LOGNAE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.564915	0.8637
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGNAE)

Method: Least Squares
Date: 08/14/11 Time: 19:12
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGNAE(-1)	-0.038756	0.068604	-0.564915	0.5768
C	0.405825	0.727787	0.557615	0.5817

R-squared	0.011682	Mean dependent var	-0.004954
Adjusted R-squared	-0.024923	S.D. dependent var	0.161635
S.E. of regression	0.163637	Akaike info criterion	-0.715861
Sum squared resid	0.722980	Schwarz criterion	-0.621565
Log likelihood	12.37999	Hannan-Quinn criter.	-0.686329
F-statistic	0.319129	Durbin-Watson stat	0.905423
Prob(F-statistic)	0.576796		

Augmented Dickey-Fuller Test for non agriculture expenditure at first difference

Null Hypothesis: D(LOGNAE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.253052	0.0273
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGNAE,2)
Method: Least Squares
Date: 08/14/11 Time: 19:19
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGNAE(-1))	-0.518894	0.159510	-3.253052	0.0032
C	-0.013242	0.025754	-0.514174	0.6115

R-squared	0.289275	Mean dependent var	-0.011474
Adjusted R-squared	0.261939	S.D. dependent var	0.158591
S.E. of regression	0.136246	Akaike info criterion	-1.079957
Sum squared resid	0.482639	Schwarz criterion	-0.984800
Log likelihood	17.11940	Hannan-Quinn criter.	-1.050867
F-statistic	10.58234	Durbin-Watson stat	2.392265
Prob(F-statistic)	0.003158		

APPENDIX G: UNIT ROOT TESTS FOR CONSUMPTION EXPENDITURE

Augmented Dickey-Fuller Test for consumption expenditure at level

Null Hypothesis: LOGC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.103655	0.7006
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGC)
Method: Least Squares
Date: 08/14/11 Time: 17:46
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGC(-1)	-0.046590	0.042214	-1.103655	0.2795
C	0.716272	0.477493	1.500069	0.1452

R-squared	0.043166	Mean dependent var	0.200478
Adjusted R-squared	0.007727	S.D. dependent var	0.529214
S.E. of regression	0.527165	Akaike info criterion	1.623866
Sum squared resid	7.503384	Schwarz criterion	1.718163
Log likelihood	-21.54606	Hannan-Quinn criter.	1.653399
F-statistic	1.218054	Durbin-Watson stat	1.510222
Prob(F-statistic)	0.279482		

Augmented Dickey-Fuller Test for consumption expenditure at first difference

Null Hypothesis: D(LOGC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.982587	0.0049
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGC,2)

Method: Least Squares
Date: 08/14/11 Time: 17:48
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGC(-1))	-0.757330	0.190160	-3.982587	0.0005
C	0.148062	0.107709	1.374645	0.1810

R-squared	0.378897	Mean dependent var	-0.004963
Adjusted R-squared	0.355008	S.D. dependent var	0.662975
S.E. of regression	0.532444	Akaike info criterion	1.646071
Sum squared resid	7.370911	Schwarz criterion	1.741228
Log likelihood	-21.04499	Hannan-Quinn criter.	1.675162
F-statistic	15.86100	Durbin-Watson stat	2.027160
Prob(F-statistic)	0.000489		

APPENDIX H: UNIT ROOT TESTS FOR INVESTMENT EXPENDITURE

Augmented Dickey-Fuller Test for investment expenditure at level

Null Hypothesis: LOGI has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.994535	0.2873
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGI)
Method: Least Squares
Date: 08/14/11 Time: 17:49
Sample (adjusted): 1983 2009
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGI(-1)	-0.072070	0.036134	-1.994535	0.0581
D(LOGI(-1))	0.040163	0.142567	0.281717	0.7807
D(LOGI(-2))	0.602393	0.142542	4.226069	0.0003
C	0.669271	0.335876	1.992616	0.0583

R-squared	0.549123	Mean dependent var	0.073271
Adjusted R-squared	0.490313	S.D. dependent var	0.278265
S.E. of regression	0.198660	Akaike info criterion	-0.258491

Sum squared resid	0.907712	Schwarz criterion	-0.066515
Log likelihood	7.489631	Hannan-Quinn criter.	-0.201407
F-statistic	9.337220	Durbin-Watson stat	2.109095
Prob(F-statistic)	0.000317		

Augmented Dickey-Fuller Test for investment expenditure at first difference

Null Hypothesis: D(LOGI) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.360650	0.5861
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGI,2)
Method: Least Squares
Date: 08/14/11 Time: 18:06
Sample (adjusted): 1983 2009
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGI(-1))	-0.263610	0.193738	-1.360650	0.1863
D(LOGI(-1),2)	-0.660311	0.147958	-4.462817	0.0002
C	0.004425	0.043724	0.101191	0.9202

R-squared	0.678324	Mean dependent var	0.002283
Adjusted R-squared	0.651517	S.D. dependent var	0.356796
S.E. of regression	0.210625	Akaike info criterion	-0.173032
Sum squared resid	1.064714	Schwarz criterion	-0.029050
Log likelihood	5.335925	Hannan-Quinn criter.	-0.130218
F-statistic	25.30457	Durbin-Watson stat	2.001734
Prob(F-statistic)	0.000001		

Augmented Dickey-Fuller Test for investment expenditure at second difference

Null Hypothesis: D(LOGI,2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.55836	0.0000
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOGI,3)
Method: Least Squares
Date: 08/14/11 Time: 18:03
Sample (adjusted): 1983 2009
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGI(-1),2)	-1.790040	0.115053	-15.55836	0.0000
C	-0.017544	0.041320	-0.424594	0.6748

R-squared	0.906389	Mean dependent var	0.027380
Adjusted R-squared	0.902645	S.D. dependent var	0.686440
S.E. of regression	0.214182	Akaike info criterion	-0.172796
Sum squared resid	1.146846	Schwarz criterion	-0.076808
Log likelihood	4.332745	Hannan-Quinn criter.	-0.144254
F-statistic	242.0625	Durbin-Watson stat	2.127467
Prob(F-statistic)	0.000000		

APPENDIX I: UNIT ROOT TESTS FOR FTLRP

Augmented Dickey-Fuller Test for FTLRP at level

Null Hypothesis: FTLRP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.664091	0.8405
Test critical values:	1% level	-3.679322	
	5% level	-2.967767	
	10% level	-2.622989	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FTLRP)
Method: Least Squares
Date: 08/14/11 Time: 19:03
Sample (adjusted): 1981 2009
Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FTLRP(-1)	-0.050000	0.075291	-0.664091	0.5123
C	0.000000	0.062526	0.000000	1.0000

R-squared	0.016071	Mean dependent var	-0.034483
Adjusted R-squared	-0.020370	S.D. dependent var	0.185695
S.E. of regression	0.187577	Akaike info criterion	-0.442781
Sum squared resid	0.950000	Schwarz criterion	-0.348485
Log likelihood	8.420325	Hannan-Quinn criter.	-0.413249
F-statistic	0.441016	Durbin-Watson stat	2.002632
Prob(F-statistic)	0.512264		

Augmented Dickey-Fuller Test for FTLRP at first difference

Null Hypothesis: D(FTLRP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.291503	0.0002
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FTLRP,2)
Method: Least Squares
Date: 08/14/11 Time: 19:08
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FTLRP(-1))	-1.037037	0.195982	-5.291503	0.0000
C	-0.037037	0.037037	-1.000000	0.3265

R-squared	0.518519	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.272166
S.E. of regression	0.192450	Akaike info criterion	-0.389211
Sum squared resid	0.962963	Schwarz criterion	-0.294053
Log likelihood	7.448949	Hannan-Quinn criter.	-0.360120
F-statistic	28.00000	Durbin-Watson stat	2.002849
Prob(F-statistic)	0.000016		

APPENDIX J: COINTEGRATION TESTS USING JOHANSEN METHODOLOGY

Date: 08/15/11 Time: 11:15
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments
Trend assumption: Linear deterministic trend
Series: LOGGDP LOGAEEXT LOGAECA LOGAERD LOGNAE LOGI LOGC FTLRP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.993151	358.8582	159.5297	0.0000
At most 1 *	0.944467	219.3145	125.6154	0.0000
At most 2 *	0.799152	138.3726	95.75366	0.0000
At most 3 *	0.770729	93.42677	69.81889	0.0002
At most 4 *	0.571790	52.18699	47.85613	0.0185
At most 5	0.423835	28.43903	29.79707	0.0711
At most 6	0.264332	13.00091	15.49471	0.1148
At most 7 *	0.145588	4.405572	3.841466	0.0358

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.993151	139.5437	52.36261	0.0000
At most 1 *	0.944467	80.94189	46.23142	0.0000
At most 2 *	0.799152	44.94585	40.07757	0.0131
At most 3 *	0.770729	41.23978	33.87687	0.0055
At most 4	0.571790	23.74796	27.58434	0.1438
At most 5	0.423835	15.43812	21.13162	0.2594
At most 6	0.264332	8.595333	14.26460	0.3214
At most 7 *	0.145588	4.405572	3.841466	0.0358

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

APPENDIX K: RESULTS OF LONG-RUN ESTIMATES

Dependent Variable: LOGGDP
Method: Fully Modified Least Squares (FMOLS)
Date: 08/14/11 Time: 18:26
Sample (adjusted): 1982 2009
Included observations: 28 after adjustments
Cointegrating equation deterministics: C
Long-run covariance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAEEXT	-0.213348	0.047566	-4.485332	0.0002
LOGAECA	-0.043440	0.019247	-2.257029	0.0353
LOGAERD	0.269084	0.127834	2.104955	0.0481
LOGNAE	0.456308	0.038847	11.74629	0.0000
LOGI(-1)	0.128505	0.018752	6.852854	0.0000
LOGC	0.004903	0.012532	0.391286	0.6997
FTLRP	-0.080825	0.048626	-1.662184	0.1121
C	10.97208	0.908777	12.07347	0.0000

R-squared	0.937114	Mean dependent var	16.74937
Adjusted R-squared	0.915104	S.D. dependent var	0.271337
S.E. of regression	0.079059	Sum squared resid	0.125006
Durbin-Watson stat	1.623354	Long-run variance	0.001619

APPENDIX L: ELASTICITIES OF AGRICULTURAL GROWTH AND NON AGRICULTURAL GROWTH

Dependent Variable: LOGP
Method: Least Squares
Date: 08/16/11 Time: 14:52
Sample (adjusted): 1980 1998
Included observations: 15 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.337878	0.723559	5.995200	0.0001
LOGAG	0.068200	0.030975	2.749648	0.0679
LOGNAG	-0.094590	0.028706	-2.611268	0.0331

R-squared	0.393043	Mean dependent var	3.876580
Adjusted R-squared	0.375217	S.D. dependent var	0.292664
S.E. of regression	0.165790	Akaike info criterion	0.364637
Sum squared resid	0.847733	Schwarz criterion	0.506247
Log likelihood	0.265223	Hannan-Quinn criter.	0.363129
F-statistic	2.487079	Durbin-Watson stat	1.424949
Prob(F-statistic)	0.024841		

APPENDIX M: REVIEW OF ELASTICITY OF AGRICULTURAL GROWTH WITH RESPECT TO AGRICULTURAL EXPENDITURES

Dependent Variable: LOGYAG
Method: Least Squares
Date: 08/30/11 Time: 16:02
Sample: 1980 2003
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.26840	1.533442	6.696311	0.0000
LOGEAG	0.572402	0.189356	3.022891	0.0063

R-squared	0.293465	Mean dependent var	14.89946
Adjusted R-squared	0.261350	S.D. dependent var	0.379492
S.E. of regression	0.326154	Akaike info criterion	0.676759
Sum squared resid	2.340277	Schwarz criterion	0.774930
Log likelihood	-6.121110	Hannan-Quinn criter.	0.702804
F-statistic	9.137870	Durbin-Watson stat	0.539053
Prob(F-statistic)	0.006254		