UNIVERSITY OF KWAZULU-NATAL

PRIMARY COMMODITY DEPENDENCE AND AGRICULTURAL DIVERSIFICATION: THE ROLE OF ORGANIC AGRICULTURE IN TRADE AND THE IMPLICATIONS FOR FOOD SECURITY IN SUB-SAHARAN AFRICA

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DECLARATION

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ABSTRACT

Sub-Saharan Africa is marginalised in the world economy and lags behind other developing regions in world trade. This is attributable to sub-Saharan Africa's inability to industrialise and diversify its exports base. Sub-Saharan Africa is still largely dependent on the exports of primary commodities, and agriculture is a vital export sector for many Sub-Saharan African economies with the majority of their exports reliant on traditional commodities. Most countries in the sub-Saharan African region have low levels of agricultural output and food security problems.

Against this background, this study first discusses the problems associated with primary commodity dependence and then examines the need and economic rationale for sub-Saharan Africa to diversify its exports from agriculture into other sectors. From this, it follows that, diversifying agricultural production and exports into organic produce could be one way to create a more sustainable development path for sub-Saharan African trade and food security. With this in mind, this study discusses the economic viability, including the policy considerations, for organic product diversification in sub-Saharan Africa. In addition, to ascertain the empirical position of this study, a statistical assessment of the supply-side food security situation in three sub-Saharan African major organic converters and exporters (Kenya, Tanzania and Uganda) is presented. The empirical results indicate that among the three countries, considering data trends and variances, Uganda's food security outlook is the most optimistic.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

1.1. The Sub-Saharan African Commodity Dependence Problem

In the wake of globalisation, an increasing number of developing countries have come under pressure to diversify their exports away from being heavily dependent on traditional primary commodities and to liberalise their trade in order to remain internationally competitive. Since 1980, there has been a significant shift in the export structure of much of the developing world, where primary commodities accounted for 75% of exports in 1980; today, 80% of exports are manufactured products (Collier, 2002). Collectively, developing countries can thus no longer be classified as being primary commodity dependent.

Sub-Saharan Africa is, however, the exception as many of the region's countries are as dependent on primary commodities today as they were in the 1960s (Farfan, 2005; Jerome and Wohlmuth, 2007). Specifically, 27 of the 47 countries in sub-Saharan Africa are presently considered primary commodity dependent (Babatunde, 2009).

The issue of primary commodity dependence was first raised by Prebisch and Singer in 1950. Prebisch and Singer questioned the commonly held view that the relative price of agricultural products would increase in the long term due to diminishing returns on land use. However, analysis of the data revealed a "declining trend in the relative price of primary commodities" (Lutz, 1999:44), from which the „Prebisch-Singer hypothesis' was formulated. This hypothesis was concerned with the increasing per capita income gap between developed and developing countries in the 1950s, as well as the gains resulting from trade. Prebisch and Singer suggested that countries exporting primary commodities would potentially have lower gains from trade than countries exporting manufactured products (Lutz, 1999; Ludema, 2001).

1.2. Export Diversification in Sub-Saharan Africa

Sub-Saharan Africa's heavy reliance on primary commodities has exposed the region to risk. These risks include large price shocks and price volatility, increased potential of civil war, poor governance and a high susceptibility to poverty traps (Hewitt and Page,

2001; Collier, 2002; Bonaglia and Fukasaku, 2003). Intrinsically linked to sub-Saharan Africa's primary commodity dependence problem are its slow but volatile economic growth rates and declining terms of trade (Habiyaremye, 2005; Elhiraika, 2008).

Hewitt and Page (2001) point out that price shocks are more serious for countries that are primary commodity dependent because these countries specialise in a narrow range of commodities that account for a large share of exports. In addition, Collier and Hoeffler (2001) found that a strong correlation exists between sub-Saharan Africa's perpetual primary commodity dependence and the occurrence of civil wars. According to Paul Collier, primary commodity dependence "directly increases the risk of conflict because it provides a means of financial viability for rebel groups" (2002: 9). Subsequently, there is a strong link between commodity dependence and poor governance. The instability of governments can substantially discourage investment in other sectors of the economy and this may reduce future growth. Moreover, primary commodity dependence could hinder or prevent economies from developing industries such as manufacturing (Sachs and Warner, 1995; Farfan, 2005).

Habiyaremye (2005) suggests that primary commodity dependent countries are more susceptible to poverty traps. A study by Sachs et al. (2004) indicates that the poverty levels found in sub-Saharan Africa cause low saving levels, resulting in very low or even negative economic growth rates. These low saving levels are not offset by foreign investment since investors are deterred by the region's lack of infrastructure and human capital. Thus, a heavy reliance on primary commodities, coupled with poverty traps, may prevent sub-Saharan Africa from successfully diversifying into secondary and tertiary activities (Elhiraika, 2008).

The above-mentioned problems have adversely affected sub-Saharan African economies and can partially explain the region's marginalisation in world trade. It is crucial that sub-Saharan Africa follow in the footsteps of the rest of the developing world, namely by engaging in export diversification (Sachs and Warner, 1995; Mwaba, 2000; Bonaglia and Fukasaku, 2003; Habiyaremye, 2005; Gibbon, 2007; Elhiraika, 2008). Export diversification belies achieving sustained economic growth and reducing poverty levels in primary commodity dependent countries (Habiyaremye, 2005; Brenton et al., 2007; Elhiraika, 2008). Whilst there seems to be consensus on the need for diversification to encompass manufacturing, some studies (Mwaba, 2000; Marinkov and Burger, 2005)

suggest that this is not entirely achievable for sub-Saharan Africa in the short to medium term.

Sub-Saharan Africa's inability to diversify its export base can be traced to the import-substitution policies used in the 1950s to 1970s. These policies were less successful than the export-oriented policies and they promoted closed economies. During the 1980s, the structural adjustment programmes intended to reform economies failed and further debilitated sub-Saharan Africa's ability to move into secondary and tertiary activities as government involvement in economic activities lessened. This corroded the small but present industrial base in many countries in the region. Numerous sub-Saharan African countries experienced reduced public spending and the incapacity to implement development-oriented policies and attract public investment. This was further compounded by the reduction of import tariffs. Insufficient infrastructure and human capital and poor domestic policies negatively influence the foreign direct investment and private investment needed for sub-Saharan Africa to diversify its export base (Martin, 2003; Mutume, 2004; Farfan, 2005; Kirkpatrick and Watanabe, 2005; Larsen and Fold, 2008; Nissanke, 2010).

Given that sub-Saharan Africa has a comparative advantage in agriculture, the region should focus its diversification efforts on further developing its agricultural sector (Wood and Mayer, 1998). This notion stems from the Heckscher-Ohlin trade theory, where "a country's trade structure reflects its comparative advantage, which is determined by the relative endowment of production factors" (Bonaglia and Fukasaku, 2003: 12).

1.3. A Non-Traditional Agricultural Diversification Strategy – Organic Agriculture

Sub-Saharan Africa's agricultural sector is pivotal to its economic growth since it comprises 32% of the GDP and provides employment to 65% of the population (Bach and Pinstrup-Anderson, 2008). Traditional export commodities such as cotton, coffee, cocoa and tobacco are dominant in the agricultural sector in sub-Saharan Africa. However, these commodities have experienced declining international prices and large price fluctuations. This, along with the region's limited capacity to diversify into manufactured goods, necessitates that sub-Saharan Africa diversify its agricultural sector to embrace non-traditional exports. Non-traditional agricultural exports include fruit, cut flowers, fish, meat, bee products, herbs and spices, nuts, vegetables, essential oils and

organic agricultural produce. This study addresses the need and opportunity for sub-Saharan Africa to diversify into organic agriculture.

Organic agriculture is defined as:

> A holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system (FAO, 1999).

The global market for organic agricultural produce is growing rapidly, with approximately 120 countries having adopted organic farming methods (Yussefi and Willer, 2007). Organic agricultural produce is the fastest growing agricultural sector in the world, with global sales increasing by more than US$ 5 billion each year (Willer et al., 2008). Consumer demand for organic produce is also on the rise, particularly in the USA and the EU (Forss and Sterky, 2000; Raynolds, 2004).

The growth in the global market for organic produce in recent years can be attributed to developments in both developed and developing countries. In developed countries, consumers' and farmers' demand for environmentally-friendly food that is healthy and of high quality has encouraged the growth of the organic market. This has resulted in organic agricultural policies that focus on environmental issues, issues pertinent to traditional agricultural policies as well as the need to develop local markets and economies (Scialabba, 2000). Thamaga-Chitja and Hendriks (2008: 323) suggest that government interventions in the organic sectors in developed countries have concentrated on "market facilitation, certification cost-sharing, funded market research and subsidised conversion to organic farming systems", which have augmented growth in the sector.

In 1972, institutions such as the International Federation of Organic Agricultural Movement (IFOAM) and the United Nations' Codex Alimentarius Commission played a major role in globalising the organic movement through the provision of international organic standards and definitions. In developing countries, however, organic agricultural policies have focused on the export potential of organic agriculture and the earning potential of much needed foreign exchange. The growth of organic agriculture in developing countries has been prompted by the reduction in preferential trade agreements, which has fuelled the production of value-added agricultural goods.

However, sub-Saharan Africa has largely been excluded from this growth, barring a few countries such as Kenya, Uganda, Tanzania, South Africa and Zambia. Many sub-Saharan African smallholder farmers produce organic crops for domestic consumption, thus are excluded from this rapidly expanding organic market. The limited growth of the organic sector in sub-Saharan Africa can be attributed to poor government involvement in the agricultural sector and organic agricultural policies that do not adequately address the objectives of improving access to international markets and increasing domestic food production and income generation as well as the many socio-economic ills in the region (Barrett et al., 2002; Raynolds, 2004; Vogl et al., 2005; Egelyng, 2007; Luttikholt, 2007).

Organic agriculture in sub-Saharan Africa is relatively small and undeveloped, with the African continent only accounting for 1% of the world's land under organic management (Willer et al., 2008). However, sub-Saharan Africa is well positioned to develop its small organic agricultural sector. At present, some traditional farming methods in the region align with organic farming methods, suggesting there could be a relatively easy and rapid conversion from conventional agriculture to organic farming (Raynolds, 2004; Gibbon, 2007). In addition, sub-Saharan Africa has a distinct advantage over many developed countries, as it is able to produce fresh produce all year round due to its tropical climate (Singh, 2002). The escalating demand from international consumers for out-of-season products such as fruit and vegetables thus presents sub-Saharan Africa with export opportunities to fulfil this demand at competitive prices (Hine and Pretty, 2006). It follows that the income growth potential for exporting organic agriculture is significant, as organic produce fetches price premiums up to 20% higher than non-organic equivalents (Pretty et al., 2005).

Diversifying into organic agriculture also has the potential to address a series of socio-economic problems in sub-Saharan Africa (Gibbon, 2007). These include high poverty levels, low crop yields and food insecurity (Hine and Pretty, 2006). Organic agriculture can lessen the risk of crop failure and stabilise returns. This is substantiated by a recent study by Pretty et al. (2005). The study revealed that, on 37 million hectares of land in 57 developing countries, changing to organic agriculture caused average yields to increase by 70%. An increase in crop yields in turn led to an improvement in food security, enhanced income levels and lowered poverty levels. These trends are evident in a number of East African countries, namely Kenya, Tanzania and Uganda (Pretty et al., 2005; Hine and Pretty, 2006; Yussefi and Willer, 2007).

It follows that organic agriculture could be a viable and sustainable option for sub-Saharan Africa, as it presents attractive export opportunities and high, stable returns. In addition, organic agriculture may assist in combating food insecurity through providing better access to food, a benefit of increased production, natural resource conservation and a reduction in crop failure (FAO, 2007a). This may further lead to a reduction in poverty and an improvement in people's health (Hine and Pretty, 2006).

1.4. Problem Statement and Study Objectives

Sub-Saharan Africa is marginalised in the world economy and lags behind other developing regions in world trade. This is attributable to sub-Saharan Africa's inability to industrialise and diversify its exports base. Sub-Saharan Africa is still largely dependent on the exports of primary commodities, and agriculture is a vital export sector for many sub-Saharan African economies with the majority of their exports reliant on traditional commodities. Most countries in the sub-Saharan African region have low levels of agricultural output and food security problems.

Against this background, this study first discusses the problems associated with primary commodity dependence and then examines the need and economic rationale for sub-Saharan Africa to diversify its exports from agriculture into other sectors. From this, it follows that, diversifying agricultural production and exports into organic produce could be one way to create a more sustainable development path for sub-Saharan African trade and food security. With this in mind, this study discusses the economic viability, including the policy considerations, for organic product diversification in sub-Saharan Africa. In addition, to ascertain the empirical position of this study, a statistical assessment of the supply-side food security situation in three sub-Saharan African major organic converters and exporters (Kenya, Tanzania and Uganda) is presented.

From this, the study considers three main research issues.

- Identifying the causes and economic problems including the threat to food security associated with primary commodity dependence.
- Exploring the economic viability, including the policy considerations for organic product diversification.

- Quantifying the levels of food security in three major sub-Saharan African organic converters and exporters.

1.5. Structure of Dissertation

Chapter 1 outlines the background to this study, the problem statement, study limitations and the overall structure of the overall dissertation.
Chapter 2 discusses sub-Saharan Africa's primary commodity dependence problems and explores its trading structure and patterns.
Chapter 3 examines the need, and economic rationale, for sub-Saharan Africa to diversify its exports to non-traditional agricultural produce.
Chapter 4 discusses the economic viability with policy considerations for organic product diversification in sub-Saharan Africa.
Chapter 5 provides an assessment of sub-Saharan Africa's food security problems and integrating the potential economic impact of organic agriculture.
Chapter 6 introduces three successful examples of organic agricultural production in sub-Saharan Africa: Uganda, Kenya and Tanzania.
Chapter 7 presents the empirical analysis and results of the supply-side food security situation in three sub-Saharan African major organic converters and exporters (Kenya, Tanzania and Uganda).
Chapter 8 provides the conclusion and recommendations of this study.

CHAPTER 2: PRIMARY COMMODITY DEPENDENCE IN SUB-SAHARAN AFRICA

2.1. Introduction

There has been a dramatic change in the export structure of developing countries since 1980, resulting in developing regions reducing their heavy dependence on primary commodities. However, most African countries have not followed suit and are still heavily reliant on exporting traditional primary commodities. Consequently, sub-Saharan Africa has become increasingly marginalised in world trade and has experienced a rapid decline in its share of world exports since the 1980s (Babatunde, 2009).

There are a number of detrimental consequences and problems associated with primary commodity dependence. Collier (2002) highlights three major problems that can arise, namely commodity price volatility, poor governance and an increase in civil wars. Habiyaremye (2005) identifies a susceptibility to poverty traps as a fourth major problem. The sub-Saharan African region experiences all of these problematic issues.

This chapter provides a discussion of the major problems that primary commodity dependent countries are exposed to and examines sub-Saharan Africa's export structure and trade.

2.2. Primary Commodity Dependence

The issue of primary commodity dependence has been a subject of extensive debate since the 1950s and, consequently, a number of theories resulted. The work of Prebisch and Singer in the 1950s, however, has remained the most prominent (Yabuki and Akiyama, 1997). Toye and Toye (2003: 437-438) describe the hypothesis as:

> Barring major challenges in the structure of the world economy, the gains from trade will continue to be distributed unequally…between nations exporting mainly primary products and those exporting mainly manufactures. Further, inequality of per capita income between these two types of countries will be increased by the growth of trade, rather than reduced.

Prebisch and Singer argued that countries that are heavily dependent on their primary commodities would struggle to increase their income and exports. The claims of the Prebisch-Singer hypothesis were substantiated by three factors: Firstly, developing

countries were decidedly specialised in primary commodity production. Secondly, any technical advancement that occurred was mainly experienced in the industrial sectors and not in the production of primary commodities. Lastly, the price of primary commodities experienced a constant decline at the end of the 19th century relative to the price of manufactures. These factors collectively caused economic growth in developing countries to lag behind that of the developed and more industrialised countries (Lutz, 1999; Ludema, 2001).

2.2.1. Problems Associated with Primary Commodity Dependence

The problems associated with a heavy dependence on primary commodities have hampered the economic advancement of many developing countries for a number of decades. These problems include large price shocks and price fluctuations, a high risk of civil war, poor governance and a high susceptibility to poverty traps (Yabuki and Akiyama, 1997; Hewitt and Page, 2001; Collier, 2002; Bonaglia and Fukasaku, 2003). Exposure to these problems results in further marginalisation in international trade and affected countries are unable to make progress with secondary and tertiary activities. Each of these problems is discussed extensively below and data from both empirical and theoretical analyses is included.

2.2.1.1. Price Shocks

The price trends of primary commodities have been notably different to those of manufactured products. A theoretical examination of available data indicates that the prices of primary commodities will decline relative to those of manufactures. This trend can be explained by the inelastic demand for primary goods, coupled with the poorly differentiated nature of the primary goods producers. It therefore follows that some primary commodity markets are purely competitive. In addition, the prices of primary commodities have been extremely volatile and unpredictable, thus bringing about both busts and booms (Hewitt and Page, 2001; Collier, 2002). Further, Yabuki and Akiyama (1997) emphasized the downward trend in the real prices of primary commodities. Whilst the fluctuations in price have long been characteristic of primary commodities, these fluctuations have occurred concurrently with a continual fall in prices over the long run (South Centre, 2005). In some periods, there have been large fluctuations of up to 50%,

confirming that "this has not been a smooth process" (Cashin and McDermott, 2002: 176).

Developing countries dependent on the export of primary commodities rely on a narrow range of primary goods. This increases their exposure to extreme price and macroeconomic shocks (Hewitt and Page, 2001). Exposure to these shocks greatly affects export earnings and the economic stability of these countries. A price shock can be defined as "a decline in real prices of at least 10% from one year to another" (Humphrey 2004: 1). According to the IMF (2003), 30 low-income developing countries experienced 204 shocks, collectively, from 1981 to 2001. This averages out to one shock per country every third year, with the average size of the shock being 20%. Collier (2002: 3) further quantifies that a large adverse export shock causes a 7% direct cost to the GDP, which further induces a "cumulative contraction in the economy over the next two or three years [following the shock], leading to an additional loss of output of around 14% of initial GDP". Therefore, these shocks have a multiplier effect on economies.

According to Parimal (2006), a country's susceptibility and openness to price shocks depends on the scale and relationship of three components: firstly, the size of the shock, or the magnitude of the change in prices; secondly, the degree of openness to the shock, where a country's openness is characterised by the "channels through which the shock is transmitted to the economy" (Parimal, 2006: 7); and thirdly, the country's ability to manage the shocks effectively. The latter plays a major role in a country's vulnerability to these price shocks. Most developing countries, however, have inefficient and ineffective domestic tools to deal with and control these shocks. This is compounded by their lack of technical knowledge. Furthermore, many primary commodity dependent countries are classified as small markets, having low income and relatively low population levels. This renders them ill equipped to develop and improve the necessary market tools to handle these shocks (Hewitt and Page, 2001).

In addition to the negative shocks, positive shocks or booms are also caused by fluctuations in commodity prices. However, these positive shocks have also proven to be problematic to exporters and exporting countries, since they do not result in increased and prolonged income, but rather represent missed growth and income prospects. This is evident in the case of Burundi, which is heavily dependent on tea and coffee exports. The price of tea and coffee decreased by 20 % and 37%, respectively, between 1986 and 1987. This significant decline saw Burundi's export earnings fall from US$154 million to

US$90 million. The price of coffee recovered slightly in 1988 and increased by 7%, which saw an increase in export earnings from US$90 million to US$132 million. Thereafter, in 1989, the coffee price fell sharply by 20% and caused export earnings to diminish to US$78 million (Parimal, 2006).

Several reasons underpin why primary commodity dependent countries fail to benefit from positive price shocks. Firstly, large once-off incomes due to an increase in export prices cause government budgets to destabilise, as government expenditure tends to increase in line with the increase in export prices. Evidence shows that price booms are short lived relative to price slumps and therefore cause countries to run deficits as their incomes begin to rapidly fall with declining prices (Hewitt and Page, 2001; UNCTAD, 2003). This is clearly illustrated in coffee-producing countries (Schukneckt, 1999). Secondly, the ineffectiveness of institutions and inappropriateness of policies hinder the correct and efficient usage of these windfall gains. This efficient usage can only be achieved with sound governance and strong policies that convert these windfall gains into productive investment to assist with smoothing out the adverse effects of further price shocks (Collier, 2002).

2.2.1.2. Governance

Poor quality governance and institutions significantly increase the likelihood of developing countries' continued dependence on primary commodities. Countries with an abundance of natural resources are susceptible to rent-seeking behaviour and to developing weak institutions. Governments of primary commodity dependent countries tend to tax primary commodity activities heavily, as they foster location-specific rents and are relatively easy to identify and collect on (Sachs and Warner, 1995; Hewitt and Page, 2001; Collier, 2002; Farfan, 2005).

Governments' reliance on tax revenues from primary commodities either occurs directly, via taxes on exports or indirectly, through taxing imports that have been funded by export revenues. In addition, governments rarely transfer the rents earned from primary commodities back to households. These rents are instead used up in public services or they accrue as "publicly owned and operated capital" (Collier, 2002: 5). As a result, socio-economic gains arising from commodity rents rely on governments utilising these

rents efficiently and distributing the gains to the correct channels. This, therefore, requires that governments operate justly and effectively.

Moreover, Learner and Schott (1999) and Amsden (2001) suggest that there is a correlation between an abundance of natural resources and high levels of income inequality. The income inequality has the potential to increase the risk of political unrest and instability. Government instability can also substantially discourage investment in other sectors of the economy, possibly reducing future economic growth. This, in turn, could hinder the advancement of primary commodity dependent economies into more dynamic activities, such as manufacturing, since export revenues alone are too volatile to support such development and progress (Farfan, 2005).

2.2.1.3. Rebellion

Collier and Hoeffler (2001) found that there is a strong association between primary commodity dependence and the risk of civil wars. Collier (2002: 9) indicates that primary commodity dependence "directly increases the risk of conflict because it provides a means of financial viability for rebel groups". In a study by Collier (2006) that analysed 47 civil wars across 161 countries between 1965 and 1999, it emerged that a 26% level of primary commodity dependence is the most perilous level for the occurrence of conflict; the risk of a country with such a primary commodity dependence level experiencing an outbreak of civil conflict is 23%. However, if a country had no primary commodity exports, ceteris paribus, it would have a 0.5% risk of conflict occurring (Collier, 2006).

Civil conflict most often occurs in countries with poor economic performance, low income levels, high poverty levels and poor governance (Collier, 2006). This has been demonstrated in a number of countries, for instance, the Democratic Republic of the Congo and Sierra Leone. Primary commodity dependence also increases the risk of civil war because it presents financial opportunities to rebel groups. However, it is not specifically the primary commodities that bring about conflict; rather, it is the "mechanisms that provide the link" (Ron, 2005: 444). An example of such a mechanism is an individual's choice to engage in violence and rebellion for economic gain so as to maximise his or her utility. This decision to engage in rebellion generally occurs in low-income countries, where the marginal benefit of economic gains acquired through rebellion exceeds the marginal cost of the associated risks.

Humphreys (2005) adds that despite the negative link presented by these mechanisms, they function as a means for policy-makers to avert or terminate civil wars. For example, introducing policies to control the extraction of natural resources assists in preventing grievances from arising among rebel groups and hence reduces the risk of civil conflict. Wherever possible, policies should comply with international practices and procedures set out by the United Nations, an organisation that aims to, among other things, protect human rights. Furthermore, the implementation of policies to improve the management of revenues received from primary commodities can assist in reducing corruption and fraud related to these revenues. This facilitates strengthening a country's economy and its institutions. Such policies can include regulations on annual government expenditure and the development of permanent and stabilisation funds.

2.2.1.4. Poverty Traps

Primary commodity dependence exposes economies to frequent fluctuations in export revenues and makes such countries more susceptible to poverty traps (Habiyaremye, 2005). Poverty traps in this study may be defined as:

> A situation confronted by individuals, communities, regions or economies, in which these economic agents get stuck up in extreme poverty and find themselves unable to break out of it for significantly long periods of time (Izhar, 2005: 1).

A study by Sachs et al. (2004) draws extensively from neo-classical growth models to provide explanations for the occurrence of poverty traps. Sachs et al.'s (2004) study focused on 33 tropical sub-Saharan African countries, but excluded North Africa (Algeria, Egypt Libya, Morocco and Tunisia), Southern Africa (Botswana, Lesotho, Namibia, South Africa and Swaziland) and a number of very small economies (Cape Verde, Comoros, Djibouti, Equatorial Guinea, Gabon, Gambia, Guinea-Bissau, Mauritius, São Tomé and Príncipe and the Seychelles). The study identified three major characteristics of poverty traps. Firstly, capital levels are extremely low – below the minimum level required to induce and engage in further, more modern production. This creates a perpetuating cycle for countries with very low capital levels, as they are unable to engage in the production necessary to facilitate increased economic growth and thereby reduce poverty levels.

Secondly, low levels of saving make the accumulation of capital unattainable. At household level in low-income countries, considerably low saving occurs as most, if not all, individuals' income is spent on basic needs (Habiyaremye, 2005). There is strong empirical evidence to substantiate the notion that saving rates are very poor with low levels of income, but improve as a country's income levels increase and individuals become less impoverished (Ogaki et al., 1996; Loayza et al., 2000).

Thirdly, the rapid growth of the population with very low capital levels may further accentuate poverty traps. Interestingly, the world's poorest countries have the greatest fertility rates, because children are perceived to offer economic benefits in terms of performing household chores. In addition, children born into poor households have a greater probability of dying at a younger age than children in wealthier families, thus parents compensate by having large families. However, large families may also occur due to a lack of accessible and affordable contraceptives. High population growth rates perpetuate the poverty cycle, as countries are unable to support such population growth with the existing low capital and saving levels (Sachs et al., 2004; Izhar, 2005).

Collectively, these characteristics may cause countries to experience poverty traps. The low capital and saving levels that are traits of poverty traps are not counteracted by foreign investment, as investors are deterred by the lack of infrastructure and capital accumulation often evident in primary commodity dependent countries. Thus, a heavy dependence on primary commodities, together with poverty traps, may prevent these countries from successfully diversifying their export base towards secondary and tertiary activities and eliminating these trap-like features. This leads to primary commodity dependent countries being increasingly marginalised in world trade (Habiyaremye, 2005; Elhiraika, 2008).

2.3. Primary Commodity Dependence in Sub-Saharan Africa

Sub-Saharan Africa's primary commodity dependence has been particularly prominent in recent years. It is the only developing region whose export structure has remained relatively unchanged since the 1980s. This is evident in that 29 of the 47 countries in the region are reliant on three primary commodities that account for 50% of their export earnings (Babatunde, 2009; Jerome and Wohlmuth, 2007). Table 2.1 illustrates sub-Saharan Africa's primary commodity dependence relative to that of other developing

regions for the periods 1975-1979 and 2000-2004. The table divides primary commodities into four major groups, namely: agricultural raw materials, food, fuels and ores and metals. The table also presents the aggregate values of primary commodities as a percentage of total merchandise exports for each region.

Table 2.1: Indicators of Regional Dependence on Primary Commodities, 1975-1979 and 2000-2004 (Percentage of Total Merchandise Exports)

	Agricultural Raw Materials		Food		Fuels		Ores & Metals		Primary Commodities	
	1975-1979	2000-2004	1975-1979	2000-2004	1975-1979	2000-2004	1975-1979	2000-2004	1975-1979	2000-2004
Sub-Saharan Africa	7.1	4.7	24.2	14.7	35.7	37.6	9.7	7.8	76.7	64.9
North Africa & the Middle East	4.9	0.9	10.0	5.7	72.6	71.0	6.0	1.8	93.6	79.5
South Asia	7.6	1.3	33.2	12.0	1.3	4.2	6.9	2.9	49.1	20.5
Latin America & the Caribbean	5.2	2.1	37.2	16.6	23.1	17.5	11.9	6.1	77.4	42.3
Low-income Countries	7.9	2.9	29.2	15.5	23.8	28.2	6.8	3.9	67.6	50.4
High-income Countries	3.9	1.7	11.2	6.4	8.1	6.2	3.6	2.4	26.7	16.6

Source: Carmignani and Chowdhury (2007)

The data presented in Table 2.1 indicates that sub-Saharan Africa as well as other developing regions (namely, North Africa and the Middle East, South Asia, Latin America and the Caribbean) have seen a decrease in the percentage share that primary commodities constitute of total merchandise exports for the periods under review. However, declines in primary commodity dependence for the sub-Saharan African region, North Africa and the Middle East have not been as significant as the declines recorded in South Asia, Latin America and the Caribbean. Latin America and the Caribbean have experienced the greatest drop in primary commodity dependence during 1975-1979 and 2000-2004, with decreases of 35.1% and 28.6%, respectively. Sub-Saharan Africa, North Africa and the Middle East, on the other hand, show smaller changes over the periods reviewed, with decreases of 11.8% and 14.1%, respectively.

Despite sub-Saharan Africa's decline in primary commodity dependence, the region is still classified as being primary commodity dependent since the share of its primary commodities in total exports exceeds 50%. Similarly, North Africa and the Middle East are also primary commodity dependent; however, fuels make up the bulk of their exports and this distorts these regions' dependence on primary commodities. It should be noted that the demand for crude oil and fuels and the prices thereof behave differently to those of non-oil primary commodities. Thus, oil and fuels are not included when examining the extent of primary commodity dependence in a country or region (UNCTAD, 2008).

It is interesting to note that, in 1975-1979, sub-Saharan Africa, Latin America and the Caribbean regions showed similar primary commodity dependence ratios (76.7% in sub-Saharan Africa and 77.4% in Latin America and the Caribbean). Over time, Latin America and the Caribbean have managed to decrease their dependence by a factor three times that of sub-Saharan Africa. Carmignani and Chowdhury (2007) attempt to explain the significant difference between these regions. They indicate that, to a certain degree, sub-Saharan Africa specialises in commodities that discourage growth and it also relies on primary commodities to a much greater extent than the rest of the world. However, only a few of these primary commodities are not conducive to economic growth. Rather, the quality of institutions, and the interaction of these institutions with primary commodities, plays a more significant role in reducing this heavy dependence on primary commodities. Ackah and Morrissey (2005) add that it is not merely the dependence on primary commodities that is problematic, but rather the reliance on a narrow range of primary commodities (usually only two or three). At the end of the 1990s, 39 African countries were dependent on only two primary commodities for more than 50% of their export revenue (Wood and Mayer, 1998).

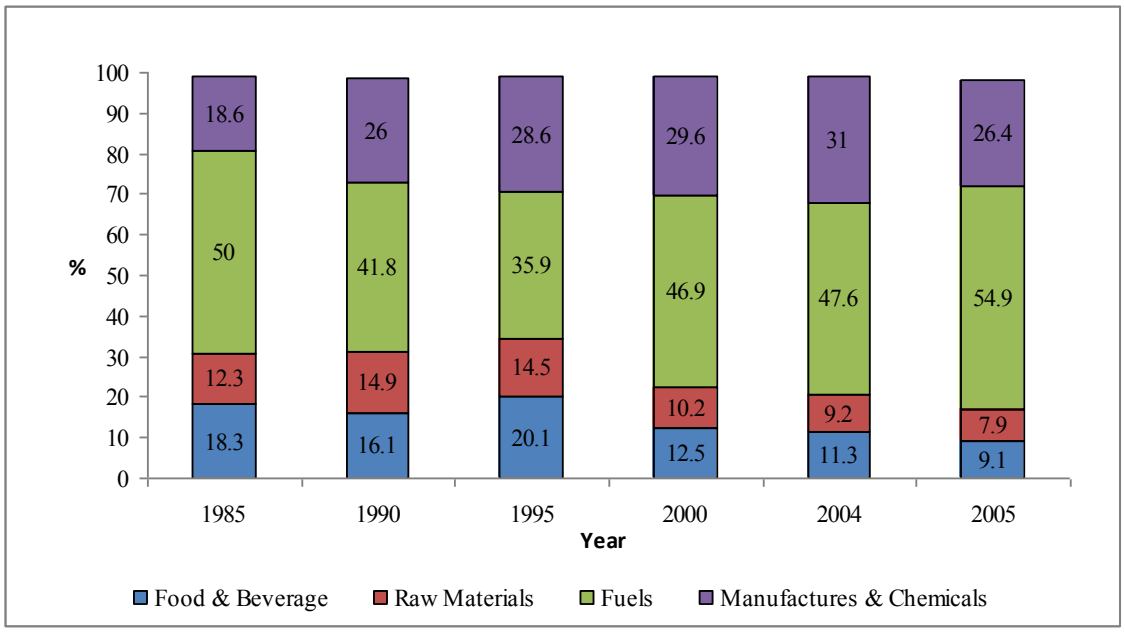
Sub-Saharan Africa's export structure has played a major role in the region's marginalisation in world trade. Figure 2.1 shows sub-Saharan Africa's export structure between 1985 and 2005. It is clear that fuel exports have dominated the region's exports by a large margin (50% of total exports). The 1990s saw a slight decline in fuel exports, by 41.8% and 35.9% in 1990 and 1995, respectively. However, between 2000 and 2005, the region's fuel exports increased, accounting for 54.9% of total exports in 2005.

Sub-Saharan Africa's food and beverage exports declined from 18.3% in 1985 to 9.1% in 2005; however, 1995 saw food and beverage exports increase to 20.1%. Thereafter, food

and beverage exports fell to 12.5% in 2000, declining to 9.1% in 2005. Raw materials followed a similar trend in that it accounted for 12.3% in 1985, then increased to 14.9% and 14.5% in 1990 and 1995, respectively. Thereafter, raw material exports declined to 10.2% in 2000 and continued to fall in subsequent years, reaching 7.9% in 2005.

Manufactures and chemical exports have shown a steady increase between 1985 and 2005, with manufactures and chemical exports accounting for 18.6% of the total exports in 1985 and 31% in 2004. A slight decline in manufacturing exports (by 3.6%) occurred in 2005. Fuels experienced the largest increase, 65%, between 2000 and 2005. Manufactures and chemicals increased by 24% between 2000 and 2005 and food and beverages and raw materials experienced a slight increase of 5%. However, the IMF (2007: 41) indicates that manufactures and chemical exports incorporate "processed natural resources", which signifies that improvements in sub-Saharan Africa's manufacturing exports are largely due to the region's abundant natural resources.

Figure 2.1: Sectoral Composition of Exports from Sub-Saharan Africa, 1985-2005
(Percentage)



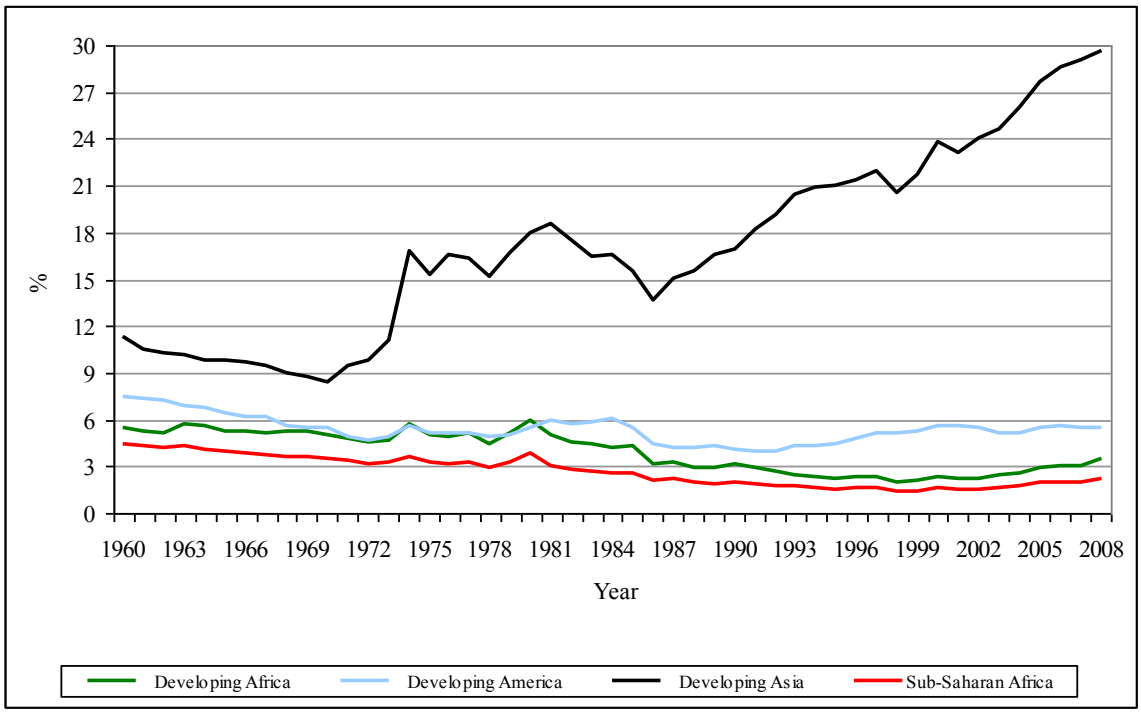
Source: Author's compilation based on IMF data (IMF, 2007)

In addition, sub-Saharan Africa has experienced a decline in its share of world exports from the 1980s onward. Figure 2.2 illustrates developing regions' shares in world merchandise trade for the period 1960 to 2008. Sub-Saharan Africa's share of world exports decreased from 4.42% in 1960 to 2.19% in 2008. The region has experienced a

similar decline in its share of world imports. Conversely, developing Asia has experienced an increase in its share of world exports and imports. Its share of world exports has increased significantly, from 11.35% in 1960 to 29.64% in 2008. Although this region did experience a slight decline in 1985, its share of world exports has steadily increased between 1990 and 2008. Developing America's share in world exports fluctuated slightly over the period reviewed, but this region had shown a small increase in its share of world exports by 2008. Between 1961 and 2008, developing America has managed, on average, to maintain its share in world merchandise trade.

It is evident from the data presented in Figure 2.2 that sub-Saharan Africa is falling behind the rest of the developing regions in terms of world merchandise trade. Manduna (2005) adds that Asia experienced an average annual growth of 7% in total exports for the period 1960 to 2000. Sub-Saharan Africa, on the other hand, showed an average annual growth of 1%. It has been the worst performing region of all developing regions.

Figure 2.2: Shares of Developing Regions in World Merchandise Trade, 1960-2008
(Percentage)



Source: Author's compilation based on UNCTAD handbook of statistics data (UNCTAD, 2010)

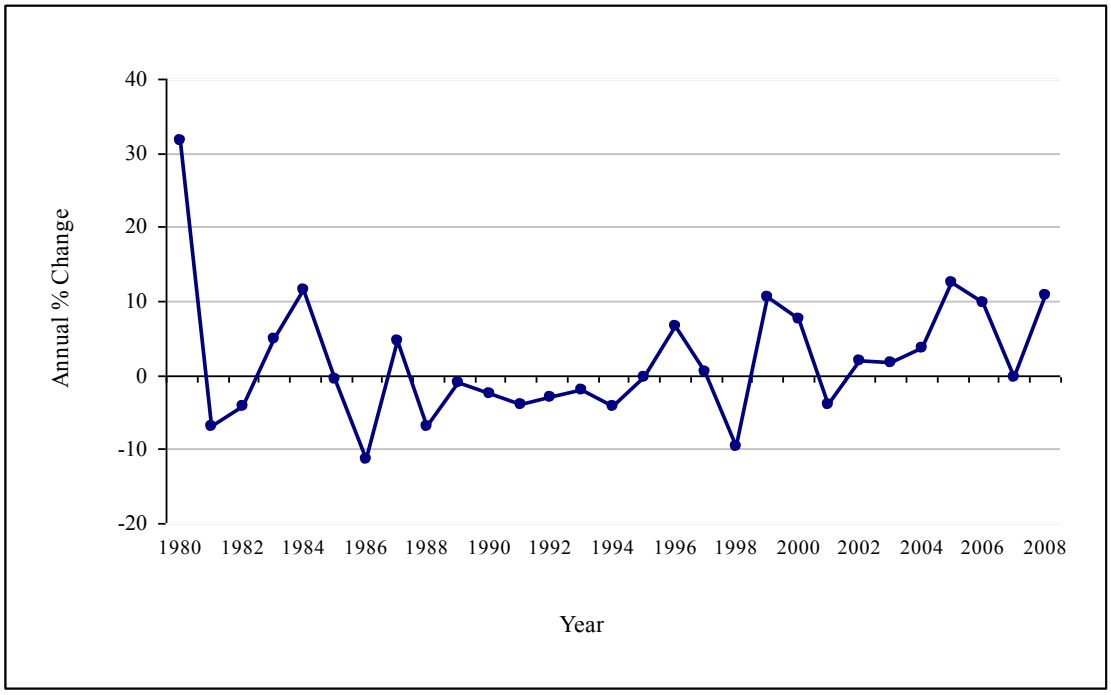
Rodrik (1997) argues that sub-Saharan Africa's marginalisation is mainly caused by the region's poor growth in output. This can be attributed to the fact that the region's countries have been unsuccessful in increasing and developing their economies at rates

high enough to ensure they remain important in world trade. Habiyaremye (2005) states that the significant fall in this region's share of world trade was not only due to the weakening and declining terms of trade in primary commodities (caused by a low income elasticity of demand) but also due to sub-Saharan Africa's lack of competitiveness relative to that of other developing regions in terms of manufactured products. While sub-Saharan Africa's collective share in world trade has been declining since the 1960s, total world exports increased at a rate of 2.5% per annum.

UNCTAD (2003), on the other hand, indicates that sub-Saharan Africa's inability to retain its share of global trade in primary commodities lies in its failure to increase the production and efficiency of the region's agricultural sectors. In addition, the region's incapacity to "overcome structural constraints and modernize its agricultural sectors, combined with the high cost of trading" (UNCTAD, 2003: 8), has resulted in a reduction in the region's share of world trade. Sub-Saharan Africa has struggled to improve the productivity of its agricultural sectors due to a number of factors. Some of these factors include: land occupancy and smallholder farming; policies that undermine the role played by institutions aiming to enhance investment and innovation in the agricultural sector; and lastly, a lack of technological advancement. Consequently, the region has lost its competitive advantage over, for instance, Asia and Latin America in the production of a number of primary commodities such as coffee, cocoa and tea.

The falling terms of trade in sub-Saharan Africa provide yet another reason for the region's marginalisation in world trade and hence its poor export performance (Yeats et al., 1996). According to Cashin and McDermott (2004: 727), terms of trade can be described as "the ratio of an index of a country's export prices relative to the prices of its imported goods". The terms of trade are one of the most vital relative prices in economics. Fluctuations in the terms of trade of primary commodity dependent countries have a major and direct impact on the country's macroeconomic performance, as well as on public and private savings. Figure 2.3 provides an illustration of sub-Saharan Africa's terms of trade between 1980 and 2008. It is evident that the annual percentage change in the region's terms of trade fell sharply between 1980 and 1981 and, thereafter, the terms of trade have followed an erratic pattern, exhibiting temporary peaks and troughs. Overall, the region's terms of trade have declined in the last twenty years.

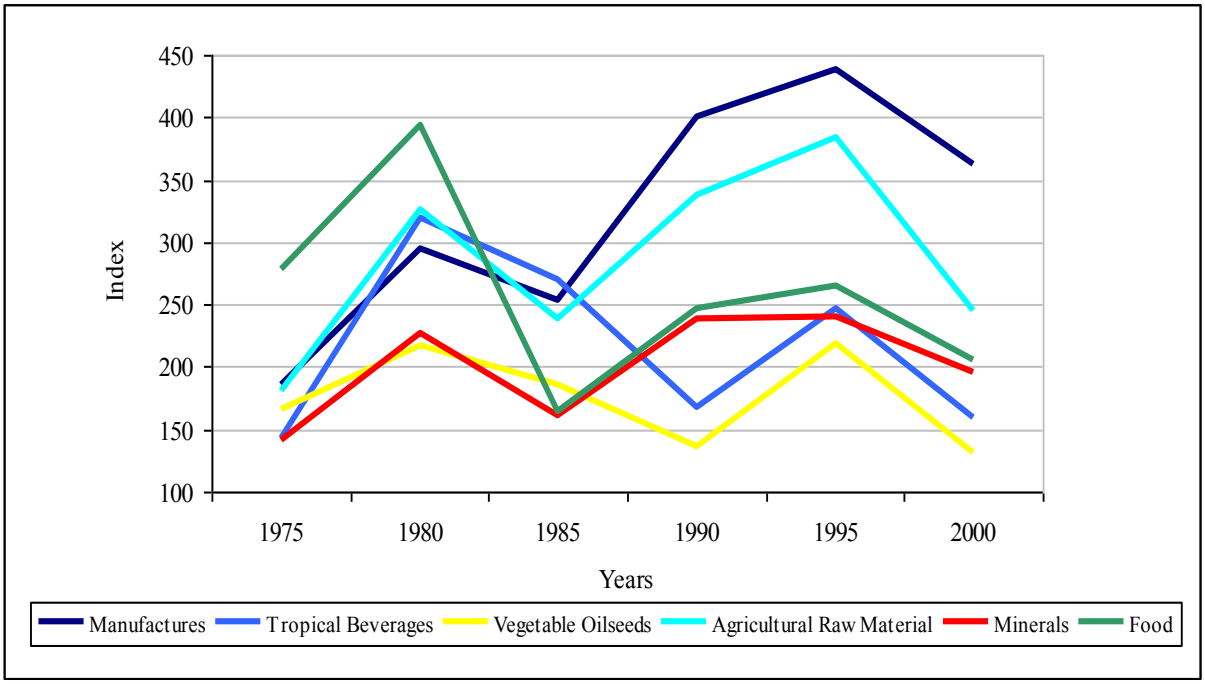
Figure 2.3: Sub-Saharan Africa's Terms of Trade, 1980-2008 (Annual Percentage Change)



Source: Author's compilation based on IMF data (IMF, 2009)

A key factor in sub-Saharan Africa's deteriorating terms of trade is the decline in primary commodity prices relative to those of manufactures. Figure 2.4 illustrates the trend in world prices by their commodity group for the period 1975 to 2000. It can be seen that by 2000, the prices of the main non-fuel primary commodities (tropical beverages, vegetable oilseeds, agricultural raw materials and food) were between a third and two thirds lower than the price of manufactures (UNCTAD, 2001). In 1975, however, there was a smaller gap between the price of manufactures and the main non-fuel primary commodities. It should also be noted that in 1975 the food price index was 278.7 while that of manufactures was 185.3. However, between 1980 and 2008, the price indices of food and manufactures have moved in opposite directions, with the price index of manufactures increasing overall and that of food decreasing overall.

Figure 2.4: World Prices by Commodity Group, 1975-2000 (Index numbers, 1970 = 100)



Source: Author's compilation based UNCTAD data (UNCTAD, 2001)

The decreasing price of primary commodities over time has resulted in a fall in income levels of primary commodity dependent countries. As a result, their income levels lag behind the rising import and production costs. Many sub-Saharan African governments are highly dependent on the taxes generated from exports and international trade. Therefore, any fluctuation in commodity prices will directly affect export earnings. This exposes the region to high levels of volatility in terms of its fiscal revenue. The instability and the fluctuation of primary commodity prices exacerbate the existing complexity of managing the macro economy of the region and create uncertainty regarding exchange rates, investment returns and the attainable level of imports. In addition, the economic growth of the region has been negatively affected because primary commodity exports form a large percentage of sub-Saharan Africa's revenue and GDP (UNCTAD, 2003).

Bonaglia and Fukasaku (2003) emphasise that it is not the actual inconsistency and variance in primary commodity prices that hamper economic performance, because, in theory, adverse price shocks should benefit net food and oil importers and positive price shocks are also expected to enhance the economic growth of primary commodity dependent countries. Rather, it is sub-Saharan Africa's mismanagement and inability to convert these shocks successfully into economic growth, as its governments squander the gains thereof on fruitless investment plans aimed at moving the respective country towards industrialisation via import-substitution policies. Evidence of such government mismanagement occurred in the primary commodity price boom of the 1970s, whereafter

many developing countries used the windfalls as security for increased debt. The end of the 1970s saw a decline in primary commodity prices. Governments incorrectly predicted that the adverse shock would be brief and proceeded to acquire further debt. This resulted in high debt levels and a lack of foreign inflows to finance and service this debt (Bonaglia and Fukasaku, 2003).

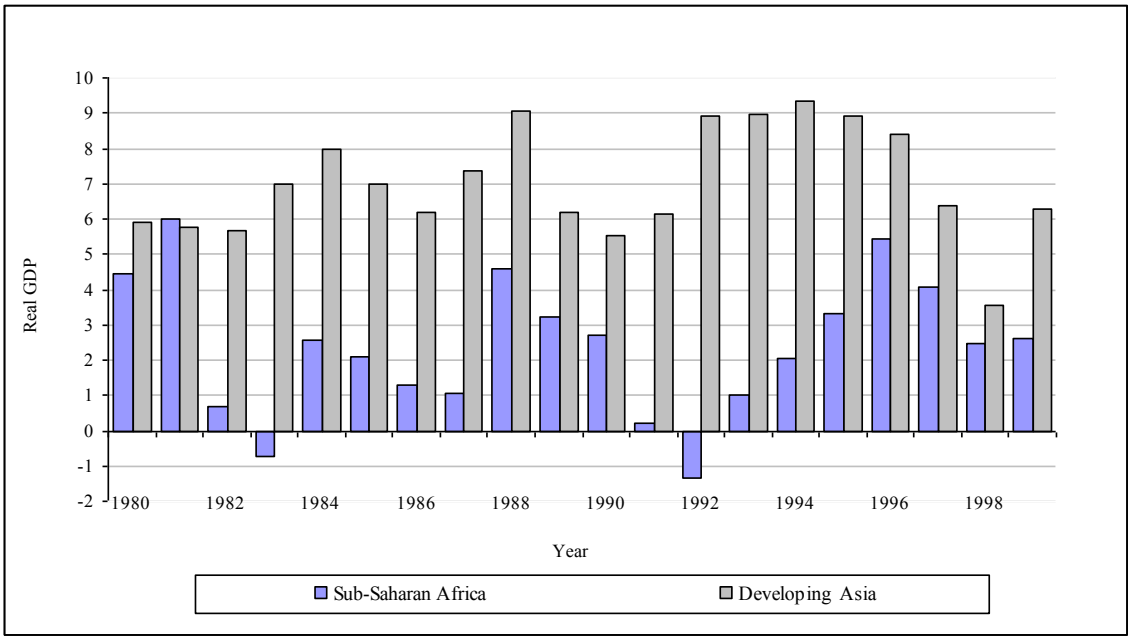
Furthermore, UNCTAD (2003) postulates that the net effect of falling primary commodity prices hinges on the degree to which global market prices are transferred to the producing countries. In addition, the extent to which increased export levels (generated through increased productivity and yields) are able to compensate for declining primary commodity prices influences the effect such decreasing prices have on economies. However, sub-Saharan Africa is no better prepared to handle booms and slumps in primary commodity prices than it was in the 1970s, despite restructuring macroeconomic policies in line with structural adjustment programmes under the guidance of the World Bank and the IMF.

A correlation exists between primary commodity dependence and slow economic growth (Birdsall and Hamoudi, 2002; Ackah and Morrissey, 2005). Figure 2.5 presents the real GDP of sub-Saharan Africa and developing Asia for 1980 to 1999. It is evident that sub-Saharan Africa's economic growth for the 1980s and 1990s was extremely erratic, falling from approximately 6% in 1981 to 0.673% in 1982, followed by a further decline to -0.715% in 1983. Economic growth recovered slightly in 1984, but fell steadily until 1987. The year 1988 saw a significant upswing in economic growth, which rose to 4.602%, but this was followed by a rapid decline to -1.331% in 1992. After 1992, there was a period of steadily increasing growth until 1996, when the region experienced its highest growth rate since 1981, namely 5.452%. Sub-Saharan Africa's economic growth fell in 1997 through to 1999, when economic growth was 2.602%. In the following year, 2000, the region experienced negative economic growth.

Sub-Saharan Africa's average annual growth rate from 1980 to 1989 was 2.1% and 0.8% for the period 1990 to 1994. This declining average economic growth can be attributed to "adverse external developments, structural and institutional bottlenecks and policy errors" UNCTAD (2001: 3) which continued well into the 1990s. Furthermore, coupled with the poor economic performance of sub-Saharan Africa, the socio-economic situation in the region deteriorated, resulting in political and civil conflict.

The economic growth in developing Asia was considerably higher than that of sub-Saharan Africa between 1982 and 1999. Developing Asia's economic growth fluctuated over the period reviewed but has remained above the 5% mark, except in 1998, when the region experienced a growth rate of 3.567%. Interestingly, developing Asia experienced its highest growth rates in the early 1990s, while sub-Saharan Africa experienced some of its lowest growth figures during this period.

Figure 2.5: Real GDP of Sub-Saharan Africa and Developing Asia, 1980-1999
(Percentage)

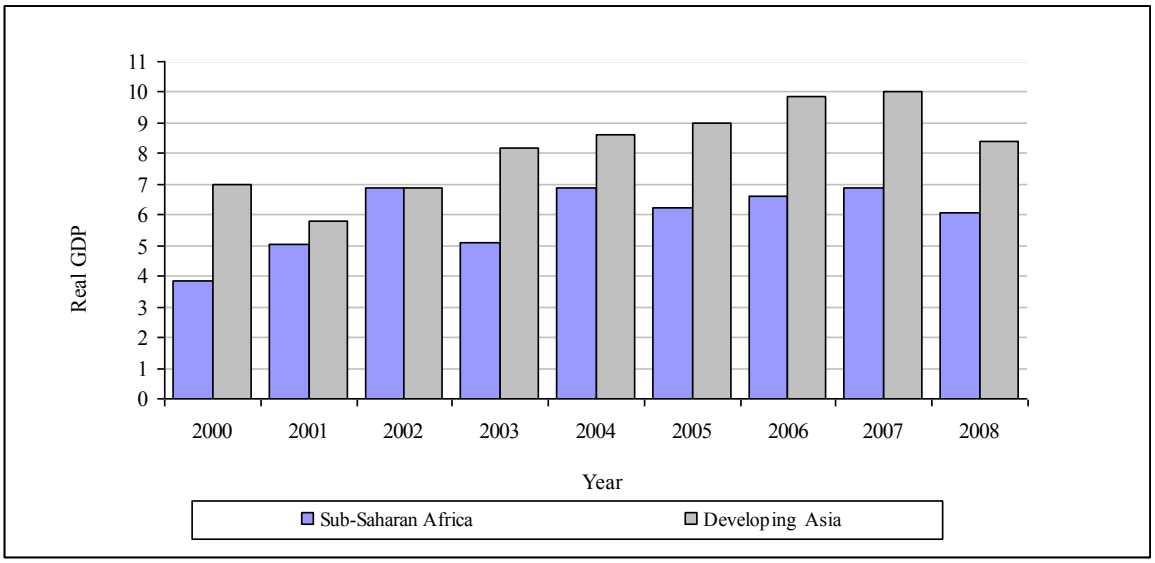


Source: Author's compilation based on IMF data (IMF, 2008a)

Sub-Saharan Africa experienced an increase in economic growth at the beginning of the 2000s, which is illustrated in Figure 2.6. Economic growth increased from 3.841% in 2000 to 6.875% in 2002 and continued to fluctuate between 5% and 6% for the remainder of the period reviewed. The period of 2000-2008 showed improved and relatively stable economic growth as opposed to slow and erratic the growth in the 1980s and 1990s. The IMF (2008b) indicates that sub-Saharan Africa's economic growth in 2007 was one of the highest the region has experienced in many decades. However, it should be stressed that this region still lags behind other developing regions; for instance, developing Asia experienced economic growth that fluctuated between 8% and 10% between 2003 and 2008.

According to the Economic Commission for Africa (ECA) (2007), although sub-Saharan Africa experienced an increase in economic growth between 2000 and 2008 and maintained a relatively stable level of growth, its economic growth has not increased significantly enough to affect poverty reduction and align with the Millennium Development Goals. The Millennium Development Goals include: eradicating extreme poverty and hunger; achieving universal primary school education; promoting gender equality and empowering women; reducing child mortality; improving maternal health; combating human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS); ensuring environmental sustainability; and developing a global partnership for development.

Figure 2.6: Real GDP of Sub-Saharan Africa and Developing Asia, 2000-2008
(Percentage)



Source: Author's compilation based on IMF data (IMF, 2008a)

It is evident that sub-Saharan Africa, as a primary commodity dependent region, has experienced slower economic growth rates than just one other developing region, developing Asia. This, in addition to the declining trend in primary commodity prices, has had spillover effects in other areas of the economy and the socio-economic situation exhibits low income per capita levels and higher unemployment and poverty levels (Habiyaremye, 2005; South Centre, 2005).

Farfan (2005) indicates that a heavy dependence on primary commodities is a significant determinant of low income levels, as no primary commodity dependent countries (except

oil-producing countries) are grouped in the „high income' category. Rather, the countries with high levels of technology and skills, or that deal in processed or value-added primary commodities are found in the „high income' group. Countries with a Gross National Income (GNI) per capita that is less than US$1000 have the heaviest dependence on primary commodities, which account for 80% or more of their total exports. Not surprisingly, the majority of these countries are in the sub-Saharan Africa region.

Primary commodity dependent countries also experience high poverty levels and low human development indices (HDI), which include poor education, malnutrition and short life expectancy levels. This is substantiated by 26 of the 30 countries with the lowest HDI, which can be classed according to one of the following groups: the 54 most agricultural-dependent countries, the 25 most mineral-dependent countries and the 25 most oil-dependent countries (South Centre, 2005).

Further, primary commodity dependent countries encounter a greater risk of falling into poverty traps than non-commodity dependent countries. Poverty traps arise when countries are susceptible to volatile and sharp fluctuations in primary commodity prices, which directly influence and hinder their export earnings. Sub-Saharan Africa is caught in a poverty trap, with more than three quarters of the region's population living on less than US$2 per day and approximately 33% of the population being considered undernourished. The high poverty level in sub-Saharan Africa is also closely associated with an unequal distribution of income. This negatively affects the actual and potential economic growth of the region (Habiyaremye, 2005).

Sachs et al. (2004) suggest five structural causes that explain why sub-Saharan Africa is the most susceptible region in the world to poverty traps:

- Firstly, most sub-Saharan Africans incur high transport costs for their exported goods as the region's interior countries are the most inhabited areas and the soil and rainfall are better inland as opposed to in the coastal regions.
- Secondly, sub-Saharan Africa has experienced low agricultural productivity as the region's rainfall is erratic due to great seasonal as well as year-to-year variability. High transport costs also deplete available funds and hamper producers' ability to purchase sufficient fertilizers, thereby resulting in lower than optimal yields.

- Thirdly, sub-Saharan Africa has a very high incidence of disease, such as HIV/AIDS and malaria. Both malaria and HIV/AIDS reduce productivity and prevent or discourage foreign investment. The high disease risk also prevents "demographic transition" (Sachs et al., 2004: 134) from occurring, thus keeping sub-Saharan Africa in a poverty trap.
- Fourthly, sub-Saharan Africa's history of colonisation may have resulted in the population being concentrated in inland regions. The remnants of colonisation in the region include poor infrastructure and education standards, which disadvantage sub-Saharan Africa and the continent and make it difficult for them to emerge from these poverty traps. In addition, sub-Saharan Africa has the lowest priority ranking in trade and debt talks and this further exacerbates the region's economic and socio-economic situation since it is unable to influence the region's plight through negotiations.
- Finally, the sub-Saharan African region has demonstrated tremendously slow technological progress, especially in the agricultural and health sectors. This further prevents the region from escaping its poverty traps, as technological development is important in improving productivity, which would ultimately result in improved economic growth.

In addition to the correlation between primary commodity dependence and poverty traps, poor HDIs and low income per capita levels, there is a link between primary commodity dependence and hunger (FAO, 2004). Developing countries that experience extensive hunger tend to be heavily reliant on the agricultural sector for employment, income and export revenues. This holds true for the sub-Saharan African region, as it is "the developing region with the highest percentage – one third – of people suffering from chronic hunger" (FAO, 2006: 23). Furthermore, countries in sub-Saharan Africa tend to be heavily, and increasingly, dependent on food imports and thus spend a large percentage of their export revenue on purchasing these food imports. This exacerbates the plight of primary commodity dependent countries because the expenditure of foreign earnings on food imports diminishes their capacity to invest in other economic sectors. This then adversely affects economic development and growth.

As sub-Saharan Africa is heavily dependent on its agricultural sector, the region has been hard-hit by fluctuating prices of its major agricultural commodities such as cocoa, tea and coffee. Fluctuating prices further hinder the region's growth and development potential,

as price fluctuations are largely triggered by shocks in supply that arise, for example, due to floods or droughts. Low agricultural production due to poor weather conditions, disease etc. cannot be remedied quickly in an attempt to satisfy demand. This then brings about a period of declining prices because the market is saturated and supply now exceeds demand. The price volatility in recent years is also thought to be partly due to speculation in the primary commodity futures markets (UNCTAD, 2003; FAO, 2004).

Sub-Saharan Africa is exposed to price shocks and price fluctuations, poverty traps, slow economic growth and low income levels, thus has scarcely contributed to the production and trade of manufactured goods. Marinkov and Burger (2005) emphasise that the lack of skilled labour retards sub-Saharan Africa's ability to move into secondary and tertiary industries, therefore limits the region to producing and exporting primary commodities.

Wood and Mayer (1998) and Mwaba (2000) also indicate that since sub-Saharan Africa has a comparative advantage in terms of its natural resources and agriculture relative to other developing regions, this partially explains its underdeveloped manufacturing sector. This reiterates the Heckscher-Ohlin (H-O) trade theory, which suggests that the trade structure of a country displays its comparative advantage, and which is in turn dependent on the abundance of the various factors of production (namely land, labour, skills and capital) with which a country is endowed. Therefore, a country's export structure depends on its resource arrangement. It follows that the wealth of land and resources as well as the lack of skilled labour in the majority of sub-Saharan African countries may explain why they have not succeeded in diversifying and specialising in manufactured products relative to East Asian countries, which have little productive land (Bonaglia and Fukasaku, 2003).

Birdsall and Hamoudi (2002) suggest that primary commodity dependence is determined by a country's geographical attributes and its social and political history, rather than by trade policies relating to global integration. Therefore, countries with a high concentration of natural resources and a heavy dependence on primary commodities are not automatically closed to trading with the rest of the world. Furthermore, for resource abundant and primary commodity dependent countries, lowering tariffs and non-tariff barriers does not necessarily result in economic growth.

Farfan (2005: 4) adds that:

> While primary commodities can provide a bedrock for development…it is that shift to higher-value-added activities through technological transformation, which will arguably make such progress sustainable.

Some examples of where this shift to higher valued-added activities has occurred include Canada, Finland, the USA and Australia. However, it is arguable whether primary commodity dependent developing countries are able to transform their primary commodities into "higher-valued-added" activities given their past poor economic performance.

2.4. Conclusion

It is evident that, despite attempts to integrate developing regions into world trade, sub-Saharan Africa continues to be marginalised and this marginalisation can largely be explained by its continued dependence on primary commodities. It is arguable that this has resulted in the region lagging behind the rest of the world, and more importantly, behind other developing regions that have managed to engage in relatively successful export diversification from primary commodities to manufactures. Sub-Saharan Africa has failed to move successfully into manufacturing due to various factors. These include its lack of infrastructure, financial resources and technology. The region has also experienced falling terms of trade and a declining share in world trade, which, again, is potentially due to its primary commodity dependence. This in turn has led the economies in the region to experience various adverse effects, including severe volatility in primary commodity prices, falling incomes, weak institutions and governments, increased civil conflict and poverty traps.

Primary commodity dependence appears to explain why the region has lagged behind others, despite increased global trade in the 20th century. It is therefore evident that sub-Saharan Africa needs to engage in export diversification in an attempt to move away from relying on primary commodities. Alternatively, sub-Saharan Africa needs to diversify within the primary commodities sector and shift its focus away from traditional commodity exports into the production of non-traditional items with expanding markets if it is to increase its economic growth and performance.

CHAPTER 3: EXPORT DIVERSIFICATION STRATEGY

3.1. Introduction

It has been established that volatility in primary commodity prices, declining terms of trade and marginalisation in world trade are some of the major problems that developing, primary commodity dependent countries face. This section of the study examines the need for primary commodity dependent states to diversify their export bases away from traditional primary commodities to facilitate sustainable economic growth and a competitive advantage (Derosa, 1992; Manduna, 2005; Marinkov and Burger, 2005).

Export diversification is a necessary progression for developing countries if they are to participate fully in international trade. The global demand for primary commodities has fallen over the last three to four decades. This could be attributed to increased globalisation and trade liberalisation experienced since the 1980s, where, according to Shafaeddin (1995), trade liberalisation should lead to a diversified export base weighted towards manufactures. Export diversification has been associated with the potential to improve economic growth and reduce export instability and exposure to volatile primary commodity prices (Hesse, 2008). Consequently, export diversification has been widely suggested as a "long-term policy response towards stabilizing export earnings of commodity dependent countries" (Al Marhubi, 2000: 559). Although the majority of the developing world has engaged in export diversification, sub-Saharan Africa has not in any significant way (Collier, 2002). Ben Hammouda et al. (2006) add that sub-Saharan Africa's weak economic growth record and its marginalisation in world trade can be explained by its dismal export diversification.

This chapter explores the adoption of export diversification as a strategy for sub-Saharan Africa to move away from its primary commodity dependence. Firstly, it defines export diversification and provides a review of the various measures and categories of export diversification available to primary commodity dependent countries. Secondly, this chapter analyses the export diversification efforts of sub-Saharan Africa from the 1960s to the present. Lastly, this chapter introduces and argues for the adoption of the proposed

export diversification strategy of this study – an agricultural diversification strategy into organic agricultural production for sub-Saharan African countries.

3.2. Export Diversification

Export diversification is a common and widely acknowledged solution to combating and reducing primary commodity dependence in developing countries. Export diversification can be defined as "an expansion of the range of goods produced and exported in order to reduce any commercial risk that would arise as a result of relying on the sale of one commodity" (Mayer, 1996: 212). It provides a means of stabilising export incomes by reducing the susceptibility to negative trade shocks and can lead to economic and socio-economic improvement (Derosa, 1992; Brenton et al., 2007).

A common hypothesis holds that export diversification is linked to improved economic growth; however, empirical evidence to support this hypothesis is scarce. Some of the existing empirical studies that have examined the relationship between export diversification and economic growth include those of Al Marhubi (2000), De Ferranti et al. (2002); Ledermann and Maloney (2003); Herzer and Nowak-Lehmann (2006); Agosin (2007); Hesse (2008).

In a study by Al Marhubi (2000: 561) using a cross-sectional country growth regression with a sample of 91 countries for the period 1961-1988, it emerged that "export diversification is associated with faster growth". Herzer and Nowak-Lehmann (2006: 6) investigated the hypothesis that export diversification and economic growth are associated through "externalities of learning-by-exporting" using Chile as the case study. The hypothesis was tested through an augmented Cobb-Douglas production function, using time series data from 1962-2001. The empirical study indicates that export diversification is an important factor in improving economic growth.

Through a cross-sectional regression, Agosin (2007) investigated the relationship between export diversification and GDP growth between 1980 and 2003, focusing on East Asian and Latin American countries experienced divergent economic growth. The study findings revealed that "export diversification is…associated with higher economic growth" (Agosin, 2007: 22).

Al Marhubi's (2000) and Agosin's (2007) findings are supported by a study carried out by Hesse (2008). A simple augmented Solow growth model was used to explore the link between export diversification and growth of per capita income. Hesse used a sample of 99 countries over the period 1961-2000. The findings of the study revealed that export diversification has a positive effect on income per capita growth. Hesse (2008: 1) explains that the effect of export diversification on income per capita growth is "potentially nonlinear with developing countries benefiting from diversifying their exports in contrast to the most advanced countries that perform better with export specialization".

There are various ways of measuring export diversification. The most common measurements include the Hirschman Index, the Normalised Hirschman Index, the Herfindahl Index and the Aggregate Specialisation Index, which are categorised as concentration ratios. According to Ben Hammouda et al. (2006), the Hirschman Index was developed by Albert Hirschman in 1964 and is a commonly used tool to measure the concentration of trade and commodities of a country. The Hirschman Index is given by equation 3.1:

$$H_1 = \sqrt{\sum_{i=1}^{N} \left(\frac{x_i}{X} \right)^2} \qquad (3.1)$$

where x_i denotes the value of exports for a specific i^{th} commodity. A country's total exports is given by X and the number of commodities exported is denoted by N. The higher the value of this index, the more exports concentrate on a few commodities.

The Normalised Hirschman Index is a variation of the Hirschman Index, where the Hirschman Index is "used as a relative measure of diversification by expressing its value between 0 and 1" (Ben Hammouda et al., 2006: 30). The closer the value of the Normalised-Hirschman Index is to one, the more primary commodity dependent the country is; and the closer the value is to zero, the more diversified the country is. The Normalised-Hirschman Index is expressed as:

$$N - H_1 = \frac{\sqrt{\sum_i^N P_i^2} - \sqrt{1/N}}{1 - \sqrt{1/N}} \qquad (3.2)$$

where P_i is the equivalent of x_i/X of the Hirschman Index, x_i denotes the export value of the i^{th} commodity and X is equal to $\sum_i^N x_i$, which represents total exports of the country. N denotes the number of export commodities.

The Herfindahl Index was developed by Orris Herfindahl in 1950 and is frequently used to measure "industrial concentration" (Ben Hammouda et al., 2006: 31). The Herfindahl Index is a means of summing up the extent of an industry's oligopolistic activity as well as the degree of market concentration enjoyed by the specified industry's major firms. The Herfindahl Index is given by equation 3.3:

$$H_2 = \sum_{i=1}^N S_i^2 \qquad (3.3)$$

where S_i represents the share of the market of the i^{th} firm and N denotes the number of commodities exported. The Herfindahl Index and the Hirschman Index are similar in all respects, barring the square root; thus, it is frequently termed the „Herfindahl-Hirschman Index'.

The Aggregate Specialisation Index is a further index available to measure the degree of export diversification in a country. The Aggregate Specialisation Index incorporates elements of both the Hirschman Index and the Herfindahl Index and is thus similar to both indices. The Aggregate Specialization Index is expressed as:

$$SPE = \sum_{i=1}^N \left(\frac{x_i}{X} \right)^2 \qquad (3.4)$$

where x_i represents the export value of the i^{th} commodity, X symbolises total exports and N denotes the number of commodities that are exported. The closer the value of the

Aggregate Specialisation Index approaches to 1, the greater the dependence on a single export commodity and the greater the level of specialisation. On the other hand, the closer the Aggregate Specialisation Index value moves towards zero, the greater the level of diversification among exports (Ben Hammouda et al., 2006).

Export diversification can take the form of vertical diversification or horizontal diversification, both of which have the potential to impact economic growth positively. According to the Prebisch-Singer hypothesis, vertical export diversification is commonly advocated as applicable to developing countries that are heavily dependent on primary commodities as a potential means to eliminate the adverse consequences of primary commodity dependence. Horizontal export diversification focuses on expanding "the export basket by diversifying into goods within the same broad category of goods" (Agosin, 2007: 16). The following section discusses both vertical and horizontal export diversification.

3.2.1. Vertical Export Diversification

Vertical export diversification can be defined as the adjustment of a country's export base from mostly primary commodities to mostly manufactured products. The focus of vertical export diversification is to process and market existing commodities and raw materials into secondary and tertiary activities, such as manufacturing. This results in value-adding spillover effects, which have the potential to improve economic growth (Ali et al., 1991; Athukolorola, 2000; Naude and Rossouw, 2008).

According to the Prebisch-Singer hypothesis, vertical export diversification may benefit primary commodity dependent countries if there are declining terms of trade for primary goods exports. Diversification into manufacturing can bring about a degree of stability to export revenues, as there is less volatility in the price of manufactures than the price of primary commodities (Herzer and Nowak-Lehmann, 2006; Hesse, 2008; Matthee and Naude, 2008). According to Ali et al. (1991: 7), vertical diversification refers to "creating additional uses for existing and new commodities through value-added activities such as processing and marketing". These value-added products could attract better prices after marketing.

Manufacturing exports also tend to provide a greater number of spillover effects than primary commodity exports. These include technological advances, increased knowledge, enhanced economic growth and higher income elasticity of demand, which creates greater export market potential. An increase in manufacturing exports may hasten and stabilise economic growth. In addition, the backward and forward linkages between the manufacturing sector and other sectors may increase employment and wealth levels and reduce poverty levels in primary commodity dependent countries (Osakwe, 2007; Elhiraika, 2008).

However, diversifying into manufacturing requires substantial investment in research and development, marketing, infrastructure and human capital, all of which are not easily accessible to many primary commodity dependent countries. These countries are caught in poverty traps as they have capital and saving levels below the threshold required to accumulate capital and engage in modern production processes (Sachs et al., 2004; Habiyaremye, 2005). In addition, high transport costs hinder the development of the manufacturing sector in many sub-Saharan African countries, especially those that are landlocked. These countries are isolated from large global markets and suppliers, thus it is difficult for them to export manufactured goods (Collier, 2002; Osakwe, 2007).

A number of Asian and Latin American countries have successfully engaged in vertical export diversification through implementing policies that ensure and encourage long-term transformation of the economy (Hewitt and Page, 2001; Agosin, 2007). However, many countries in sub-Saharan Africa have not yet managed to diversify into manufacturing.

3.2.2. Horizontal Export Diversification

Diversifying into manufacturing is not always a feasible option, especially for sub-Saharan African countries. However, horizontal export diversification may be a more viable option than vertical export diversification, due to the region's comparative advantage in natural resources and agriculture (Hewitt and Page, 2001). Horizontal export diversification is described as "adjustments in the export mix in order to counter international price (or export quality) instability or decline" (Ali et al., 1991: 7). It reduces dependence on a few commodities since it involves increasing the number of export sectors. This results in dampened export revenue volatility because export earnings are drawn from a greater number of primary commodities (Herzer and Nowak-Lehmann, 2006; Matthee and Naude,

2008). Hesse (2008: 2) further points out that increasing the group of export products can be viewed as a "dynamic effect of export diversification on higher per capita income growth".

For agriculture-dominated low-income countries and resource-abundant countries, horizontal export diversification appears to be a feasible and suitable option to combat primary commodity dependence. Bonaglia and Fukasaku (2003) suggest that primary commodity dependent countries should improve the efficiency of firms in the agricultural sector and move towards establishing non-traditional primary commodities for export. Improving the efficiency of firms in the agricultural sector refers to technological advancements in, for example, transportation and packaging, as well as identifying new trends in consumers' food demand patterns and acting thereon. The improved technology has the potential to create spin-offs for other economic industries activities, such as services.

In addition, by sourcing efficient and cost-effective marketing and transportation systems for new commodities and products, commodities that are similar to the existing commodities being exported may have a greater chance of being successful. Agricultural commodities are open to a number of risks (e.g. unfavourable weather) and are subjected to various "market-distorting regulations and restrictions", necessitating that commodity dependent countries consider policy constraints and limitations as well as production conditions (Hewitt and Page, 2001: 22).

Although horizontal export diversification is a feasible option for less industrialised countries struggling to engage in vertical export diversification, it does present a number of disadvantages. Theoretically, horizontal export diversification appears to be straightforward to implement, however, if incorrectly executed, it can aggravate the primary commodity dependence problem. Primary commodity prices as a whole appear to be falling and this may adversely affect countries engaging in horizontal export diversification, which does not resolve the problem of deteriorating terms of trade. Countries would then need to expand their export base to approximately five or six primary commodities. However, exporting primary commodities classified in the same group as current exports will not reduce the risk of price instability. This is because the prices of these commodities tend to move together as the products are often deemed to be interchangeable. Therefore, countries considering diversifying their exports horizontally in

the hope of ensuring a substantial reduction in risk should ensure that the new primary commodities are unrelated to the existing primary commodities being exported. However, certain factors will cause all the primary commodity prices to move in unison, for example, a significant change in global demand, which will invariably affect the manufacturing and service sectors as well (Hewitt and Page, 2001; South Centre, 2005).

The „fallacy of composition' is often associated with horizontal export diversification. This occurs if a group of countries produce and export the same new primary commodities, which will increase the risk of price volatility and price declines (UNCTAD, 2003). This, therefore, results in a crisis in the market of one primary commodity being transferred to the market of another primary commodity. In some instances where support and aid has been granted for horizontal export diversification, greater productivity and output have resulted and this has caused global primary commodity prices to decline (South Centre, 2005).

Therefore, as trade liberalisation increases, primary commodity dependent countries (particularly in sub-Saharan Africa) should attempt to increase and expand their primary commodity base, especially their non-traditional exports, as well as maximise their comparative advantage in natural resources (Hewitt and Page, 2001). Despite the disadvantages of horizontal export diversification, sub-Saharan Africa is more likely to be successful engaging in horizontal export diversification than in vertical export diversification, given the region's history of poor manufacturing.

3.2.3. Export Diversification in Sub-Saharan Africa

Sub-Saharan Africa has performed poorly on the export diversification front and has lagged behind other developing regions such as Asia and Latin America (Bonaglia and Fukasaku, 2003). The performance gap between Sub-Saharan Africa and Asia and Latin America on the one hand, and Africa on the other, is clear from the categories of export diversification outlined in a UNCTAD (2002) report. Most African countries fall under the categories that are not yet diversified (or are the least diversified), known as the „perennial non-diversified commodity exporters' and the „transitory non-diversified exporters', respectively. In both the former and latter categories, countries' export structures are largely made up of a few primary commodities, generally grow slowly and are open to price shocks. Conversely, Latin America and Asia are classed as „diversified commodity

exporters'. The countries in this category are generally "larger, medium and high-income developing countries with relatively diversified economies" (UNCTAD, 2002: 6), where primary commodity exports are important in the process of developing the economy and lowering poverty levels. These countries are also less open to the volatility experienced in commodity markets and they emphasise the positive effect that the commodity sector has had on development and the reduction of poverty.

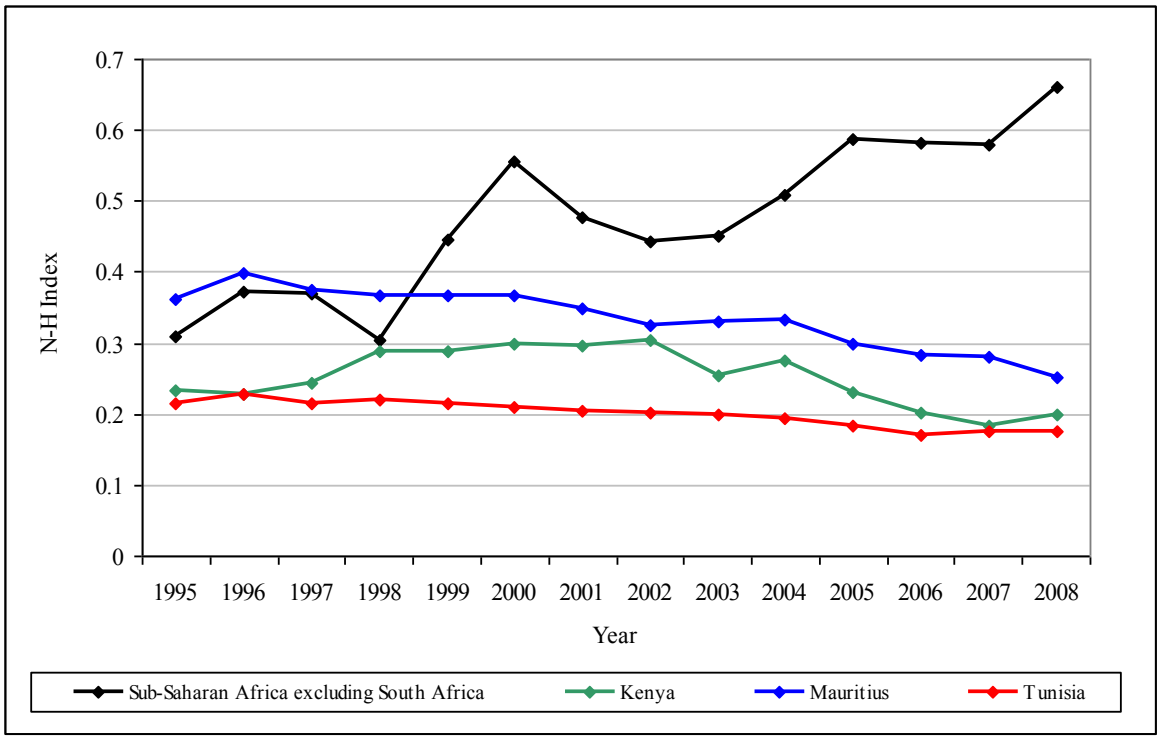
Over the past 25 years, sub-Saharan African countries have shown low export diversification levels as well as limited changes in their export structures (Ng and Yeats, 2000; ECA, 2007; Sundaram and von Arnim, 2008). The diversification efforts of sub-Saharan African states have been unstable and inconsistent. According to Ben Hammouda et al. (2006: 17), the 1960s and 1970s saw most African countries undertake an "industrial process whose objective was to diversify their economic structures and reduce dependency on primary commodities". Their export diversification approaches were modified to include import-substitution strategies.

The diversification attempts of the 1960s and 1970s bore positive results in the early 1980s, despite the economic crises that many countries in the region encountered. However, these positive effects were short-lived as countries' economic and debt crises heightened. Over the next ten years, the positive effects and results that the 1970s diversification efforts had achieved were undone. Ironically, this period was characterised by the introduction of structural adjustment programmes. A further attempt at diversification in 1992 resulted in temporary gains and small returns, as the diversification efforts only lasted up to 1998. Thus, the region was further marginalised in global trade and poverty levels increased, sparking both political and social unrest. This spurred another attempt at export diversification between 1998 and 2002 (Ben Hammouda et al., 2006; ECA, 2007).

Figure 3.1 provides a graphical representation of the export diversification in sub-Saharan Africa for the period 1995-2006. The Normalised-Hirschman Index has been used. It indicates that the closer the index value is to zero, the more diversified the economy; the closer the value is to one, the more concentrated the economy is (UNCTAD, 2008). Sub-Saharan Africa's export diversification efforts have been weak and volatile, as the Normalised-Hirschman Index for the region has remained between 0.335 and 0.55 for the period reviewed. Furthermore, the region has become less diversified between 1995 and

2006, as the Normalised-Hirschman Index has, overall, tended towards one rather than zero.

Figure 3.1: Export Diversification of Sub-Saharan Africa (excluding South Africa), Mauritius, Tunisia and Kenya, 1995-2008 (Normalised Hirschman Index [N-H] used)



Source: Author's compilation based on UNCTAD data (UNCTAD, 2010)

Despite sub-Saharan Africa's fragile and erratic diversification efforts, as typified by Benin, Burkina Faso and Malawi, there are a few countries in the region that have managed to engage in effective export diversification. Mauritius, Kenya and Tunisia have been among those to exhibit successful export diversification efforts. The Normalised-Hirschman indices for Mauritius, Tunisia and Kenya are significantly lower than the sub-Saharan African average. These three countries have also shown a declining trend in their Normalised-Hirschman indices, which indicates that these states are moving towards being less concentrated (as indicated in Figure 3.1).

Mauritius is a noteworthy case as it has developed a successful manufacturing export sector, despite previously being heavily dependent on sugar. Mauritius has also developed its non-traditional exports, including fish and woven cotton fabrics. The movement into both manufacturing and non-traditional commodities demonstrates how Mauritius has

engaged in both vertical and horizontal export diversification (Bonaglia and Fukasaku, 2003; ECA, 2007).

Kenya is one of the more diversified sub-Saharan African countries, along with its neighbouring countries, Uganda and Tanzania. These three countries have shown remarkably low market concentration levels in recent years. In 2009, the top three products in Kenya, Tanzania and Uganda held a less than 40% share of total exports (Blanke et al., 2011). Kenya's non-traditional exports, which include vegetables and cut flowers, have managed to achieve robust growth. Kenya is considered the largest African grower of cut flowers as well as the largest fresh produce exporter. However, Kenya has not been successful in diversifying towards manufacturing as the country's top ten commodities have not moved into value-added manufactured goods. In addition, the incentives provided to the country's manufacturing firms in the export market did not succeed in maintaining export growth. Since Kenya has successfully moved into non-traditional commodities, it has engaged in horizontal export diversification. As a result, Kenya has increased its expertise and knowledge, received foreign investment and improved it infrastructure (Bonaglia and Fukasaku, 2003; ECA, 2007).

Similarly, export diversification in Tunisia is characterised by substantial horizontal diversification, as some of Tunisia's top ten export products comprise various types of garments as well as electricity distribution equipment. These products are classified as the „emerging or newer products in the export mix' (Ben Hammouda et al., 2006: 60). Tunisia was heavily reliant on the export of its crude oil in the 1980s, which accounted for approximately 50% of its total exports. In 2002, however, crude oil accounted for approximately 7% of total exports, indicating that Tunisia has moved away from its major traditional exports (Ben Hammouda et al., 2006).

Despite there being some successful cases of export diversification, many sub-Saharan African countries have either demonstrated little diversification efforts, or these efforts have not created gains significant enough to ensure sustainability. According to Ng and Yeats (2000), the passive and closed domestic policies of sub-Saharan Africa are a crucial factor behind this failure to diversify successfully. In addition, the "inefficiency and a lack of investment in technology in [sub-Saharan] African manufacturing firms" (Morrissey and Mold, 2006: 10) has further contributed to the region's poor export diversification.

Export diversification is contingent on a country's level of infrastructure in order to improve transportation, communication and power facilities and develop the necessary skills level. In developing countries, and specifically sub-Saharan Africa, "the provision of basic infrastructure is likely to be more linked to activities in the primary commodity sector than to other forms of industrial production" (Habiyaremye and Ziesemer, 2006: 9). This follows from the view that the export structure of a country depends on its resources and therefore reflects its comparative advantage (Wood and Mayer, 1998). This is derived from the Heckscher-Ohlin trade theory, which advocates that "a country's trade structure reflects its comparative advantage, which is in turn determined by the relative endowment of production factors" (Bonaglia and Fukasaku, 2003: 12).

This holds true for sub-Saharan Africa, as its comparative advantage lies in its agriculture and may provide a partial explanation as to why sub-Saharan Africa has lagged behind the rest of the developing world in diversifying into manufacturing. Wood and Mayer (1998) therefore argue that sub-Saharan Africa should utilise its comparative advantage and develop the volume and quality of its primary commodities, rather than diversify into manufactured products.

3.3. Export Diversification – The Role of Organic Agriculture in Sub-Saharan Africa

It is clear that sub-Saharan Africa is in need of a suitable, yet realistic and feasible, export diversification strategy to reduce its dependence on primary commodities and the effects thereof. Since sub-Saharan Africa has not yet achieved successful diversification into manufacturing, a possible solution is for it to exploit its comparative advantage in its primary activities in order to diversify its export base (Marinkov and Burger, 2005). This is potentially a feasible option for sub-Saharan African countries, as many are not yet industrialised (such as Ghana, Tanzania and Mozambique) and they may struggle to diversify vertically.

In addition, since sub-Saharan Africa's agricultural sector contributes 32% of the region's GDP and provides employment to 65% of its population (Bach and Pinstrup-Anderson, 2008), it is apparent that sub-Saharan African countries have a comparative advantage in agriculture as, collectively, they are land, labour and resource abundant (Gibbon, 2007). It would therefore be apt to suggest that sub-Saharan Africa adopt a diversification strategy

that includes diversification within its agricultural sector. This study proposes that countries in the region consider diversifying into organic agricultural produce for both the export and domestic market in order to regain their share in world trade, enjoy high prices and improve the growing food security problem in the region.

3.4. Conclusion

It is imperative that primary commodity dependent countries adopt export diversification strategies in order to increase their economic growth and reduce the adverse effects of a heavy dependence on primary commodities. It is evident that, overall, sub-Saharan Africa's diversification attempts have been weak relative to those of other developing regions such as Latin America and Asia. However, given the region's comparative advantage in agriculture, sub-Saharan Africa should focus its diversification efforts on diversification within its agricultural sector, as it is land, labour and resource abundant and may find it difficult to move successfully into manufacturing in the short to medium term. The export diversification strategy proposed in this study suggests that the sub-Saharan African region should move into organic agriculture, at both export and domestic level. There is potential for sub-Saharan Africa to benefit greatly from entering the export market for organic agriculture as it has a comparative advantage in agriculture. Moreover, organic agriculture may assist in combating the growing food security problem in the region, reduce the risk of crop failure and result in greater crop yields than with traditional farming methods.

CHAPTER 4: NON-TRADITIONAL AGRICULTURAL DIVERSIFICATION STRATEGY – THE ROLE OF ORGANIC AGRICULTURE IN SUB-SAHARAN AFRICA'S TRADE

4.1. Introduction

It has been well established that sub-Saharan Africa's inability to industrialise and diversify its export base has resulted in the region becoming increasingly marginalised in the global economy. However, it is widely acknowledged that sub-Saharan Africa has a distinct comparative advantage over other developing regions such as Asia in terms of primary commodities because of the region's abundant land, labour and natural resources (Wood and Mayer, 2002; Farfan, 2005; Gibbon, 2007). Not surprisingly, agriculture is a key sector to achieving economic growth and development in many sub-Saharan African countries.

The importance of agriculture in economic growth has long been emphasised by numerous scholars. The work of early scholars such as Lewis (1954), Fei and Ranis (1961), Jorgenson (1961) and Johnston and Mellor (1961) was largely theoretical in nature and highlighted agriculture's potential to shift surpluses of labour and raw materials to industrial activities. In recent years, scholars have revisited this subject and have provided empirical evidence on the relationship between agriculture and economic growth (Humphries and Knowles, 1998; Gemmell et al., 2000; Gollin et al., 2002; Tiffen and Irz, 2006).

Humphries and Knowles (1998) used an augmented Solow-Swan growth model in their study and they found that agriculture contributes to economic growth through shifting labour resources from the agricultural sector to sectors of the economy that are more productive. A study by Gollin et al. (2002) used an extended neoclassical growth model to include an agricultural sector. It revealed that growth in agricultural productivity can stimulate industrialisation and have a large and positive impact on the income of a country. The results of this study conclude that economic growth overall is dependent on the growth of the agricultural sector. Tiffen and Irz (2006) recently tested the causal relationship between value-added agriculture and economic growth in 85 countries using

bivariate Granger causality tests. Their study provided strong evidence that value-added agriculture impacts on the economic growth of developing countries.

Over the past four decades, however, the role of agriculture and the trends within agricultural trade have changed somewhat for both developed and developing countries. Whilst developed countries have experienced increasing shares of global agricultural exports (the EU is responsible for the majority of the increase), developing countries have exhibited a substantial decrease, from 40% in the 1960s to 30% in the early 2000s (FAO, 2005). In addition, developing countries generated substantial agricultural trade surpluses in the 1960s, namely US$7 billion per annum. These surpluses rapidly dwindled by the end of the 1980s and resulted in developing countries (particularly the least developed countries) becoming net importers of agricultural produce (FAO, 2004).

The success of agriculture has not been shared uniformly across regions and countries. There has been a marked decrease in sub-Saharan Africa's global share of agricultural exports, from approximately 60% in the 1960s to 20% in the early 2000s (FAO, 2004). This decrease may be attributed to the global decline in demand for traditional agricultural commodities, on which the region is still heavily reliant. Since agriculture is a vital sector in the economic growth of many sub-Saharan African countries, it is essential that the region aim to reduce its heavy dependence on traditional agricultural commodities.

This study therefore proposes that sub-Saharan Africa diversify into non-traditional agricultural commodities, as the non-traditional agricultural sector has experienced notable growth and increased global consumer demand in recent years. Of particular focus within the non-traditional agricultural commodity category is the development of organic agriculture, which has experienced considerable growth and success since the early 1990s. Accordingly, it has recently been suggested by Crucefix (1998), Parrot et al. (2006), Hine and Pretty (2006), Rundgren (2008) and Gibbon et al. (2008) that organic agriculture may present sub-Saharan Africa with profitable export opportunities due to rapidly increasing global demand. In addition, given that sub-Saharan Africa's agricultural sector largely comprises smallholder farmers, organic agriculture presents an attractive and feasible farming alternative that may generate many positive effects for both farmers and economies.

This chapter begins by examining the trends and performance of sub-Saharan Africa's agricultural sector and includes an analysis of the various factors contributing to the sector's poor performance since the 1960s. A brief overview follows of the central role agriculture plays in sub-Saharan Africa and the rationale behind non-traditional agricultural export diversification. Thereafter, the economic and environmental impact of certified organic agriculture is examined critically as well as the export potential of organic agriculture. The chapter then presents the various constraints and challenges organic agricultural farmers in sub-Saharan Africa face and an overview of the sector. Lastly, a discussion is included regarding the policy amendments necessary for sub-Saharan Africa to implement and develop a certified organic sector.

4.2. The Trends in, and Performance of, Sub-Saharan Africa's Agricultural Sector

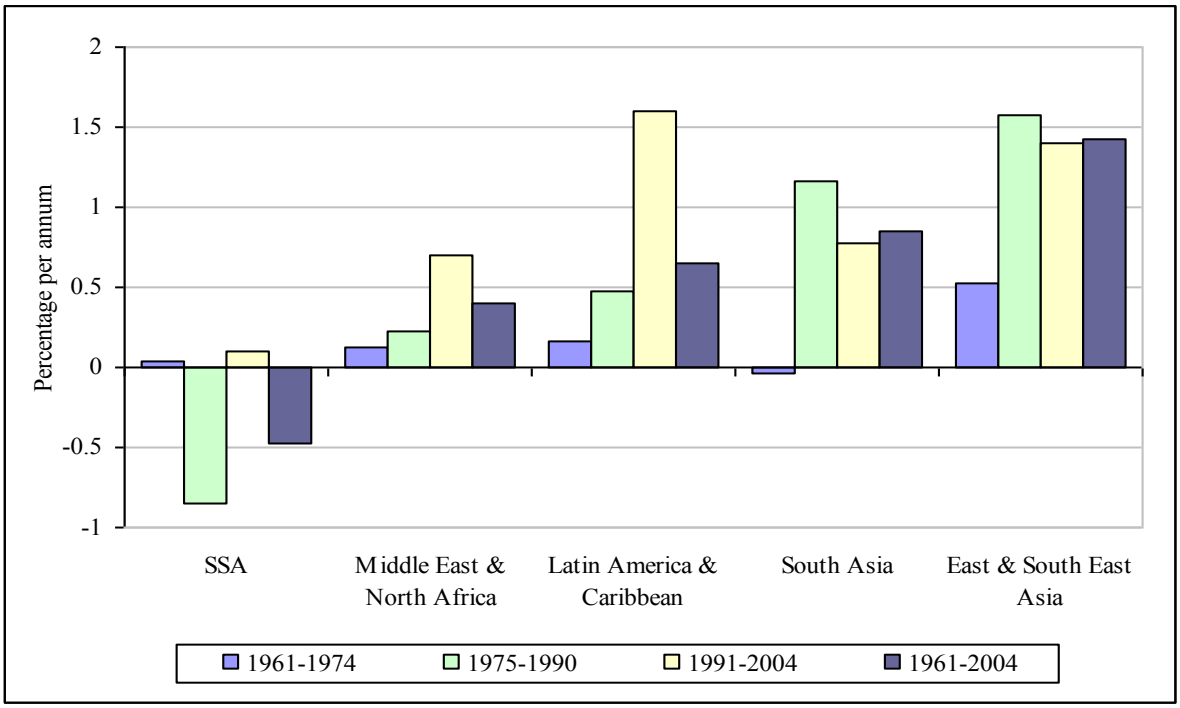
The agricultural sector is pivotal to the majority of sub-Saharan African economies. On average, it accounts for 32% of the GDP and provides employment to 65% of the population in the region (Bach and Pinstrup-Anderson, 2008). For many sub-Saharan African countries, the agricultural sector is the principal source of foreign exchange and is the primary source of revenue for governments. However, traditional agricultural commodities such as cocoa, coffee, cotton, sugar, tea and tobacco dominate sub-Saharan Africa's agricultural sector. These traditional commodities account for more than 50% of sub-Saharan Africa's total agricultural exports (Diao and Hazell, 2004).

At first glance, sub-Saharan Africa's aggregate agricultural performance has been positive since the 1960s, with an annual growth rate of 2.5% in agricultural production. This performance is, however, rather modest relative to that of other developing regions such as Latin America and developing Asia, where the annual aggregate agricultural production increased by 2.9% and 3.5%, respectively (Haggblade et al., 2004). However, a closer look at agricultural production per capita (an indicator of agricultural performance) suggests that sub-Saharan Africa's agricultural performance has in fact deteriorated since the 1960s.

Sub-Saharan Africa's overall per capita agricultural production has worsened during the period 1961-2004. Yet, at a global level, per capita agricultural production has steadily increased by 0.6% per annum since 1961, with total agricultural production growing at 2.5% per annum and the global population increasing by an average of 1.7% per annum.

This global growth in per capita agricultural production has not been experienced evenly across all regions, as shown in Figure 4.1 (Wik et al., 2008). It is evident that sub-Saharan Africa performed worst of the developing regions reviewed. Each of the developing countries analysed displayed positive growth in agricultural production per capita between 1961 and 2004. The situation in sub-Saharan Africa was somewhat different as the region experienced negative per capita agricultural production between 1961 and 2004. Thus, sub-Saharan Africa is the only region in which agricultural production has lagged behind population growth.

Figure 4.1: Growth in Total Agricultural Production per Capita across Developing Regions, 1961-2004



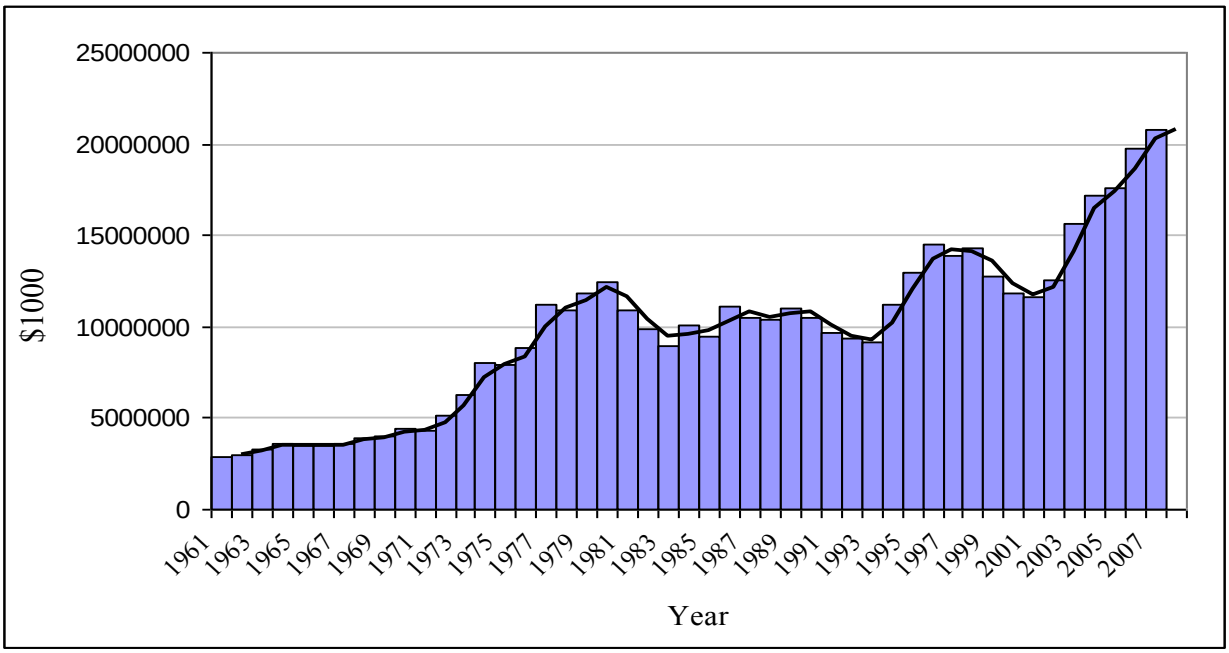
Source: Adapted from Wik et al. (2008)

Sub-Saharan Africa has also experienced a decline in its share of world agricultural exports since the 1960s. Sub-Saharan Africa held an 8% share in global agricultural exports in the 1960s; however, by the early 2000s, this fell to 2%. The decline in traditional agricultural commodity prices is largely responsible for the drop in sub-Saharan Africa's share of world agricultural exports. This dwindling share is further exacerbated by developed countries that receive high agricultural subsidies and the various challenges developing countries face when attempting to access the global

agricultural markets (Diao and Hazell, 2004; Kidane et al., 2006; Babatunde and Busari 2011).

In value terms, sub-Saharan Africa's agricultural exports have increased between 1961 and 2007, as illustrated in Figure 4.2. Between 1961 and 1980, sub-Saharan Africa's agricultural exports steadily increased. Thereafter, between 1981 and 1999, agricultural exports experienced gentle fluctuations, with the level of these fluctuations being higher than the value of agricultural exports in the 1960s and 1970s. Between 2002 and 2007, agricultural exports increased significantly, achieving the highest levels of the whole period. However, sub-Saharan Africa's increase in agricultural exports is modest when compared with that of Latin America and East and South East Asia. Furthermore, the value of its agricultural exports between 1981 and 2007 has not been high enough to improve agricultural performance indicators such as the contribution to total production (or its value) and agricultural production per capita. This further highlights the poor agricultural performance of sub-Saharan Africa relative to other developing regions (Haggblade et al., 2004; Gayi, 2008; UNCTAD, 2008).

Figure 4.2: Sub-Saharan Africa's Agricultural Exports by Value, 1961-2007 (1000$)

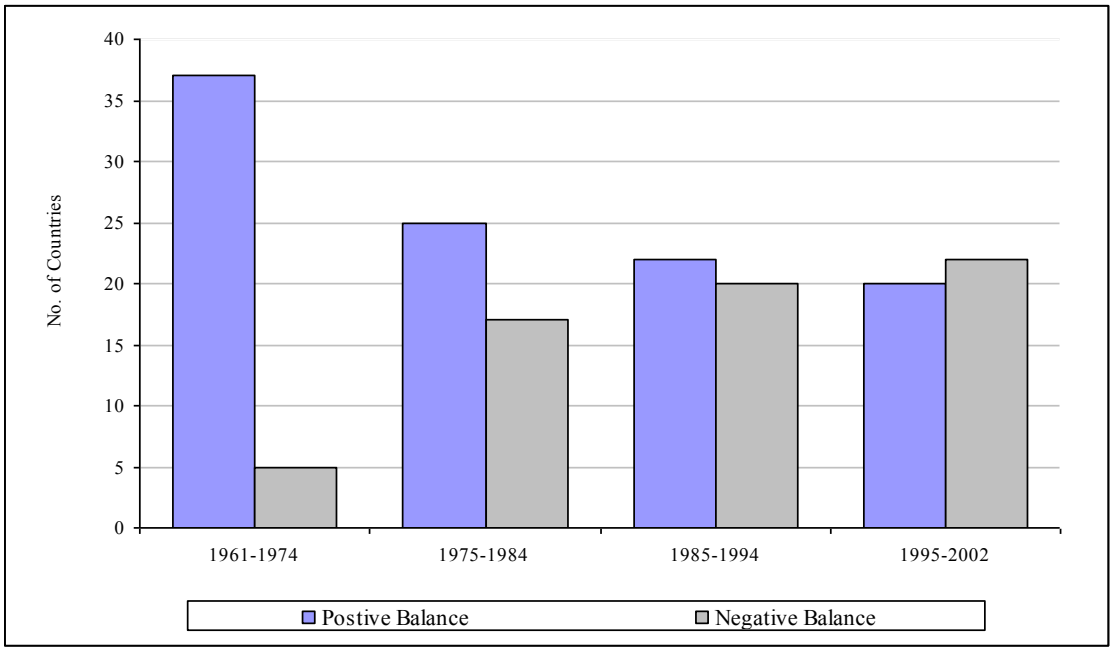


Source: Author's compilation based on FAO data (FAOSTAT, 2010)

As a result, sub-Saharan Africa's agricultural imports have increased by an average of more than 4% per annum since 1961 for a number of the region's countries (Kidane et al., 2006). Figure 4.3 shows the number of sub-Saharan African countries with positive and

negative agricultural trade balances for periods between 1961 and 2002. It is clear that the number of countries in the region with positive trade balances has decreased over this period, from approximately 37 in 1961-1974 to 20 in 1995-2002. This further shows sub-Saharan Africa's poor agricultural performance and its increase in agricultural imports since the 1960s. The decline in sub-Saharan Africa's share in global agricultural exports is a possible reason for the significant increase in the number of countries that have negative agricultural trade balances.

Figure 4.3: Number of Sub-Saharan African Countries with Positive and Negative Agricultural Trade Balances, 1961-1974 to 1995-2002

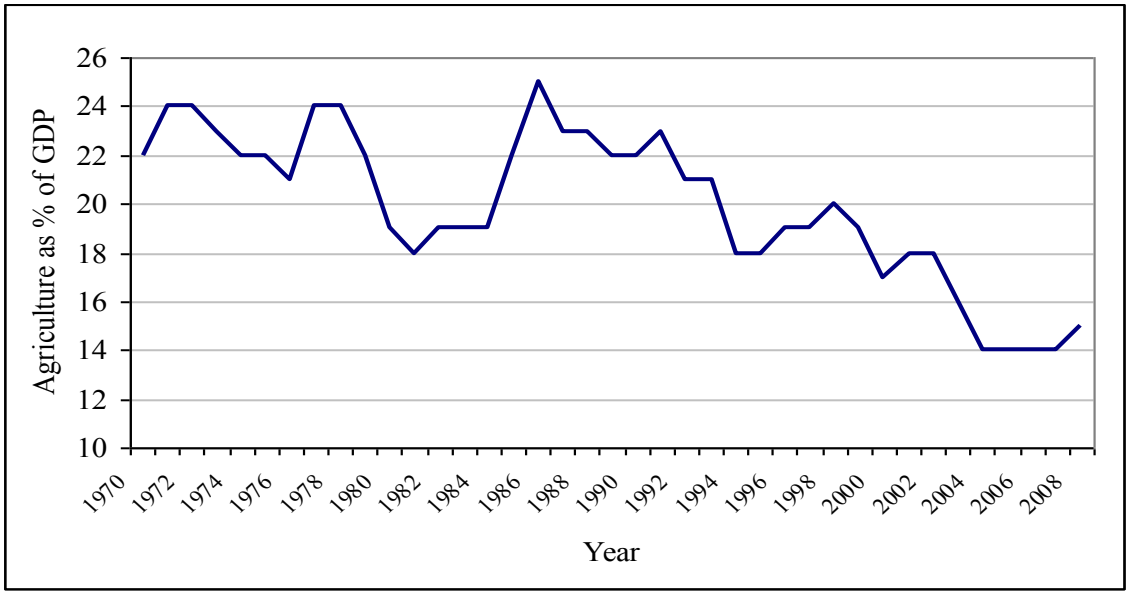


Source: Kidane et al. (2006)

This data does not bode well for sub-Saharan Africa. Being a net importer of agricultural produce means that the region's capacity to increase investment in agriculture (and rural development in particular) is weakened due to a lack of foreign exchange. The agricultural sector's contribution to the region's GDP has only decreased slightly, from 22% in 1970 to 15% in 2008 (Figure 4.4). However, between 1970 and 2008, agriculture's share of GDP fluctuated greatly and, for the most part, remained above the 18% mark until 2002. Thereafter, it declined slightly, falling to 15% in 2008. Other developing regions such as East and South East Asia have significantly reduced agriculture's contribution to GDP, from 25% in 1980 to just below 10% in 2005. This has resulted from diversifying exports into manufactured goods. In contrast, sub-Saharan

Africa currently has the highest agriculture to GDP ratio in the developing world (Gayi, 2008). This further indicates sub-Saharan Africa's lack of „structural transformation'; namely, its inability to industrialise or diversify its exports (UNCTAD, 2008: 30).

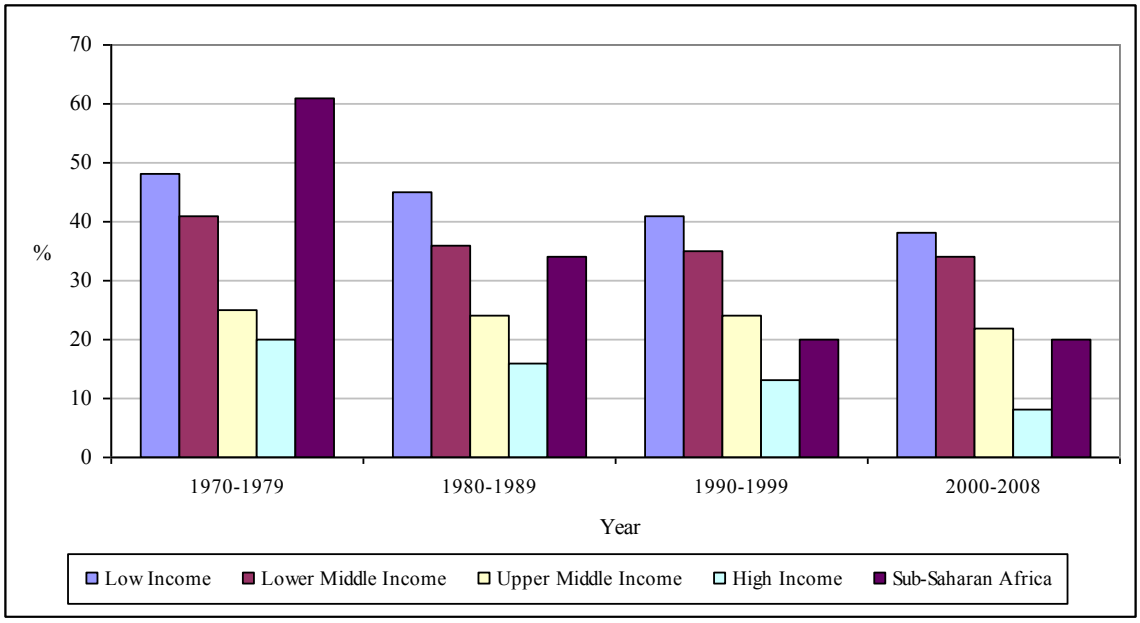
Figure 4.4: Sub-Saharan Africa's Agriculture (Value-added) as a Share of GDP, 1970-2008



Source: Author's compilation based on Africa Development Indicators data (World Bank, 2010b)

Agriculture's contribution to sub-Saharan Africa's GDP, however, has varied between countries within the region. Figure 4.5 illustrates agriculture's share of GDP across various income groups in sub-Saharan Africa for the periods 1970-1979, 1980-1989, 1990-1999 and 2000-2008. Agriculture's contribution to GDP remained relatively unchanged between 1980 and 1997 for both low-income and lower middle-income countries. On the other hand, the upper middle-income and high-income countries showed declines in the agriculture to GDP ratio between 1980 and 1997, and were below the sub-Saharan African average agriculture to GDP ratio.

Figure 4.5: Agriculture as a Share of GDP across Income Groupings in Sub-Saharan Africa, 1970-1979 to 2000-2008 (Median Values)



Source: Author's compilation based on UNCTAD Handbook of Statistics data (UNCTAD, 2010)

Notes:

- Low-income countries:
  Ethiopia, Eritrea, Burundi, Democratic Republic of the Congo, Mozambique, Sierra Leone, Malawi, Tanzania, Niger, Guinea-Bissau, Burkina Faso and Chad.
- Lower middle-income countries:
  Rwanda, Madagascar, Uganda, Mali, Nigeria, Kenya, Gambia, Togo, Central African Republic, Sudan, Benin and São Tomé and Príncipe.
- Upper middle-income countries:
  Zambia, Ghana, Lesotho, Mauritania, Comoros, Guinea, Senegal, Zimbabwe, Angola and Cameroon.
- High-income countries:
  Côte d'Ivoire, Djibouti, Equatorial Guinea, Republic of the Congo, Cape Verde, Swaziland, Namibia, Botswana, Mauritius, South Africa, Gabon and the Seychelles.

It is evident that the agriculture to GDP ratio within the sub-Saharan African region varies considerably. The upper middle-income and high-income groups have shown slight declines in their average agriculture to GDP ratios over the decades reviewed. This mimics the trends of other developing regions. The low-income and lower middle-income groups have the highest agriculture to GDP ratios and have not experienced much change between 1970 and 2008. The sub-Saharan African average has declined considerably since the 1970s. This may be because of declines in the high-income groups' agriculture to GDP ratios. However, the sub-Saharan African average agriculture to GDP ratio is still well above the high-income countries' agricultural contribution to GDP.

This variation across sub-Saharan Africa extends to agricultural production, in which success is limited to a few countries. In recent years, agricultural exports have become

progressively more concentrated in fewer countries. Between 2002 and 2005, 56% of sub-Saharan Africa's agricultural exports originated from South Africa, Côte d'Ivoire and Ghana, in declining order of importance. South Africa and Côte d'Ivoire are classified as high-income countries while Ghana is considered an upper middle-income country. Thus, sub-Saharan Africa's lower middle-income and low-income countries have not accounted for a substantial share of the region's agricultural exports. However, these countries are heavily dependent on the agricultural sector, which further indicates the poor performance of the sector (UNCTAD, 2008).

Sub-Saharan Africa's poor agricultural performance is further highlighted by the decline in the volume of traditional commodities traded. The volume of traded traditional commodities has decreased from 18% in 1980-1981 to 11% in 2000-2001. These falling trade volumes indicate the drop in global demand for traditional agricultural commodities and the deteriorating global prices of these commodities. On the other hand, the trade of non-traditional commodities such as fruit and vegetables has increased by 15% over the same period (UNCTAD, 2008).

The sub-Saharan African region's poor agricultural performance can be attributed to a number of factors, such as declining agricultural commodities prices, poor domestic policies and a lack of investment, infrastructure and research and development. Agricultural export prices, which play a major role in the performance of sub-Saharan Africa's agricultural sector, have been declining since the 1960s. In general, agricultural export prices have fallen by approximately 2% per annum between 1960 and 2002 (Gilbert, 2004). In selected agricultural commodities, larger declines in price have been experienced over a similar period. Table 4.1 illustrates the percentage decline in global prices of selected agricultural commodities between 1970 and 2004. These commodities, in particular rice and sugar, have experienced significant price decreases during this period. Some of these crops are traditional commodities and form part of sub-Saharan Africa's total agricultural exports. The large reduction in the price of these commodities over a 30-year period has contributed to sub-Saharan Africa's poor agricultural performance and has caused the region's net terms of trade to deteriorate.

Table 4.1: Percentage Decline in World Prices of Selected Commodities, 1970- 2004

Crop	Units	Average Price 1970-1974 (Constant 1990 Prices)	Average Price 2000-2004 (Constant 1990 Prices)	Percentage Decline
Cotton	US cent/kg	161.43	137.48	15
Maize	US$/tonne	131.47	108.83	17
Rice	US$/tonne	380.02	234.27	38
Soybean	US$/tonne	310.15	292.00	6
Sugar	US cent/kg	39.06	1651	58
Wheat	US$/tonne	164.39	150.62	8

Source: Cornish and Fernandez (2005)

The declining trend of agricultural commodity prices shown in Table 4.1 has been attributed to increases in output as a result of seed improvements, better marketing and greater productivity of capital. The improvement in productivity of capital in particular is said to enhance welfare, as it "allows the same volume of goods to be consumed for lower resource expenditure" (Gilbert, 2004: 12). However, if countries have not improved their agricultural productivity, declining agricultural prices will clearly be detrimental to their agricultural performance.

The agricultural sector's response to variations in the prices of inputs and exports is sluggish and inelastic because the decisions about which crops to plant and inputs to use are made prior to the release of new crop prices. Consequently, agriculture cannot easily respond to a drop in export prices from one season to the next. This then results in oversupply, which decreases the export price even further (FAO, 2004; Gilbert, 2004). As many sub-Saharan African countries are dependent on only one or two agricultural export commodities, falling and fluctuating prices severely affect the performance of their agricultural sectors.

Poor and restrictive policies have been prominent in sub-Saharan Africa for several decades and they constitute a second major factor retarding sub-Saharan Africa's agricultural performance. Firstly, the protective policies and agricultural subsidies enjoyed by many developed countries have adversely affected sub-Saharan Africa's

agricultural performance. This is because developed countries are able to subsidise input costs and are protected from declining agricultural commodity prices. In addition, many policies also restrict market access into developed countries and this narrows the global outlets available to sub-Saharan Africa's exports (Hoekman et al., 2001).

Secondly, sub-Saharan Africa's domestic agricultural policies, both pre-independence and post independence, have hindered the region's capital accumulation and growth prospects. From independence (which began in the late 1950s) to the 1970s, sub-Saharan Africa's economies as well as agricultural sectors have been characterised by extensive government intervention. Marketing boards, established in the 1940s through to the 1970s, were created to control agricultural commodity prices and trade as well as to provide credit, fertilizer and input subsidies to farmers. Thereafter, these marketing boards were abolished between 1980 and 1990, with the expectation that increasing agricultural prices and decreasing government intervention would stimulate a supply reaction and thus create a competitive market. Discontinuing the marketing boards fell under the structural adjustment programmes of the early 1980s. Twenty years later, however, these anticipated results have not materialised, as a large majority of smallholder farmers in sub-Saharan Africa were heavily reliant on the subsidies and credit provided by the marketing boards to maintain productivity. In reality, agricultural yields and quality declined, leaving smallholder farmers even more vulnerable to agricultural price volatility (van der Laan and van Heeren, 1990; Kherallah et al., 2000; FAO, 2004).

Furthermore, many of the government policies implemented in the 1980s (such as the exchange rate appreciation policy and anti-agricultural industrial policy) were prejudicial towards the region's agricultural sector and contributed to its worsening performance. A number of policies within sub-Saharan Africa, such as macroeconomic, price and trade policies, have taxed the agricultural sector heavily. These taxes are compounded through various channels, one of which results in farmers obtaining lower prices for agricultural produce than developed countries. There are a number of empirical studies that highlight taxing of the agricultural sector through prominent price distortions, for example by Schiff and Valdés (1992), Herrman (1997) and Pursell and Diop (1998). Agricultural exports also carry heavy taxes and imported inputs required for agricultural production are taxed through high tariffs (Binswanger and Townsend, 2000; Kandiero and Randa, 2004).

Sub-Saharan Africa's lack of investment, infrastructure and research and development have also contributed to the agricultural sector's declining performance. The region's poor infrastructure has hampered its access to markets and vital inputs required to achieve optimal yields. Poor infrastructure stimulates an increase in transaction costs, which is why the costs incurred by sub-Saharan African farmers are higher than in other developing regions. A lack of efficiency in areas such as telecommunications, transport and financial services can increase the cost of exporting to a greater extent than tariffs or non-tariff barriers do.

As already mentioned, the region has fallen short in ensuring adequate investment and research and development in the agricultural sector relative to other developing regions. China and India have managed to triple their investment levels in agriculture, whereas in sub-Saharan Africa, approximately half of the countries experienced a decline in agricultural investment and a few countries experienced slight increases of less than 0.2% in recent years (Bach et al., 2008). Despite the agricultural sector's heavy taxation through inappropriate policies, investment in public goods and infrastructure has also been meagre.

Investment in public goods and infrastructure has important "forward linkages" with the agricultural sector. It follows that increased investment of this type will assist in increasing sub-Saharan Africa's agricultural exports, as well as in improving the region's share in world agricultural exports (Kandiero and Randa, 2004: 26). However, almost half of sub-Saharan African countries have shown a decrease in their agricultural investment and this lack of investment is partly due to poor domestic policies and institutions and the restrictive policies implemented by developed countries (Binswanger and Townsend, 2000; Diao and Hazell, 2004). It is therefore essential that sub-Saharan Africa improve investment in its agricultural sector and diversify its export base in order to remain globally competitive.

4.2.1. The Role of Non-Traditional Agriculture in Sub-Saharan Africa's Export Diversification

Sub-Saharan Africa's agricultural sector has the potential to generate economic growth and development, but this potential lies in non-traditional agricultural commodities rather than in traditional commodities. Non-traditional agricultural commodities are defined as "crops that are not part of the customary diet of the local population and grown primarily for their high cash values and export potentials" (Singh, 2002: 86). Alternatively, non-traditional export commodities can be distinguished from traditional export commodities by their respective market concentrations. Traditional export commodities are classified as such when they account for more than 70% of total exports. The exports that make up the remainder of the total exports are then classified as non-traditional export commodities (Ng and Yeats, 2002). Fresh fruit and vegetables, cut flowers, seafood, herbs and spices and meat are some of the major non-traditional agricultural commodities groups. Producing these non-traditional agricultural commodities organically is of particular interest, since this offers a further niche market within the non-traditional agricultural sector (Delgado, 1995; Dijkstra, 2001; Diao et al., 2003; Hallam et al., 2004; Jaleta et al., 2009).

Although relatively small, the export market for non-traditional agricultural products has grown rapidly in recent years and has experienced an increase in demand, particularly from the EU. Between 1989 and 1997, EU imports of non-traditional agricultural commodities increased in excess of 130% (75% of which originated from sub-Saharan Africa) (Diao and Hazell, 2004). Globally, non-traditional exports are worth in excess of US$30 billion per annum (FAO, 2007b). During the past 40 years, non-traditional commodities have experienced the smallest decline and least volatility in real prices of agricultural commodities overall. Non-traditional agricultural commodities are also rapidly gaining ground in developing countries, where their aggregate share of global non-traditional fruit and vegetable commodities increased to 56% in 2002 (Hallam et al., 2004; Wilkinson and Rocha, 2008).

However, the effects of this rapid increase have been disproportionately distributed across developing countries and it has only occurred in a few countries. Specifically, Chile and Mexico account for 53% of the global trade in avocadoes, while 61% of mango exports originate from Mexico, Brazil and the Philippines. Costa Rica and Côte d'Ivoire contribute 61% of pineapple exports and Mexico has the largest share of exports in

tomatoes, asparagus, onions and aubergines. Kenya accounts for 25% of global green bean exports and Thailand, Mexico and India are the forerunner developing countries in exporting cabbages, green corn and dried onions. Latin American countries and Asia thus dominate the non-traditional agricultural export market. Sub-Saharan Africa accounts for only a small share of this market and has fared better in the export of vegetables than fruit (Hallam et al., 2004). This niche market has considerable potential to generate economic growth and development in sub-Saharan Africa. This is because vegetables and fruit are subject to fewer demand constraints in the short and medium term and the region's climate is conducive to their production.

In addition, the specific niche market of organic agriculture has attracted considerable attention because of its potential for both farmers and exporters. Specifically, this interest focuses on the potential benefits that organic agriculture can bring to developing countries. Because sub-Saharan Africa's non-traditional agricultural sector, and particularly the market for organic products, is relatively untapped, this study proposes that sub-Saharan African countries diversify their export base towards non-traditional agricultural exports and that it concentrate on organic products (Diao et al., 2003; Diao and Hazell, 2004).

4.3. Definition of Organic Agriculture

The term „organic' can be a problematic label as it can be interpreted in various ways (Lipson, 1997). Lord Northbourne first used the term (1940, cited in Paull 2006: 14), explaining that "the farm itself must have a biological completeness; it must be a living entity, it must be a unit which has within itself a balanced organic life". It is clear that Northbourne's (1940) definition focuses on the farm management aspect rather than the inputs. In recent years, a more comprehensive and universal definition has been employed by the international food standards organisation, Codex Alimentarius, which states:

> Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system (FAO, 1999).

The term „organic agriculture' used in this study is based on the above Codex Alimentarius definition. It is further expanded to distinguish between „certified' and „non-certified' organic agriculture. Certified organic agriculture aims to provide consumers with a guarantee that certain standards have been met and adhered to in the production process. Thus, it is a guarantee of the production process rather than the end product. Organic certification is an essential procedure for farmers to follow if they want to sell their produce as „organic produce', whether internationally or domestically. An accredited body conducts the certification process and a number of criteria need to be met before this accreditation is awarded (IFAD, 2003; Hine and Pretty, 2006; Rundgren, 2008). Non-certified organic agriculture, on the other hand, has not undergone this stringent certification process, but organic farming methods have been used nonetheless. However, non-certified organic produce cannot be marketed as „organic produce' but rather is sold as „conventional produce'. The large majority of organic produce grown in sub-Saharan Africa is classed as non-certified (IFAD, 2003).

4.4. Developmental Phases in Organic Agriculture

The development of global organic agriculture has evolved in two key phases: the expansion phase and the growth phase.

4.4.1. Expansion Phase (1970-1990)

Organic agriculture research and practices expanded rapidly across the world after the 1960s. This expansion was triggered by the 1973 oil crisis, which brought about a measure of environmental awareness and called for sustainable agriculture. This also produced new ways of thinking about the use of natural resources and the concepts of low input and high efficiency, ensuring food security and maintaining sustainable development in agriculture through using ecological, organic, biodynamic and natural agriculture farming methods. These new ideas were considerably developed in terms of conceptual, research and practical aspects (Rigby et al., 2001; Pacini et al., 2002).

The expansion phase was further characterised by a strengthening of existing organic agriculture organisations as well as the formation of new organisations. A number of these organisations were particularly focused on the certification of farmers. Despite the rapidly growing interest in organic produce in the 1970s, it was not considered part of mainstream conventional agriculture and thus did not receive the government support that

conventional agriculture enjoyed. This resulted in individual groups collaborating and working with private organic organisations. Furthermore, the lack of government support promoted the formation of global organic networks. In 1972, the International Federation of Organic Agricultural Movement (IFOAM) was founded by five organic organisations from South Africa, the USA and Europe. To date, this is the largest non-governmental organic organisation in the world (Kristiansen et al., 2006; Luttikholt, 2007).

IFOAM's main activities are maintaining its organic guarantee system, improving harmonisation of regulations and trade and promoting organic agriculture at a global and intergovernmental level. The founding of IFOAM promoted the formation of other major organic organisations and research institutions around the world in the 1970s and 1980s. These included FiBL (Forschungsinstitut für biologischen Landbau) and FNAB (Fédération Nationale d'Agriculture Biologique), which are the world's largest organic research institutes. FiBL and FNAB played a significant part in the standardisation of the production and marketing of organic produce and they advocated for consumer awareness (Luttikholt, 2007).

The 1980s saw the organic movement gain momentum and organic food become popular with consumers as a result of its health benefits and improved food safety. The growth in organic agriculture extended beyond Europe and the USA into parts of Australia, Central and South America, Asia and, to a lesser degree, Africa. The accelerated growth and awareness of organic agriculture also piqued the interest of scientists in the 1980s, bringing about increased research in organic agriculture. The focus of this research was primarily on comparative studies between conventional and organic farming methods, rather than on how to assist organic producers with improved methods to support and strengthen organic principles and practices (Lockeretz, 2002; Parrot and Marsden, 2002; Freyer, 2007).

4.4.2. Growth Phase (since 1990)

The rapid growth in organic agriculture experienced in the 1970s and 1980s continued well into the 1990s and the 2000s. Both demand for and supply of organic produce grew at exponential rates of up to 20-30% per annum. In the 1990s, organic agriculture entered a new stage of growth. This was characterised by the foundation of organic producers trade organisations, the implementation of organic farming regulations and increasing

support from governments. In 1990, the first fair for organic products, the BioFach Fair, was held in Germany. To date, it is the biggest fair in the world for organic products (ITC, 1999; Kristiansen et al., 2006).

This growth phase saw increased collaboration between international players and increasing cooperation between governments, for example the EU and the FAO of the United Nations. In 1999, IFOAM and the FAO joined forces to produce a set of guidelines for the organic sector that focused on the production, processing, labelling and marketing of organic produce. These guidelines were particularly important in the synchronisation of worldwide organic agricultural standards (FAO, 2001a).

The growth in global organic agriculture is continually increasing in terms of both production and markets. Globally, there is an estimated 31.9 million hectares under organic management and approximately 700 000 organic farms. Table 4.6 provides key statistics on organic agriculture in Africa and other regions. It is evident that Australia has the largest share of land under organic management, with an estimated 12.4 million hectares, followed by Europe with 7.4 million hectares and Latin America with 4.9 million hectares. Asia, North America and Africa have 3.1 million hectares, 2.2 million hectares and 0.4 million hectares, respectively, under organic management.

It is clear that although Oceania has the largest area of organically managed land, it only accounts for 1% of the world's organic farms, but accounts for almost 60% of worldwide permanent organic grasslands. It appears that Europe has a substantial share in the global organic sector across all the listed categories. Surprisingly, North America has a considerably small share in organic agriculture across the board, despite its rapidly increasing consumer demand for organic produce. Latin America is gaining ground in the global organic sector, as its organically managed land is six times greater than that of Africa and its organic farms make up almost a third of organic farms globally. Asia's share of organic land is three times greater than that of Africa, but half that of Latin America; however, there are considerably fewer organic farms in Asia than in Africa and Latin America. Despite Africa's considerably small share in organically managed land, its share of organic farms makes up almost a quarter of the world's organic farms and accounts for 11% and 25% of the world's permanent organic crops and organic wild collection, respectively (Willer et al., 2008).

Table 4.2: Key Statistics on Organic Agriculture in Africa and Other Regions

(Percentages of World Data)

Region	Area (million ha)	Organic Land Share (%)	Organic Farms (%)	Organic Permanent Crops (%)	Organic Permanent Grasslands (%)	Wild Collection (%)
Africa	0.4	1	24	11	0	25
Europe	7.4	24	28	48	15	28
Asia	3.1	10	13	4	4	24
Latin America	6.4	16	32	34	18	22
North America	2.2	7	2	3	5	1
Australia	12.4	42	1	0	58	0

Source: Willer et al. (2008)

Further to the increased land under organic production, consumer demand for organic produce is increasing significantly, particularly in the USA and the EU. This has led to the growth in the global organic market being primarily demand-led. The rising consumer demand has surpassed that of supply in both the USA and the EU, leading to increased imports from developing countries. In 2008, the trade in organic food and drinks reached US$50 billion per annum. Despite the recent global economic recession, the market for organic produce remains the fastest growing in the food sector. Consumers' preference for environmentally-friendly, healthy food, particularly in developed countries, is largely responsible for this significant increase in demand for organic produce. This growth, however, has not been limited to organic food and drinks, as demonstrated by the growth of the market for organic cotton, which grew from US$241 million in 2001 to US$5 billion in 2008. Despite the rapid growth of the demand and market for organic produce, many developing countries, including sub-Saharan African countries, have not been able to take advantage of the opportunities that the growing global organic market presents. This can be attributed to a number of factors, such as lack of financial and government support, knowledge and training (Niemeyer and Lombard, 2003; Ndugire, 2010).

At present, sub-Saharan Africa's organic agricultural sector remains relatively small and underdeveloped. In fact, Africa accounts for a mere 1% of the world's land under organic management. Much of sub-Saharan Africa's small organic agricultural sector focuses on the export market, with the majority of exports destined for the EU. However, these exports originate from a handful of countries in the region. Sub-Saharan Africa's organic export products include fresh vegetables, bananas, coffee, tropical fruit, tea, sugar, cotton and honey (Raynolds, 2004; Parrot et al., 2006).

4.5. Critical Analysis of the Profitability, Environmental Impact and Export Potential of Organic Agriculture in Sub-Saharan Africa

In order to critically evaluate an organic agricultural sector and its economic and socio-economic influences, an evaluation should address the economic, environmental and social aspects of the sector (Zanoli et al., 2007). This section critically examines organic agriculture from an economic and environmental perspective and then identifies the export potential thereof. The social aspect, which particularly focuses on the food security implications of organic agriculture, is discussed in the following chapter.

4.5.1. Economic Impact

Many academics suggest that organic agriculture has the potential to improve the economic and socio-economic status of developing countries through various means. These include improved profitability of farming activities, increased market potential, price premiums, better yields, lower input costs, improved food security, enhanced soil fertility and a greater reliance on natural resources to facilitate agricultural sustainability (Wynen, 1998; Forss and Sterky, 2000; Hine and Pretty, 2006; Kilcher et al., 2008). However, few studies have quantitatively examined the economic impact and profitability of organic agriculture in developing countries, especially in Africa. Some notable studies include Hough and Nell (2003), Bolwig et al. (2009), Gibbon et al. (2009), Owusu and Owusu (2010) and Kleemann (2011).

Twarog (2006) suggests that the economic benefits and profitability of organic agriculture in developing countries should be assessed by examining the interaction of three variables, namely price, quantity and costs. This can be expressed by:

Net Income or Profits = (Price x Quantity Sold) – Total Costs (4.1)

Each of these variables will be examined along with a review of relevant case studies and quantitative studies.

4.5.1.1. Price

Certified organic agricultural produce is generally sold at high international prices, with premiums up to 20% higher than non-organic equivalents. This manifests at both a farm and retail level and is a major motivating factor for many farmers to convert to organic farming. Globally, the average price premiums vary from 20% to 40%, and are dependent on individual products, seasons and the balance of demand and supply in the market in the short run. These price premiums reflect the „organic' nature of this produce and provide justification to farmers for the high costs incurred through certification (Forss and Sterky, 2000; Harris et al., 2001; Raynolds, 2004; Greer, 2008).

Offermann and Nieberg (2000) examined the prices of organic produce in 18 European countries and found considerable variations across countries and produce. The study concluded that it is difficult to generalise about organic prices due to different markets for organic produce and the unequal access farmers have to these markets. However, despite the lack of global organic price data, it is still beneficial to consider the price premiums experienced in specific cases to identify the profitability of organic sectors.

Some studies have highlighted the significant price premiums organic produce in sub-Saharan African countries have fetched. For example, Kleemann and Effenberger's (2010) study compared the prices of conventional and organic pineapple from Ghana, Côte d'Ivoire and Costa Rica in the European market for the period of September 2007-August 2009. Organic pineapple price premiums varied from €0.00 to €0.76 and had a mean of €0.50 and a standard deviation of €0.20. It was also found that organic pineapple prices have tended to be more stable in the short run, experiencing fewer and gentler fluctuations than the prices of conventional pineapples.

A number of organic farmers in sub-Saharan Africa have enjoyed higher prices for their produce; however, these price premiums vary considerably. For example, Waniala (2004)

highlights that organic cotton farmers fetch price premiums as high as 25%. Uganda's organic sesame also received a price premium of 24%, whereas conventional sesame was sold for US$0.29 per kilogram and organic sesame for US$0.36 per kilogram. Interestingly, when the price of conventional sesame fell to US$0.26 per kilogram, the price of organic sesame per kilogram remained unchanged at US$0.36. Examples of considerably large price premiums were evident in Uganda in 2004 for organic apple-bananas and passion fruit, which earned premiums of 212% and 100%, respectively (Twarog, 2006). Ferrigno et al. (2005) indicate that organic cotton farmers generally receive a 20% price premium relative to conventional cotton farmers.

While the price premiums appear to be impressive for a number of organic products, there is some debate as to whether these premiums are sustainable in the long term. Giovannucci (2006) points out that there seems to be a declining trend in these premiums received by farmers, especially with the highly competitive products such as rice and coffee. In a survey of European countries, Hamm et al. (2002) observed that the average consumer price premiums fell to between 15% and 40%. In countries where supermarket chains are dominant in the trade of organic produce (such as the UK), prices are inclined to be approximately 20% lower than the European mean. This declining trend in price premiums also appears to be present in the US.

Didier and Lucie (2008) attribute this declining trend in organic price premiums to increasingly competitive organic sectors and markets and to the economies of scale incurred while shipping, processing and distributing organic produce due to the heightened trade levels of organic products. However, this has not been the case for all countries and all products. Kleemann and Effenberger (2010) tracked the prices of organic pineapples in Ghana, Côte d'Ivoire and Costa Rica between September 2007 and August 2009 and found a fluctuating rather than declining trend. However, the limitation of Kleemann and Effenberger's (2010) study is its short-term nature. A longer period of study is necessary to substantiate or dispute existing studies that demonstrate declining price trends and to determine whether developed and developing countries differ in this respect.

The high price premiums generally signify high demand, thus enabling farmers to identify which markets they can expand in. An example of this is the significantly high premiums experienced in Uganda in the organic apple-banana and passion fruit markets

in 2004, namely 212% and 100%, respectively (Twarog, 2006; Steven-Garmon et al., 2007). Organic fresh fruit and vegetables have been identified as the most prominent product group in the trade of organic products. These commodities are considered important in organic trade because of their market size, the high number of producing countries and the significant consumer interest. Furthermore, organic fruit and vegetables are considered „entry products' for consumers switching to purchasing organic products. Developing countries are therefore encouraged to supply organic produce in these food groups, paying particular attention to off-season vegetables and tropical fruit as these have the greatest trade and price prospects. There is an increasing market for processed organic fruit and vegetables, including fruit juices, dried fruit and canned fruit and vegetables, which provides sub-Saharan African countries with further value-adding opportunities (Kortbech-Olesen, 2006).

4.51.2. Quantity

There has been much contention over organic agriculture's ability to increase profitability through increasing yields and output per hectare. However, this debate has largely focused on the comparison of conventional agricultural yields and organic yields in developed countries, particularly in the European region. A number of these studies have found that yields in developed countries decrease by approximately 50% after converting to organic agriculture (Mäder et al., 2002; Nieberg and Offermann, 2003; Greer et al., 2008; Bolwig et al., 2009; Nemes, 2009).

Relatively few studies of this nature have been carried out in developing countries. Nevertheless, the results of these studies contradict those found in developed countries. These studies focused on developing countries found that organic agricultural yields are higher under normal to favourable conditions than those attained with conventional farming and are substantially higher under less favourable conditions (Mendoza, 2002; Pretty et al., 2003; Gibbon and Bolwig et al., 2007; Setboonsarng et al., 2008).

An extensive study by Pretty et al. (2003) on sustainable farming systems shows that the conversion to organic agriculture has increased the yields of various crops across numerous countries by 30% to 500%. This study examined 208 projects in 52 developing countries; 179 projects were classified as integrated and near-organic systems and 29 were certified and non-certified organic systems. The organic systems in this study

included a range from produce, from foods to fibre and beverage-based commodities. The study covered 106 179 hectares farmed by 154 742 households, with the average area farmed per household being 0.7 hectares. Table 4.3 provides a summary of Pretty et al.'s (2003) findings. It is evident in each of the projects that the conversion from a low input smallholder farming system to an organic agricultural system, whether certified or non-certified, results in increased yields across a variety of crops and countries. A number of these projects are based in sub-Saharan African countries.

Table 4.3: The Impact of Certified and Non-Certified Organic Agricultural Projects on Agricultural Productivity in Selected Developing Countries

Country	Project	Number of Farm Households	Area Under Organic Agriculture (ha)	Changes in Productivity
Bolivia	PRODINPO integrated development programme	2 000	1 000	Potato yields from 4 to 10-15 t/ha
Brazil	AS-PTA alternative agriculture	15 000	60 000	Bean yields up 50-100%
Cuba	Organic urban gardens	26 000	8 000	Total production up from 4 000 to 700 000 t/yr
Egypt	SEKEM biodynamic cotton	150	2 000	Cotton from 2.25 to 3.0 t/ha
Ethiopia	FAO Freedom from Hunger	2 300	2 150	Sweet potato yields up from 6 to 30 t/ha
Ethiopia	Cheha integrated rural development	12 500	5 000	Cereal yields up 60%
Kenya	Manor House Agriculture Centre	70 000	7 000	Maize yields from 2.25 to 9 t/ha; new vegetable crops
Kenya	C-MAD programme	500	1 000	Maize from 2 t/ha to 4 t/ha
Kenya	Mumias Education for Empowerment project	2 069	217	Beans/groundnut yields up from 300 to 600 kg/ha
Kenya	Push-pull pest management	300	150	Maize yields up 60%
Mexico	UCIRI fair trade and organic coffee	4 800	5 000	Coffee yields up from 300-600 kg/ha to 600-1 200 kg/ha
Nepal	Jajarkot Permaculture Programme	580	350	Rice yields up from 1.8 to 2.4 t/ha; maize up from 1.2 to 1.6 t/ha
Pakistan	Sindh Rural Women's Uplift Group	5 000	2 500	Mango yields up from 7.5 to 22.5 t/ha; citrus up from 12 to 30 t/ha
Senegal	Rodale Regenerative Agriculture Research Centre	2 000	2 000	Millet/sorghum yields up from 0.34 to 0.6-1.0 t/ha

Source: Adapted from Pretty et al. (2003)

(Note: Of the 29 projects, only those with statistical data have been included)

Gibbon and Bolwig (2007) compared organic and conventional yields of cocoa and coffee produced by smallholder farmers in Uganda for 2005 and 2006. The organic farming in this study fell under a contract-based farming system in which the exporting

firm operated and managed the projects. A formal household survey was conducted with 172 organic farmers and 159 conventional farmers. With both coffee and cocoa, organic yields were higher than those using the conventional farming systems. The study found organic coffee yields to be 836 kilograms per hectare, while conventional coffee yielded 630 kilograms per hectare. Similarly, organic cocoa displayed yields of 208 kilograms per hectare and conventional cocoa yields were 151 kilograms per hectare.

Conversely, the results of Kleemann's (2011) study reveal that organic pineapple yields in Ghana are 16% lower than conventionally grown pineapples from the same region. In addition, the study found that fewer organic pineapple plants reached the harvest stage and they had, on average, a lower weight than their conventional counterparts did. This has been attributed to the well-established fertilizing regime and better pest control utilised by conventional pineapple growing systems. Despite these lower yields and their lighter weights, organic pineapples were found to be more profitable (twice as high) overall than conventional pineapples in Ghana, because of higher prices and lower or similar production costs.

The downfall of many of these comparative studies is their short review period. In order to achieve an accurate comparison of organic and conventional farming methods, a longer period of study is necessary to track not only the conversion period but also the effects and changes thereafter as the mode of farming becomes entrenched. However, this would be costly to monitor. Thus, simulation studies are useful to examine potential farm developments and any economies of scale (Lamine and Bellon, 2009). Two such studies by Badgley et al. (2007) and Halberg et al. (2007) found that a large-scale conversion from a conventional agricultural system to organic system has the potential to increase yields. Both studies emphasise that the increase in yields depends on the conventional system in place before the conversion to organic farming. For example, with the conversion from conventional to organic farming in high-input areas (such as the USA and Europe), yields are expected to decrease by as much as 50%. However, in developing regions where the conversion to organic farming is from low-input subsistence farming (as found in much of sub-Saharan Africa), the "average yield for the 133 examples from the developing world is 1.80" (Badgley et al., 2007: 91). This translates into an average yield increase of 180%.

Badgley et al.'s (2007) study uses current and real data on the global food supply across 20 general food categories for the world, developed countries and developing countries. Yield ratios were derived in order to obtain comparisons of organic to non-organic agricultural production, achieved by multiplying the food supply by a ratio comparing average organic to non-organic yields. The study's comparison includes 160 cases of conventional farming methods, which mostly originate from developed countries, and 133 cases of low-intensity farming methods, mostly found in developing countries. The food products have been grouped into ten categories, namely grain products, starchy roots, sugars and sweeteners, legumes, oil crops and vegetable oils, vegetables, fruits, all plant foods, meat and offal, milk, eggs, all animal foods, and all plant and animal foods.

The study emphasises that the yield ratios are made up of averages from many developed and developing countries and thus include a wide range of soils and climates. It therefore follows that the results of this study intend to provide a general indication of potential yield performances of organic production as opposed to conventional farming approaches. These results are hence not intended to predict specific crop yields for a specific region. The large differences in expected average yield increases of developed and developing countries after converting to organic methods should not be compared, as their previous methods of agricultural production vary. However, these results indicate that the low-input subsistence form of agriculture has the potential to increase yields significantly when making the conversion. This is because the limitations that low-input subsistence farmers face are partially addressed through organic farming. For instance, limited access to synthetic inputs is no longer a problem once practising organic farming, as synthetic inputs are unnecessary in organic agricultural production. It should be noted that extensive government involvement, intensive training and considerable support from research institutions should accompany large-scale conversions to organic agriculture (Badgley et al., 2007).

Twarog (2006) points out that when comparing the yields of organic and conventional farming methods, as well as those of developed and developing countries, a number of factors should be taken into account. Firstly, organic farming is rooted in the principles of crop rotation and multi- and inter-cropping. Thus, to accurately compare an organic farming system with a conventional, mono-cropping system necessitates examining a full rotation cycle over a number of years. In addition, the production of all crops on the total farm land area should be used as a measure of comparison against conventional farming

systems rather than comparing one crop produced via organic and conventional methods. This is because of the multi- and inter-cropping nature of organic farming.

Bolwig et al. (2009) further highlight that two major factors can explain the contradictory results of comparative studies about organic and conventional farming methods carried out in developing and developed countries. Firstly, the yield changes experienced after the conversion to organic agriculture are highly dependent on the agricultural point of departure. For example, conventional agriculture in developed countries is typically industrial, whereas conventional or traditional agriculture in sub-Saharan Africa is generally non-industrial. One indicator of such classification between industrial and non-industrial agriculture is the consumption of non-organic fertilizers. Fertilizer consumption in sub-Saharan Africa in 2008 was 9.4 kilograms per hectare of arable land, whereas fertilizer consumption in Europe was 204 kilograms per hectare of arable land (World Bank, 2010b). The limited use of synthetic inputs and fertilizers by sub-Saharan African farmers lowers the costs associated with changing to producing certified organic produce. It is naturally more expensive for farmers in developed regions (e.g. in Europe) to make the transition, as they use more synthetic inputs and fertilizer than sub-Saharan African farmers.

Moreover, the institutional framework for both conventional and organic agriculture is better established in developed countries than in sub-Saharan Africa. Thus, in general, sub-Saharan African farmers receive little or no government support when they begin to produce certified organic products. Furthermore, the private credit and domestic saving levels in sub-Saharan African economies are, on average, too low to support this conversion. In theory, this means that the conversion to certified organic agriculture in the sub-Saharan African region is a feasible export option only for large-scale operators or for privately funded contract farming structures (Egelyng, 2007; Bolwig et al., 2009). Currently, relatively large-scale certified organic agriculture is only present in a small number of sub-Saharan African countries, such as Kenya, Uganda, Gambia, Zambia and Tanzania (Parrot and von Elzakker, 2003).

4.5.1.3. Total Costs

The total production costs are generally lower for organic agricultural systems than conventional farming systems. This is because synthetic inputs are prohibited in organic

agriculture (Offermann and Nieberg, 2000; Greer et al., 2008; Nemes, 2009). The total cost of an organic farming system comprises direct costs of production and costs related to transport, storage and certification. The direct costs of production include costs related to land, labour and capital, where the capital costs include the purchase of seed, planting materials and fertilizers (Twarog, 2006).

The cost structures of organic agriculture in developed and developing regions differ substantially. Bolwig et al. (2008) point out that in sub-Saharan Africa, the fixed cost component of organic farming is a minor share of the revenue, with variable or direct costs making up a large share of the costs associated with organic farming. Fixed costs refer to long-term costs such as land investments, buildings and equipment. Organic agriculture is more labour intensive than conventional agriculture. However, for smallholder farmers in developing regions like sub-Saharan Africa, labour requirements are sourced largely from within the family. Thus, the opportunity cost of labour is relatively small. For large-scale organic farmers, it may be necessary to employ extra labour, which increases the cost of production.

As organic agricultural systems prohibit the use of any form of synthetic inputs, organic farmers almost completely avoid these costs. Not using these synthetic inputs also reduces farmers' debt requirements. Musime et al. (2005) add that in sub-Saharan Africa, the small volume of synthetic inputs used in conventional smallholder farming is financed through loans with high interest rates. Farmers are forced to purchase these inputs on credit, as the revenue generated by their farming operation is not sufficient to make such purchases. The plight of farmers in many sub-Saharan African countries has worsened since the removal of the marketing boards when the structural adjustment programmes were initiated in the early 1980s, as smallholder farmers obtained relatively cheap finance and subsidies through these marketing boards. Organic farmers can avoid these high interest loans and thus, the savings incurred can typically offset the cost of any additional labour. Some studies, however, indicate that this does not have a profound effect on most sub-Saharan African organic farmers as inputs in the conventional, traditional farming systems are greatly lacking (Ng and Yeats, 2002; Diao and Hazell, 2004; Hine and Pretty, 2006; Gibbon et al., 2008).

The results of numerous sub-Saharan Africa case studies substantiate the claim that the production costs of organic farming systems are lower, or at least similar to, those of

conventional systems. For example, Kleemann (2011) found that, despite the fact that organic pineapples had lower yields than conventional pineapples in Ghana, the cost of producing organic pineapples was US$0.085 per kilogram whereas conventional pineapples cost US$0.093 kilograms to produce. Gibbon and Bolwig (2007) compared, amongst other variables, the production costs of organic coffee, cocoa and pineapples with those of their conventional counterparts in Uganda. The production costs in this study were classified according to fixed costs and variable costs. The fixed costs of organic coffee, cocoa and pineapples ranged between 4.7% and 6.7% of the average gross farm's income. This indicates low investment levels, as fixed costs comprise land, interest on farm loans, equipment, planting materials, fertilizer and scheme membership. The fixed costs of conventional coffee, cocoa and pineapples represented higher shares of the average gross farm's income in Uganda. These shares, however, varied greatly across the three crops. For example, the fixed costs associated with conventional coffee were only slightly higher than those of organic coffee; however, for cocoa, they were triple that of organic cocoa and for pineapples, they were ten times higher than with organic pineapples, having an approximately 71% share of the average gross farm income. The variable costs included hired labour, seasonal inputs and marketing costs. Gibbon and Bolwig (2007) conclude that the variable costs of organic pineapples and cocoa were lower than those of conventional pineapples and cocoa. However, in the case of coffee, the variable costs were similar across both organic and conventional produce. In most cases, the cost of labour formed the highest share of variable costs.

The greatest cost that certified organic farms in sub-Saharan Africa and the rest of the world face is that of certification. Certification costs and the annual inspections are of particular concern to smallholder organic farmers in sub-Saharan Africa who want to enter the export market. Algra and Rijninks (2000) state that the certification costs necessary to enter the EU markets are too costly for farmers with a cash income of less than US$2000 per annum. The cost of certification can vary between 1% and 4% of the value of a farm's organic produce (Rundgren, 2008). As a result, many farmers in sub-Saharan Africa consider this a major obstacle to converting to certified organic farming (Niemeyer and Lombard, 2003; UNCTAD, 2004). This, however, can be turned around through collective action and group certification. The Ezemvelo Farmers' Organization in Umbumbulu, South Africa, is a prominent example of how farmers can share the costs of certification (Gadzikwa et al., 2006).

At present, the certification of organic farms in sub-Saharan Africa and much of the developing world is largely carried out by inspection bodies in North America and Europe. Consequently, the cost of certification is quoted in foreign currency, which many sub-Saharan African countries and farmers lack because of their downward-spiralling terms of trade and the marginalisation in world trade that they have experienced since the 1980s. This potentially limits smallholder farmers' market access to North America and Europe, which are the world's most prominent organic export markets (Neuendorf and Koschella, 2001).

However, the cost of certification can be reduced by engaging in group certification. Group certification involves the formation of a group of smallholder farmers, the members of which are then certified as a unit rather than on an individual basis. This group is usually controlled by an „Internal Control System' (ICS) that is monitored by certification bodies. Group certification ensures that the cost of certification is shared by all farmers within the group, thus making certification more feasible for these smallholder farmers. A further benefit of group certification is that it is easier for farmers to gain market access on a group basis than on an individual basis. This method of certification has proven to be successful and viable for smallholder farmers in Uganda (Raynolds, 2004; Hine and Pretty, 2006; Preiβel and Reckling, 2010).

4.5.1.4. Profitability

The significant growth in the global organic market since 1990 has been the focus of recent literature on the economics of organic agriculture. This literature focuses on the relative profitability of organic versus conventional farming. In general, the findings are relatively consistent and indicate that the two agricultural approaches bear similar levels of profitability. This has been attributed to the price premiums and lower non-labour costs of organic production systems relative to conventional farming, which compensate for the generally lower yields associated with organic production. However, these studies have had a strong focus on developed countries in the Northern Hemisphere (Mäder et al., 2002; Nieberg and Offermann, 2003; Greer et al., 2008; Bolwig et al., 2009; Nemes, 2009).

In contrast, there is very little literature on the profitability and economics of organic agriculture versus that of conventional agriculture in developing countries and, in

particular, in Africa. The findings of the few existing studies all present similar results, namely that organic agriculture tends to be more profitable and has a greater export market potential than conventional organic farming (Bolwig et al., 2009; Gibbon et al., 2009; Owusu and Owusu, 2010; Kleemann, 2011). It should be noted that, to date, studies of this nature in developing countries have generally reflected results over the short term. This is because the formal organic agricultural sectors in these countries are still considered embryonic. In addition, the results of a number of these studies are based on interviews with farmers. This may influence the quality of the data about organic agriculture in developing countries (Nemes, 2009).

Theoretically, the higher yields achieved by organic systems in developing regions with historically low-input agricultural systems, coupled with the low production costs and price premiums, should result in higher net returns and greater profitability for organic systems than that experienced with conventional systems (Twarog, 2006; Kilcher, 2007; Nemes, 2009). A few case studies that examined the profitability of organic agriculture in various sub-Saharan African countries found that organic farming is more or less as profitable as conventional farming. Some of these studies include those by Kleemann (2011), Gibbon and Bolwig (2007), Lakhal et al. (2008), Gibbon et al. (2009) and Hough and Nell (2003).

Gibbon et al. (2009) examined the effects on revenue of organic contract farming and the use of organic methods in tropical Africa. This study compared organic systems with conventional farms with no contractual relations using a survey and a standard OLS regression approach. The results revealed positive revenue effects for certified organic produce, which arose from participation in contract farming schemes and, to a lesser extent, the adoption of organic farming methods.

A study by Lakhal et al. (2008) compared the gross margins of organic and conventional cotton in Mali. The results show that organic cotton has higher gross margins than conventional cotton, despite the fact that organic cotton has a lower average yield than conventional cotton. The average organic cotton yield is 570 kilograms per hectare while conventional cotton yields are, on average, 1127 kilograms per hectare. These lower yields, however, can be attributed to the fact that formal organic cotton farming has only existed since approximately 2005, whereas conventional cotton has been well established for 30 years. The higher gross margins for organic cotton are partially a result of price

premiums and organic cotton farmers presently do not pay for the cotton seed nor for their organic certification. The certification costs are borne by Helvetas, a Swiss non-governmental organisation that works closely with organic cotton growers around the world (Bassett, 2010). Lakhal et al. (2008) conclude that converting to organic cotton can increase farmers' profits in the medium to long term.

Gibbon and Bolwig (2007) have compared the relative profitability of certified organic and conventional agricultural operations. Their study was based on three surveys of smallholder farmers in Uganda on organic coffee, organic cocoa and organic pineapples. The results conclude that farmers participating in certified organic export production displayed significantly higher levels of profitability across all three commodities than those farmers involved in conventional agricultural production. In addition, organic pineapples displayed the highest level of profitability: three times that of organic cocoa and five times that of organic coffee.

Hough and Nell (2003) assessed the financial viability of growing organic wine grapes versus conventional wine grapes in the Vredendal district, South Africa. They compared the costs and incomes of conventionally and organically produced wine grapes and conducted a risk sensitivity analysis for both the price and yields of both production methods. The break-even production was also calculated. The study was based on 2 hectares of planted Shiraz and 1 hectare of planted Cabernet Sauvignon. The results of Hough and Nell's (2003) study revealed that it was profitable to produce organic wine grapes since the gross margin was positive and the existing production levels were able to cover operational and total costs. The break-even production level was below budget for both conventional and organic methods. It should be noted that the organic wine grapes in this study were in their first year of organic production, thus indicating the farm's positive conversion to certified organic wine grape production. However, this short period cannot be used to predict future trends in organic wine grape production in this region.

Further to the evidence of organic farming's profitability in some sub-Saharan African countries, the organic sectors in countries such as Uganda, Kenya, Tanzania and Zambia have experienced substantial growth. Muwanga (2010) points out that organic exports from Uganda have grown an average 60% per annum between 2007 and 2009. Currently, in Uganda there are over 200 000 smallholder certified organic farmers, whereas there

were 40 000 in 2004. There has also been a considerable increase in the number of exporting companies focusing on organic products since 2004. In 2004, there were less than 12 companies working in the organic sector in Uganda, while there were 44 companies in 2009. Similar trends have been noted in Kenya, Tanzania and Zambia.

4.5.2. Environmental Impact

Organic agriculture and the economic opportunities it presents positively impact on the environment, which cannot be ignored amidst the current efforts to ensure a sustainable and eco-friendly world (Giovannucci, 2006). Organic agricultural systems benefit the environment through a number of channels, which will be discussed below (Twarog, 2006). It should be noted that the overwhelming majority of studies focused on the environmental benefits of organic agriculture have been carried out in developed countries.

4.5.2.1. Improved Soil and Less Soil Erosion

The key feature that distinguishes organic agriculture from conventional agriculture is its prohibition of synthetic or non-natural inputs. Consequently, organic agriculture reduces environmental pollution, particularly of the ground water, and averts the degradation of soil structures. The methods and techniques that underpin organic farming work to improve the soil structure, since soil is a vital natural resource in organic agriculture as well as any other form of agriculture. This is achieved through, amongst other things, multi-cropping, inter-cropping, crop rotation and using animal and plant manures as well as crop residues. Using animal and plant manures improves the soil fertility and involves combining each harvest with a cover crop that draws nitrogen from the atmosphere and fixes it in the soil when the crop is ploughed into the soil. By building the soil structure and fertility, flora and fauna are stimulated (such as soil microbes and nematodes), both of which are vital to ensuring the sustainability of the soil structure and its fertility (Kirchmann and Bergström, 2001; El-Hage Scialabba, 2002; de Oliveria and van Montagu, 2005; Hole et al., 2005).

Improving the soil structure has a number of positive spillover effects. For example, it reduces soil erosion, which is critically important in countries that experience regular droughts and/or floods. The loss of fertile top soil, which is caused by soil erosion, results

in lower agricultural yields and a loss of nutrients for growing plants. Organic agriculture advocates that soil should not lie bare, but be covered by plant material at all times. This reduces the loss of this top soil and can lessen the effects of droughts and floods, thus reducing soil erosion. The improvement in soil structure also increases the water retention of the soil (El-Hage Scialabba, 2002; Schnug et al., 2006; Jordan et al., 2009).

A 21-year study conducted in Central Europe comparing organic and conventional farming in terms of crop success, soil structure and fertility found that the soils under organic management were healthier than those under conventional farming systems (Mäder et al., 2002). Furthermore, Pimental et al. (2005) found that organic farming systems had high organic matter (soil carbon) and nitrogen in their soils, which enhances the sustainability of organic farming. Overall, soil fertility is vital in any agricultural system and more so in organic agriculture, as it cannot rely on synthetic inputs. Soil fertility forms the foundation from which any additional environmental benefits will arise with organic systems.

4.5.2.2. Enhanced Biodiversity

Biodiversity is a crucial element in ensuring the stability of agricultural systems. Organic agriculture has been shown to improve the biodiversity of farming systems and to ensure the stability and sustainability thereof. Organic systems lead to a greater abundance and wider range of flora and fauna than conventional farming systems. Stable agricultural systems are critical to sustaining a country's food supply. This can be achieved through promoting soil fertility and implementing habitat management, for instance by using green manures and crop rotation methods to encourage diversity of larger species and plants, insects and micro and macrofauna in the soil (Altieri et al., 2005; Gabriel et al., 2006; Schnug et al., 2006; Niggli et al., 2007).

Hole et al. (2005) studied the impact of both organic farming and conventional agriculture on biodiversity through conducting a comprehensive review of comparative studies on the two agricultural systems. Of the 76 studies reviewed, it was concluded that the majority of the studies showed that the variety and abundance of species was greater on organic rather than conventional farms. Bartram and Perkin (2003) conducted a similar comparative study and examined 33 published studies. These studies compared the biodiversity effects of both organic and conventional farms. Bartram and Perkin

(2003) found that, in general, organic agriculture was associated with richer biodiversity than conventionally managed farms. Furthermore, this study highlighted that the organic management practices that positively affected biodiversity included mixed crop rotations, the non-use of herbicides and insecticides, the utilisation of farmyard manure and shallow ploughing and the adoption of sensitive management practices in fields that were not cropped so as to preserve ecologically sensitive habitats. On the other hand, the organic practices that impacted negatively on farm biodiversity were the use of mechanical methods to control weeds and the undersowing of crops.

Furthermore, a study using a multiscale hierarchical sampling design assessed the effect of land use across multiple spatial scales on farmland biodiversity in the UK. This study used a sample of 301 plant species, 19 farmland bird species, 9026 earthworms, 119 121 epigeal arthropods, 4451 butterflies, 10 420 hoverflies, 4399 bumblebees and 5751 solitary bees. The results indicate that organic farming positively affects biodiversity on a farm and landscape scale. However, on average, these positive effects are not as dominant as anticipated. The authors attribute this to the fact that not many previous studies have evaluated paired farms (similar in size) within a landscape. However, the results show that organic farming strongly affected the biodiversity of farm management in some cases (Gabriel et al., 2010).

4.5.2.3. Mitigating Climate Change and Reduced Energy Consumption

There is overwhelming evidence to suggest that various greenhouse gases are causing climate change and global warming. Agriculture is a major contributor of these greenhouse gases (Kotschi and Müller-Sämann, 2004). The Fourth Assessment Report of the Intergovernmental Panel on Climate states that the agricultural sector accounts for 10-12% of greenhouse gas emissions. This, however, only includes direct agricultural emissions and omits emissions arising from the use of agricultural inputs, such as nitrogen fertilizers, synthetic pesticides and fossil fuels used by machinery and irrigation systems, as well as the changes in carbon stocks attributed to the removal of primary forests. This 10-12% can be supplemented with the emissions resulting from deforestation for agricultural purposes, which accounts for 12% of all emissions. Thus, agricultural emissions amount to approximately a quarter of global emissions (El-Hage Scialabba and Müller-Lindenlauf, 2010).

A number of studies highlight organic agriculture's tremendous potential to mitigate climate change through its practices and principles. The two most prominent ways in which organic agriculture can mitigate climate change include carefully managing nutrients and high carbon sequestration and decreasing the amount of primary ecosystems being cleared. The careful management of nutrients within the organic system contributes to reducing N_2O emissions from the soil. Soil stores three times more carbon than air and five times more carbon than forests. The loss of carbon from the soil due to agricultural production accounts for approximately one tenth of total CO_2 emissions globally. Unlike with other carbon stores, the carbon trapped in the soil can be regenerated if appropriate farming methods are employed. Due to its focus on improving soil structure and fertility, organic agriculture can recapture this carbon cost effectively, as organic practices prohibit the use of synthetic inputs. However, its success in this respect depends on the local environmental conditions and management practices (Jordan et al., 2009; Muller, 2009). El-Hage Scialabba and Müller-Lindenlauf (2010) indicate that if all agricultural systems in the world are organically managed, agricultural emissions would reduce by an estimated 20%, with half of this reduction resulting from decreased N_2O emissions and half being caused by a lower demand for energy for agricultural purposes. However, there are limited long-term scientific studies to confirm the authors' findings.

There are a number of additional organic agricultural practices that can assist with reducing greenhouse gas emission. These include not using chemical fertilizers, pesticides and herbicides; avoiding leaving soil bare; planting a combination of annual and perennial crops; practising sustainable livestock management; enhancing the management of grasslands; and promoting local production and consumption. Furthermore, organic agriculture can mitigate climate change relatively cheaply as the organic system itself represents a cost effective form of production and its practices and management principles can potentially lower greenhouse gas emissions. However, a major disadvantage of the organic system in influencing climate change is the size of this sub-sector. In order to reduce C_2O successfully, organic agriculture would need to expand substantially (Jordan et al., 2009; Muller, 2009).

Organic agricultural systems also require less energy than conventional agricultural systems, directly, through reduced use of oils and fuels, as well as indirectly, through the non-use of synthetic inputs, which consume large amounts of energy during the manufacturing process. This has been substantiated by a number of studies, which have

generally found that organic systems use 30-50% less energy in the production process than conventional farming systems and that they are more energy efficient. Reducing energy consumption demands plays an important role in lowering green house gases (Dalgaard et al., 2001; FAO, 2002; Pimental, 2006; Ziesemer, 2007).

4.5.3. Organic Agriculture's Export Potential and Market Access in Sub-Saharan Africa

Having examined the economic and environmental impact of organic agriculture and ascertained that it appears to be potentially profitable in sub-Saharan Africa and that its environmental benefits will ensure its sustainability, it is fitting to discuss its export potential and global market access available to sub-Saharan African countries. Sub-Saharan Africa's organic sector is currently small but growing, with a handful of countries dominating this sector (Ghana, Ethiopia, Kenya, Uganda, South Africa and Zambia). These countries have achieved success in organic agriculture, but their organic sectors represent a minimal share of their agricultural production and trade. For example, Uganda is the forerunner of organic agriculture in Africa, but its organic agricultural sector can only boast a 1.46% share of its total agricultural output (Bolwig and Gibbon, 2009).

Sub-Saharan Africa's certified organic sector has also lagged behind that of other regions, as it has the smallest share of organically managed land in the world. This is largely due to the region's larger non-organic agricultural sector and, because much of the existing organic farming is uncertified, it is not included in the organic data. A vast and untapped export potential exists for sub-Saharan Africa's certified organic sector, but this comes with a number of challenges. There is currently considerable demand for organic produce in developed countries, with the largest demand coming from the EU and the USA. To date, this demand has far outweighed supply and it is predicted that this demand will continue to increase at its current pace as these populous developed countries become more aware of the link between health and organic produce (UNCTAD, 2004).

This presents sub-Saharan Africa and other developing regions with an opportunity to fulfil this demand. Sub-Saharan Africa has a distinct comparative advantage in the production of organic foods, as much the sub-Saharan African region enjoys a tropical

climate that is conducive to growing fruit and vegetables all year round. The agricultural production of the Northern Hemisphere countries, on the other hand, is typically confined to summer only (an average of three months). This is one of the factors contributing to these countries' rapid increase in demand for organic produce, particularly in out-of-season months. Waarts et al. (2009) have identified this as a distinct advantage for South Africa in the South Africa/Netherlands organic trading relations. Furthermore, the sustainability of organic systems, the stabilisation of ecosystems, the reduced risk of crop failure and increased yields place organic farmers in an optimal position to increase their harvests and enable farmers to improve the quality of their produce to acceptable export levels (Ng and Yeats, 2002; Diao and Hazell, 2004; Hine and Pretty, 2006; Gibbon et al., 2008).

Kortbech-Olesen (2006) indicates that export opportunities exist for organic produce from sub-Saharan Africa and particularly from East Africa (which has the most concentrated and developed certified organic sector). The EU, the Middle East and the USA are the world's largest markets and sub-Saharan African countries should export their certified organic produce to these markets. However, there will be strong competition from the Latin American countries when exporting to the USA. Furthermore, the study highlights that East Africa should consider producing organic herbs, spices and essential oils, as there is a particularly interesting and growing market for these commodities, which can be used in either their raw or processed states.

There are a number of non-tariff barriers associated with the global organic trade, but many of these are advantageous to sub-Saharan Africa. For example, the conversion period from conventional agriculture to certified organic agriculture is considered a barrier to entry for many farmers worldwide and, in particular, for commercial farmers in developed countries. This is because the conversion period is typically three years. During this period, farmers cannot market their produce as certified organic and generally experience a decline in yields and a loss of profits. However, in the case of sub-Saharan African countries, the conversion period is typically only one year because the region's land is largely classified as „virgin land' because local farmers have used traditional, low-input farming practices for centuries. This puts sub-Saharan Africa at a distinct advantage as its existing organic farmers will potentially gain their certification status before conventional farmers and can thus export their certified organic produce sooner than competitors. In addition, this shorter conversion period does not act as a deterrent in sub-

Saharan Africa when deciding to adopt organic agriculture as it does in developed countries (TIPS and AusAID, 2008; UNEP-UNCTAD, 2010).

Certification is a major non-tariff barrier for many smallholder organic farmers. It is a costly process and largely beyond the financial means of many smallholder sub-Saharan African farmers. However, this need not be a barrier to entry into the global market since there are an increasing number of international non-governmental organisations and export companies that work with smallholder organic farmers in Africa and facilitate group certification to spread the high certification costs. Prominent examples of such organisations are the Export Promotion of Organic Products from Africa, which is largely active in East Africa, and Helvetas, which focuses on organic cotton in West Africa (Forss and Sterky, 2000; Bassett, 2010; UNEP-UNCTAD, 2010).

International certification bodies based in the EU or the USA primarily carry out the certification of organic produce in sub-Saharan Africa. Despite the evident cost disadvantage this presents, being certified by international bodies implies that the organic produce from sub-Saharan Africa will meet global standards. Theoretically, this enables certified organic farmers in sub-Saharan Africa to access global markets easily. However, it is still in the best interests of sub-Saharan Africa's organic agricultural sector to develop an internationally recognised certification body to reduce high certification costs (Barret et al., 2002; Saxena, 2007).

There are several other constraints that hinder the export potential of organic produce from sub-Saharan African and these should be addressed in order for the region to maximise on the current opportunities available to it.

4.6. Constraints Faced by Certified Organic Agriculture in Sub-Saharan Africa

Sub-Saharan Africa's conversion to certified organic agriculture is hindered by various constraints. These constraints include high initial costs, the high cost of transportation, a lack of infrastructure, education and training in relevant and efficient production methods and inadequate financing. In fact, the small size of sub-Saharan Africa's current certified organic agricultural sector can be attributed to a number of the above factors and, more specifically, to a lack of infrastructure that facilitates certification and low income levels

(Forss and Sterky, 2000; Parrott et al., 2006; Hine and Pretty, 2006; Yussefi and Willer, 2007).

The high initial costs of certification are a major obstacle to the majority of sub-Saharan African smallholder farmers. There are no national or local certification organisations and the current certification costs, which are set by foreign certification authorities, are too expensive for most sub-Saharan African farmers. This leads some sub-Saharan African farmers to perceive that certification of organic produce does not make economic sense (UNCTAD, 2004). However, organic agriculture can be financially viable for smallholder farmers with appropriate and sufficient government support focused on reducing the costs of certification. One such example is to engage in collective action and group certification. The Ezemvelo Farmers' Organization in Umbumbulu, South Africa, is a prime example of how group certification can make the process of converting to organic agriculture affordable (Gadzikwa et al., 2006).

The establishment of local certification boards can reduce the cost of certification. At present, the only option available to farmers is to be certified by the relevant bodies in developed countries and regions, such as the EU. Lustig and Rundgren (2007: 5) indicate that most sub-Saharan African countries do not yet have a „unified national organic movement'. This may be a critical factor in the establishment and advancement of the region's organic sectors for export, as it offers all participants common ground from which to work. The development of local certification bodies would enable the region to develop organic standards and policies that are locally relevant and improve domestic conditions and the flow of information between farmers and certification boards. Establishing local certification organisations would also result in funds being retained in sub-Saharan Africa rather than transferred to foreign regions such as the EU. This could improve investment in research and development and funding within the organic agricultural sector (Algra and Rijninks, 2000; Harris et al., 2001; Rundgren, 2008).

However, local certification boards would struggle to become recognised by international organic certification bodies. Thus, a realistic and commonly suggested approach to reducing certification costs is to engage in group certification. Group certification involves the formation of a group of smallholder farmers, who are then certified as a whole rather than on an individual basis. This group is usually controlled by an „internal control system', which is monitored by the certification bodies. This significantly reduces

the cost of certification for each farmer because the group members share the costs. Furthermore, certified organic groups are able to enter markets with greater ease than individual farmers can (Raynolds, 2004; Hine and Pretty, 2006).

It has also been noted that sub-Saharan African farmers face the challenge of lacking infrastructure and insufficient education and training on correct organic methods. Because sub-Saharan Africa's agriculture is organic by default, minimal adjustments and improvements are required to gain a certified status. However, the gap between growing crops on a subsistence basis and producing organic produce for domestic and export markets is rather large and requires certification as well as extensive training and education (Myers, 2000). Many sub-Saharan African governments are ill informed about organic agriculture. This can result in the marginalisation of the sector due to the unavailability of financial and educational resources and lead to the formulation of inadequate policies and a lack of research and development in organic agriculture (Forss and Sterky, 2000; Hine and Pretty, 2006).

Minimal government support and involvement is a major obstacle to smallholder organic farmers in sub-Saharan Africa, many of whom lack the initial financial resources to engage in certified organic agriculture and thus enter the export markets (Boor, 2003). El-Hage Scialabba (2000) identifies three reasons why governments, particularly in developing countries, should increase their involvement in and support of the organic sector.

Firstly, certified organic agriculture creates income opportunities via exports and is characterised by lower production costs than conventional agriculture. Exporting organic products increases developing countries' international trade and provides a means for them to diversify their export base away from one or two traditional commodities. Furthermore, government policies have the potential to reduce the costs of certification and assist with the technical challenges of production. The above benefits suggest that an increase in certified organic output could potentially increase and generate foreign exchange for the sub-Saharan African region.

Secondly, correctly implementing organic farming methods results in considerable conservation of natural resources. Environmental policies often restrain the growth of conventional agriculture, but organic agriculture has a number of beneficial

environmental spillover effects. Hence, organic agriculture provides a means to conserve natural resources.

Thirdly, organic agriculture may improve the "livelihoods of resource-poor farmers" (Boor, 2003: 32). This is because organic agriculture is characterised by low levels of inputs and minimal production costs. Conversely, conventional agriculture requires high external inputs, which are often beyond the means of many sub-Saharan African farmers. Consequently, organic agriculture provides smallholder farmers with the opportunity to produce successful and profitable outputs. Organic agriculture also has the potential to improve soil systems and increase the returns on yields, which in turn increases the quantity of food available to poor households and improves food security in the region.

It is evident that certified organic agriculture provides sub-Saharan Africa with considerable export potential and it may be a feasible and sustainable diversification option for the region. However, the various constraints discussed need to be addressed in order to ensure the successful development of the sector. Despite the extensive involvement of various NGOs in sub-Saharan Africa's organic agriculture, government support and involvement in the sector as well as the establishment of certification boards have important roles to play in the success of organic agriculture in the region. Given the constraints and barriers to entering organic markets, Parrot et al. (2006: 100) suggest that:

> For most sub-Saharan African countries the best potential for organic export undoubtedly lies in low volume - high value crops (such as coffee, herbs, spices, medicinal and beauty products), non-perishable items and those which offer opportunities for adding value locally.

Furthermore, it is crucial for sub-Saharan Africa to adopt an export development strategy at a regional level. This would involve decisions about which countries should export which goods because, if all of the countries in the region export the same organic produce, market saturation and declining prices will result. Rather, countries should specialise in only one or two specified organic agricultural crops, with the region cooperating as a unit in this regard (Diao and Hazell, 2004).

4.7. Best Practices and Institutional Factors Necessary for the Development of the Organic Agricultural Sector in Sub-Saharan Africa

It has been established that great export potential in certified organic produce exists for many sub-Saharan African countries. Despite this export potential, it is necessary to identify the policies, best practices and institutional arrangements that are critical in ensuring the development and growth of an organic agricultural sector in sub-Saharan Africa.

The policies on organic agriculture in developed and developing countries vary in that developed countries' organic agricultural policies focus on the environmental and health aspects of organic farming. Conversely, organic agricultural policies in developing countries focus more on the trade characteristics needed to earn foreign exchange for exports in order to address other development needs. In a number of developed and developing countries, organic agricultural policies have developed from the bottom up and, in many cases, the development of organic agriculture has been initiated and carried by NGOs and the private sector, with little or no government support (El-Hage Scialabba, 2000; Raynolds, 2004; Egelyng, 2007; Källader and Rundgren, 2008).

It is essential that governments be actively involved in the organic agricultural sector and that they facilitate the development of certification bodies, acquire and maintain access to export markets and provide public funding and technical assistance to smallholder farmers to assist them with the conversion process from traditional agriculture to organic agriculture (Egelyng, 2007; Källader and Rundgren, 2008).

Rundgren (2008) identifies key recommendations and best practices for developing countries' governments to promote and grow their organic agricultural sectors. These are classified according to General Policy, Standards and Regulations, Markets, Production, and Other, which includes training, education and research.

4.7.1. General Policy

In order to develop a country's organic agricultural sector and related policies, the government must carry out an integrated assessment of general agricultural policies, programmes and plans in order to identify how these affect the competitiveness and

conditions of the organic agricultural sector. This assessment should be supplemented with clearly defined objectives relating to government involvement in the development of the organic agricultural sector. In addition, an action plan should be developed that provides targets for the organic sector; this will assist stakeholders and agencies in focusing their efforts (Giovannucci, 2006; Rundgren, 2008).

It is essential that general agricultural policies and organic policies are aligned. This is particularly important if organic agriculture is to be incorporated into a country's key policies, namely agricultural policies, food and health policies, poverty eradication policies and environmental policies. This can only be realised when governments recognise the diverse interests represented by the organic sector, which will then enable them to integrate organic agriculture objectives into various mainstream policies (Källander and Rundgren, 2008).

Thereafter, it is essential that governments create permanent bodies through which the relevant departments can consult with the private sector involved in organic agriculture and so address the needs of stakeholders such as farmers and cooperatives. Governments' involvement will promote the development of the organic sector and assist stakeholders with achieving their objectives. In order to assess the growth, trends and overall performance of the organic sector, data needs to be collected, analysed and made accessible to stakeholders and policy-makers (Rundgren, 2008).

4.7.2. Standards and Regulations

Currently, there are two international standards for organic agriculture, the Codex Alimentarius Guidelines and the IFOAM Basic Standards. Many countries' organic standards and regulations are based on one or both of these international standards. This simplifies the trade of organic products, but not for the farmers (particularly smallholder farmers), since these regulations and standards are not country-specific (Bowen, 2003; Egelyng, 2007; Källader and Rundgren, 2008).

As such, when developing national or regional standards and regulations for organic production, it is important that governments collaborate with the private sector and international regulating bodies. This will ensure that standards and regulations are adapted to country-specific conditions but also have international relevance. Since the

large majority of farmers in sub-Saharan African countries are smallholders, governments should facilitate access to certification services by advocating that international certification organisations create local offices and should assist in the development of local certification bodies (Wynen, 2003; Rundgren, 2008).

Sub-Saharan African governments should encourage organic farmers, particularly smallholder farmers, to comply with existing standards, regulations and certification procedures. In addition, they should implement special considerations specific to smallholder farmers . An example of such special consideration would be to encourage group certification and the establishment of an internal control system to reduce costs but maintain high standards across the organic sector. This has been successful in South Africa. In the event of group certification, it is essential that governments provide training for the farmers on how to set up an internal group system and the procedures involved in group certification (Raynolds, 2004; Giovannucci, 2006; Hine and Pretty, 2006).

4.7.3. Markets

The organic agricultural market essentially only accepts high quality produce. While some crops, such as coffee, can easily be converted to organic produce, this results in oversaturation of the market, leading supply to outstrip demand and prices to decrease. As a result, organic markets and the higher prices associated with organic produce should not be assumed. Thus, before embarking on key initiatives to increase the supply of organic produce, sufficient research should be undertaken and a proposed plan of market activities should be considered (IFAD, 2003; Rundgren, 2008).

Strategies to develop domestic organic markets should include measures for both the demand and supply side, as well as address the role to be played by imports. Furthermore, export promotion necessitates governmental support. Organic agricultural exporters should be encouraged to unite in order to enhance the promotion and marketing of organic produce. Governments can play an important role in developing organic markets during initial stages, by assisting producer organisations with developing efficient supply chains, thus ensuring timeous and accurate distribution of the produce. This efficient distribution can be enhanced through the development of market information systems (El-Hage Scialabba, 2000; Rundgren, 2008).

4.7.4. Production

The organic production conditions are crucial to the development of the organic sector, since the success or failure of organic farming is a direct result of the farm and farmer's activities and not government's activities. However, governments can enhance production and the sector as a whole through providing support and financial assistance and implementing appropriate policies. It is therefore necessary that governments develop direct support measures to help both small farmers and commercial operations. This can be achieved by establishing extension services and providing staff training. Such initiatives should be participatory and the farmers should be encouraged to incorporate existing traditional knowledge on pest controls and seed varieties into their farm management practices (Lampkin, 2003; Källader and Rundgren, 2008).

Furthermore, governments should establish basic controls for biological inputs, such as pest control agents and organic fertilizers. The breeding and testing of seed varieties should be adjusted to suit organic production and alternative seed treatments should be identified and promoted. Such efforts must ensure that genetically modified organisms (GMOs) are not allowed to contaminate organic seeds. (Kim, 2003; Rundgren, 2008).

4.7.5. Other (Including Training, Education and Research)

Education, research and training play a vital role in the future development of the organic sector. New and improved methods of production, as well as supply chains, can be identified through research. These new methods can be conveyed to farmers and producers via educational and training programmes. As such, it is necessary to establish specialised training and research institutes for organic farming. Research and development in organic agriculture should be of a participatory nature, building on and incorporating traditional knowledge and the needs of farmers (El-Hage Scialabba, 2000).

In order to keep abreast of international trends in the organic sector, governments and the private sector should attend or participate in international forums hosted by international organic bodies such as the Codex Alimentarius and IFOAM. Overall, cohesion and cooperation should be promoted at a regional level with respect to initiatives on marketing, standards, conformity assessments and research and development to ensure

that the entire organic sector and its supply chain are operating at an optimal level and working towards a common goal (Rundgren, 2008).

4.8. Conclusion

It is clear that sub-Saharan Africa's agricultural sector has performed poorly since the 1960s. The region's share in global agricultural exports has decreased considerably and the region has experienced falling terms of trade. Furthermore, the agricultural production of sub-Saharan Africa has not kept pace with its increasing population. However, the non-traditional agricultural sector has experienced increasing growth in recent years, despite its small size. The poor performance of traditional agriculture in the region and the increasing success of the non-traditional agricultural sector emphasises the need for sub-Saharan Africa to diversify its agricultural export base towards non-traditional commodities, specifically towards organic agriculture. Globally, organic agriculture has exhibited the highest growth rates within the agricultural sector.

Organic agriculture presents sub-Saharan Africa with a number of potential opportunities to improve its agricultural output. Converting to organic production will lower production costs, increase stable yields, maximise on the competitive advantage sub-Saharan Africa has over Northern Hemisphere countries and other regions in general, incur higher export prices and lower input costs. The limited case studies and empirical evidence on sub-Saharan Africa's performance in organic agriculture indicate that organic agriculture has been profitable in the short term. However, longer review periods are necessary to identify trends in the profitability of organic agriculture in sub-Saharan Africa. The environmental benefits of organic production include improved soil fertility, enhanced biodiversity, lower energy consumption and the potential to mitigate climate change.

However, sub-Saharan Africa faces a number of challenges and constraints that may hamper the growth and development of a certified organic agricultural sector. These include high certification costs attributed to a lack of local certification boards and limited government support, education and infrastructure. In order to develop a successful certified organic agricultural sector that is geared for the export market, it is essential that sub-Saharan Africa address these constraints and challenges.

CHAPTER 5: FOOD SECURITY IN SUB-SAHARAN AFRICA AND THE ROLE OF ORGANIC AGRICULTURE

5.1. Introduction

Global agricultural production has experienced significant growth and has kept pace with the global population growth rate. However, the levels of food insecurity and hunger are increasing. It was estimated that during 2009, 1.02 billion people worldwide were undernourished. At a regional level, Asia and the Pacific currently account for the largest number of undernourished people (642 million), followed by sub-Saharan Africa with 265 million undernourished people. Latin America and the Caribbean account for a considerably smaller share of undernourished people, approximately 53 million, followed by the Near East and North African regions, with 42 million undernourished people. Developed countries account for the smallest share, approximately 15 million undernourished people (FAO, 2009). Food insecurity and chronic hunger are thus major problems in developing countries, especially those in sub-Saharan Africa, as the region has one of the most severe food security problems worldwide.

The world food crisis of 1972-1974 triggered major concerns about food security, a recurrent problem in developing economies. The 1970s were characterised by a focus on the supply side of food in response to the world food crisis. Food insecurity and chronic hunger were associated with a diminishing availability of food and thus, self-sufficiency schemes were adopted at national levels and initiative were implemented to stabilise world food stocks and imports (Maxwell, 1996). The definition of food security that was accepted at the World Food Conference in 1974 clearly voiced concerns about food availability. According to the United Nations report on the 1974 World Food Conference, food security was defined as the:

> Availability at all times of adequate world supplies of basic food-stuffs…to sustain a steady expansion of food consumption…and to offset fluctuations in production and prices (UN, 1975, cited in Maxwell 1996: 156).

The work of Amartya Sen (1981) has been pivotal in the food security debate and has prompted the paradigm shift from a food first perspective to a livelihood perspective. Food insecurity was no longer viewed as purely being a supply problem. Sen's work was referred to as the „food entitlement' approach and entitlements were based on an

individual's endowment bundle. The failure to include enough food in an individual's endowment bundle results in the collapse of entitlements and this is perceived to increase food insecurity. Sen demonstrated that a diminishing availability of food does not necessarily result in, or cause, food insecurity.

The entitlement approach prompted further examination of the concept of food security and resulted in yet another paradigm shift, from the considerations of using objective indicators to considering it using subjective indicators. Definitions of food security have increasingly focused on food access juxtaposed with food availability, its sustainability over time, poverty and low income levels and individuals' livelihoods (Maxwell and Smith, 1992; Maxwell, 1996; Díaz-Bonilla et al., 2003). The evolution of views on food security has led to various definitions. However, the most widely accepted definition of food security was proposed at the World Food Summit in 1996, which stated that:

> All people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, 1996).

A state of food insecurity occurs when the parameters of the above definition are not met. Food insecurity can be classified into two general types: chronic food insecurity and transitory food insecurity. Chronic food insecurity arises when households are unable to meet their minimum food requirements for extended periods and it is often caused by sustained poverty. Transitory food insecurity, on the other hand, occurs when there is temporary food insecurity due to a sudden decrease in a household's ability to produce or access enough food to sustain a satisfactory level of nutritional intake (Maxwell and Smith, 1992).

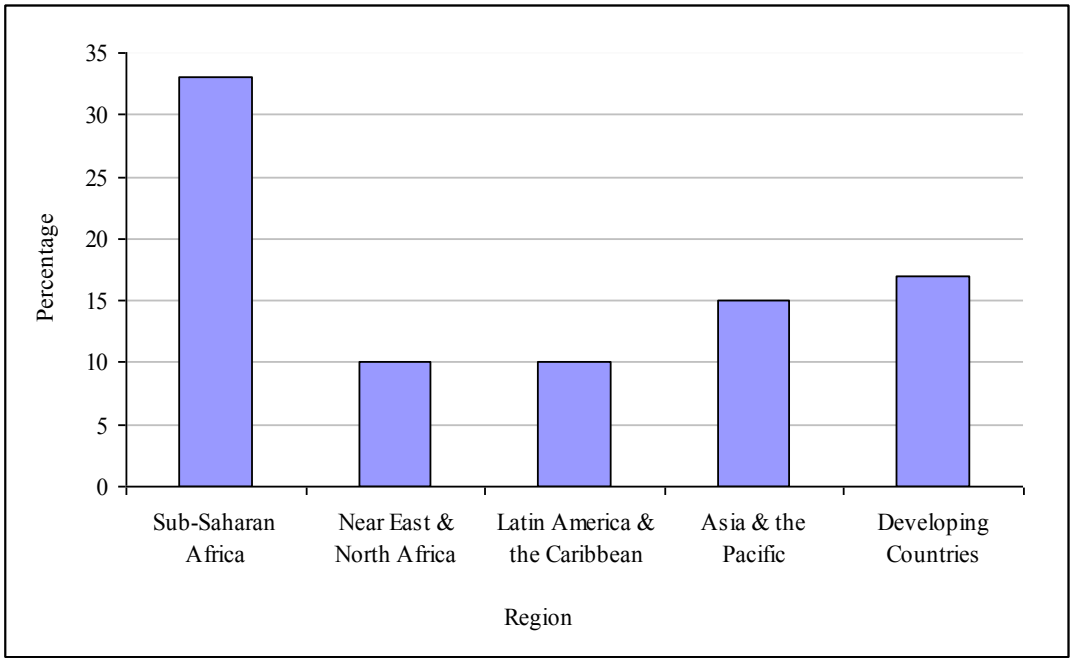
This chapter aims to examine the food security problem in sub-Saharan Africa and suggests a potential solution to addressing this problem. Firstly, the food security trends in sub-Saharan Africa between 1961 and 2008 are analysed according to the two major dimensions of food security: food availability and access to food. A discussion follows regarding a possible solution to the region's food security problem, namely the potential role organic agriculture can play in alleviating this food insecurity.

5.2. Trends in Food Security in Sub-Saharan Africa

In developing countries, the percentage of undernourished people has generally decreased, from 28% in the 1979-1981 period to 17% in the 1998-2000 period (Pingali and Stringer, 2003). However, this has not been the case with sub-Saharan Africa, as the region's food insecurity has worsened since the 1970s. The number of chronically hungry people in Sub-Saharan Africa has increased from 88 million in the 1970s to an estimated 265 million in 2009 (FAO, 2009; Nair, 2008). As such, the sub-Saharan African region has one of the highest levels of food insecurity in the world.

More specifically, the region accounts for 25% of undernourished people across all developing regions. In the sub-Saharan African region, 33% of the population is classified as undernourished and food insecure (FAO, 2006). This is illustrated in Figure 5.1, which shows the percentage of undernourished people in each developing region. The percentage of undernourished people in sub-Saharan Africa is significantly higher than in other developing countries and the African continent.

Figure 5.1: Percentage of Population Undernourished by Region, 2000-2002

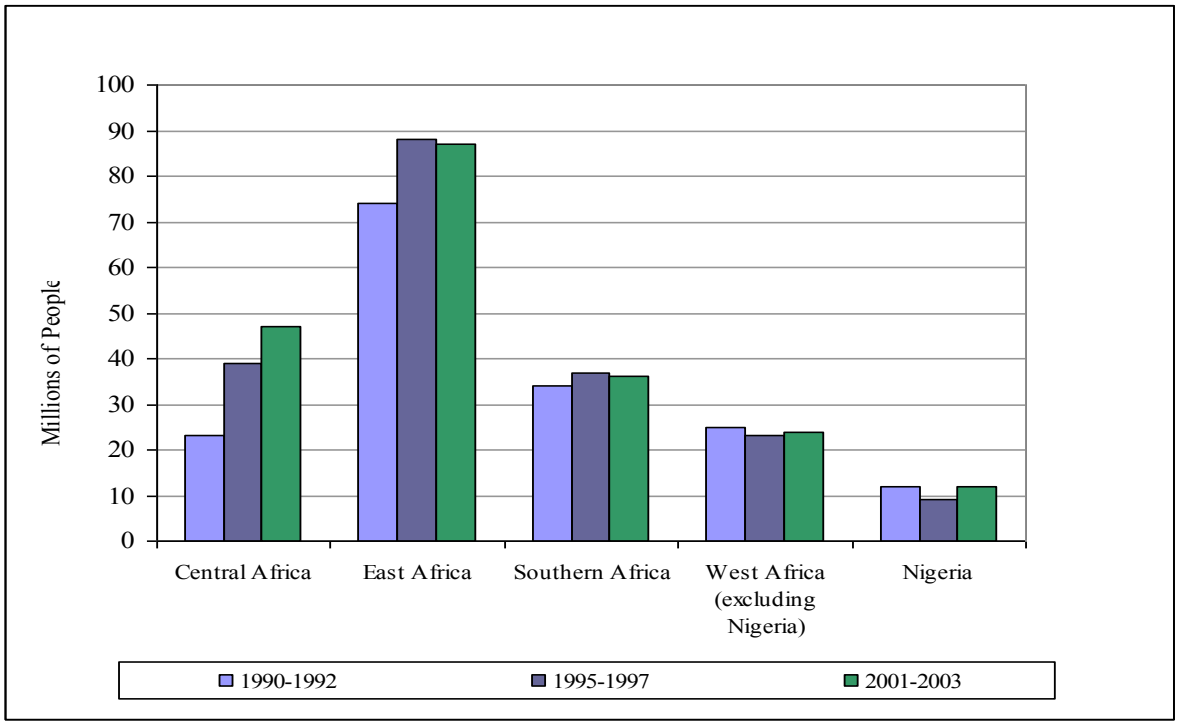


Source: Adapted from FAO (2005)

The severity of food insecurity in sub-Saharan Africa varies across areas, as indicated in Figure 5.2, which shows the absolute number of undernourished people according to sub-

regions. East Africa has the highest number of undernourished people in the sub-Saharan African region. There has been an increase in the number of undernourished people in East Africa, from approximately 74 million for the 1990-1992 period to 88 million for the 2001-2003 period. In Central Africa, the number of undernourished people increased from approximately 23 million to almost 50 million between the 1990-1992 period and the 2001-2003 period, respectively. On the other hand, the number of undernourished people in Southern Africa has remained relatively stable, at approximately 35 million between 1990 and 2003. West Africa had the lowest number of undernourished people between 1990 and 2003: approximately 23 million. However, this excludes Nigeria's data. Nigeria alone has approximately 12 million undernourished people.

Figure 5.2: The Number of Undernourished People in the Sub-Regions of Sub-Saharan Africa, 1990-1992 to 2001-2003



Source: Adapted from FAO (2006)

An important indicator of food insecurity in a region or country is the child malnutrition rate, which is measured by the percentage of underweight children and those with stunted growth. Table 5.1 indicates the average percentage of children under five that are underweight and have stunted growth for the 2003-2008 period in sub-Saharan Africa, the Middle East and North Africa, and Latin America and the Caribbean. It is clear that the percentage of underweight children in sub-Saharan Africa below the age of five in the

moderate and severe categories is considerably higher than in the Middle East and North Africa and in the Latin American and Caribbean region. Sub-Saharan Africa also has the highest percentage of underweight children in the severe category. Furthermore, 42% of sub-Saharan African children under five years old suffered from stunted growth between 2003 and 2008, followed by 32% in the Middle East and North Africa and a low 14% in Latin America and the Caribbean.

Table 5.1: The Percentage of Under-Fives Underweight and Stunted for Selected Developing Regions as an average for the period 2003-2008

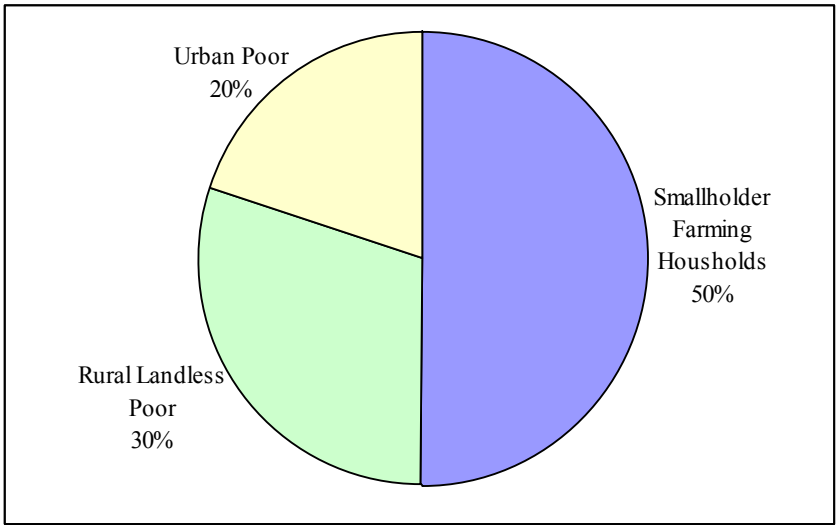
	% of Under-Fives (2003-2008):		
	Underweight		Stunting
Region	Moderate & Severe	Severe	Moderate & Severe
Sub-Saharan Africa	23	8	42
Middle East & North Africa	14	5	32
Latin America & the Caribbean	4	-	14

Source: Author's compilation based on SOWC data (SOWC, 2010)

The data on child malnutrition further highlights sub-Saharan Africa's persistent food insecurity and, overall, the evidence suggests that food insecurity is a problem in sub-Saharan Africa as the number of undernourished people within the region increased between 1990 and 2003.

The large majority of food insecure people (namely 70%) in sub-Saharan Africa live in rural areas. In particular, 50% of food insecure people in this region are smallholder farmers and such farmers produce more than 90% of the region's food, as illustrated in Figure 5.3. The remaining 30% and 20% of the food insecure population comprises the rural landless poor and the urban poor, respectively (Nair, 2008).

Figure 5.3: Food Insecure Population in Sub-Saharan Africa



Source: Nair (2008)

Countries with undernourishment levels affecting more than 34% of the population are generally heavily dependent on their agricultural sectors (Nair, 2008). The agricultural sectors of these countries account for 30% of their GDP and an estimated 70% of the population work in the agricultural sector. This emphasises an over reliance on primary commodities and a lack of export diversification within such countries, which is evident in an overwhelmingly large number of sub-Saharan African countries.

As 50% of sub-Saharan Africa's food insecure population are smallholder farmers and given the complex nature of its food security problem, the region's food security situation should be considered from both an availability and access to food perspective. Measuring the complexity of food insecurity with a number of indicators provides a multidimensional view of the problem. Some of these indicators include food supply and production trends, daily calorie intake, food aid levels, poverty levels, HIV/AIDS prevalence, income per capita and the prevalence of conflict.

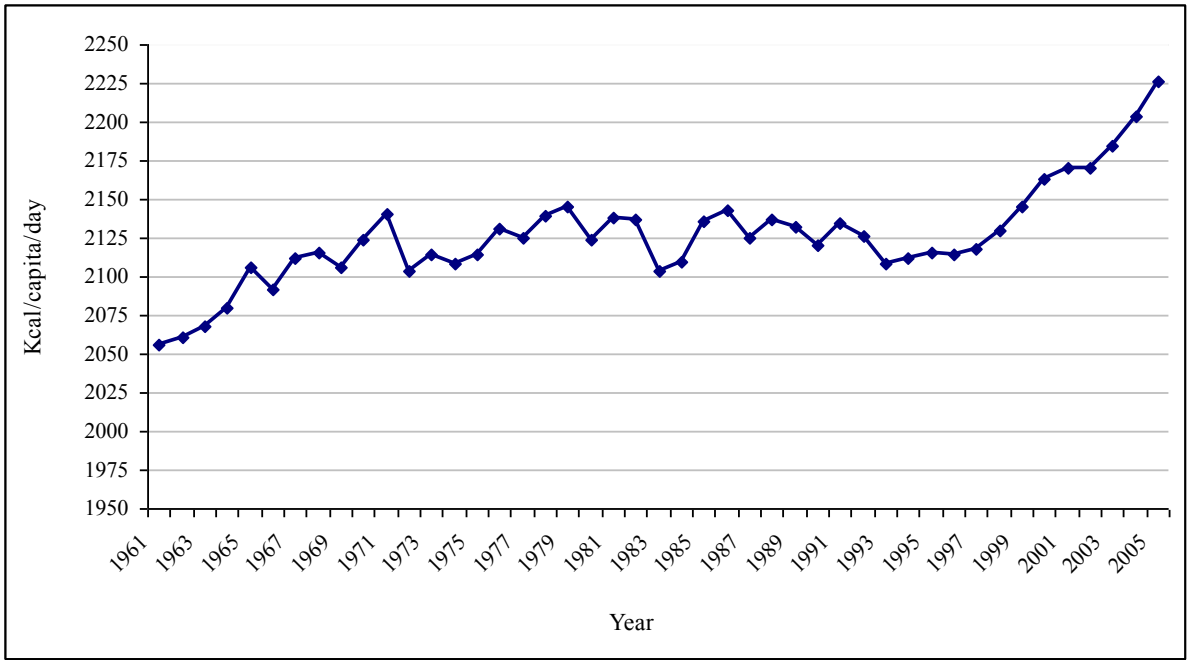
5.2.1. Food Availability

The availability of food in a country or region can be examined firstly by looking at the daily calorie intake per capita and secondly, by looking at the food supply trends. The daily calorie intake per capita is set out by the FAO as 2300 calories (Kidane et al., 2006). Figure 5.4 illustrates sub-Saharan Africa's average daily calorie intake between 1961 and 2005 and shows that the region has experienced a slight upward trend in the

calorie consumption per person over this period. The region's average per capita calorie intake fluctuated between 2100 and 2150 calories for over three decades (between 1967 and 1999). The beginning of the 2000s saw a marked increase in calorie consumption and by 2005, the daily calorie consumption per person had increased to 2226 calories.

When viewed in isolation, this increase suggests that food insecurity in sub-Saharan Africa is improving. However, considering the 3198 daily calorie consumption in North Africa during the 2002-2004 period and the 2415 daily calorie consumption in the Latin American and Caribbean region for the same period (USDA, 2006), it is clear that sub-Saharan Africa ranks well below other developing regions according to this food security indicator and does not meet the FAO's minimum daily requirement. This further indicates the severity of sub-Saharan Africa's food security plight.

Figure 5.4: Average Daily Calorie Intake per Capita in Sub-Saharan Africa, 1961-2005

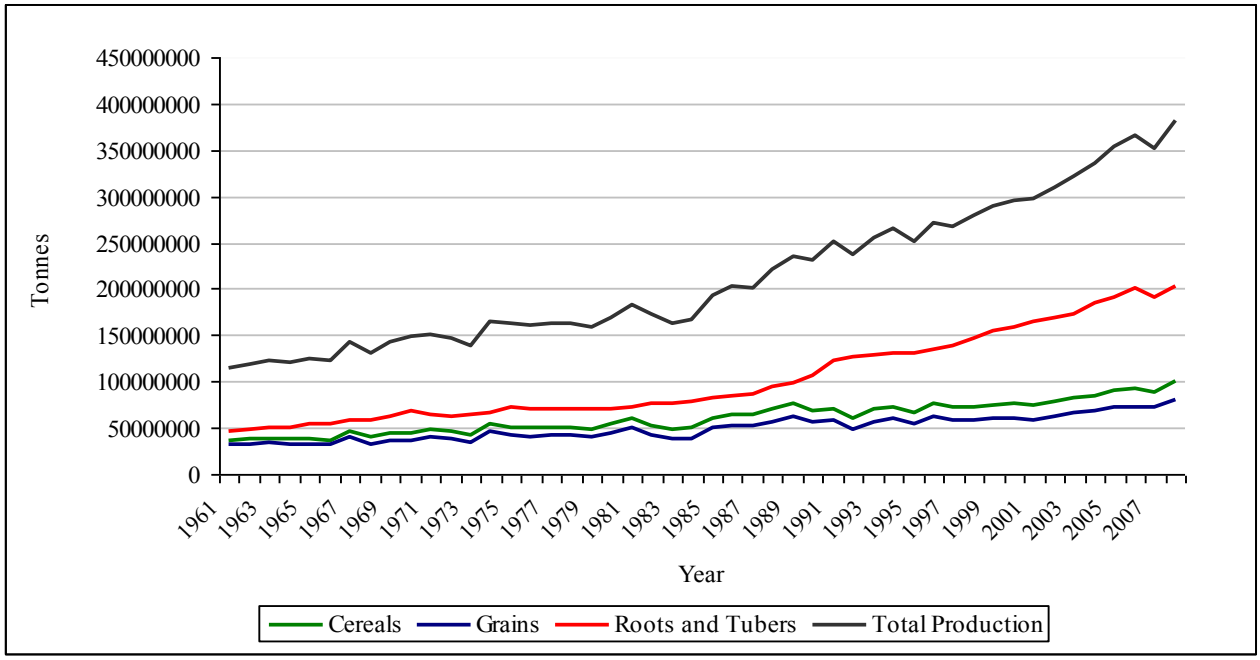


Source: Author's compilation based on FAOSTAT data (FAOSTAT, 2010)

The diet of sub-Saharan Africans has remained unchanged since the 1960s and it mainly consists of grains, cereals, roots and tubers. Cereals account for 46% of the sub-Saharan African diet while roots and tubers account for 20% (Hine and Pretty, 2008; USAD, 2008). The food supply of sub-Saharan Africa comprises three components: domestic food production, food imports and food aid. Figure 5.5 provides a graphical representation of the first component of food supply in sub-Saharan Africa and depicts

the trends in the production of cereals, grains and roots and tubers between 1961 and 2008. It is evident from Figure 5.5 that sub-Saharan Africa's domestic production of its main food staples has increased between 1961 and 2008. Total production, which is the sum of cereals, grains and roots and tubers production, has more than tripled during this period.

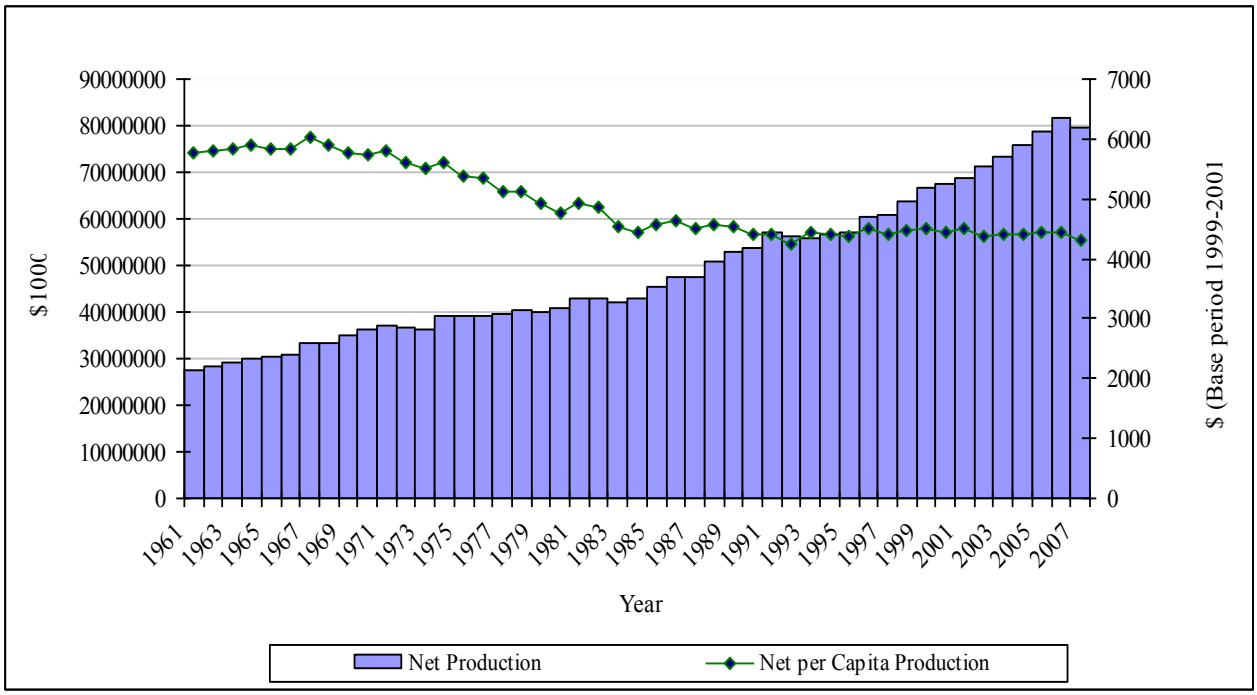
Figure 5.5: Cereals, Grains and Roots and Tubers Production in Sub-Saharan Africa, 1961-2008 (Tonnes)



Source: Author's compilation based on FAOSTAT data (FAOSTAT, 2010)

However, when analysing the region's per capita food production, this upward trend in food production is no longer as impressive. Figure 5.6 shows the trends in net food production and plots the per capita food production for comparative purposes. The net production of food has increased significantly between 1961 and 2007, but it is a different scenario with the net per capita food production. It is clear that sub-Saharan Africa's net food production has not kept pace with its population growth, since net per capita food production shows a downward trend between 1961 and 2007. Net food production per capita fell by $1441 between 1961 and 2007, which highlights how the availability of food in sub-Saharan Africa has diminished since the 1960s.

Figure 5.6: Net Food Production ($000) and Net per Capita Food Production ($) in Sub-Saharan Africa, 1961-2008



Source: Author's compilation based on FAOSTAT data (FAOSTAT, 2010)

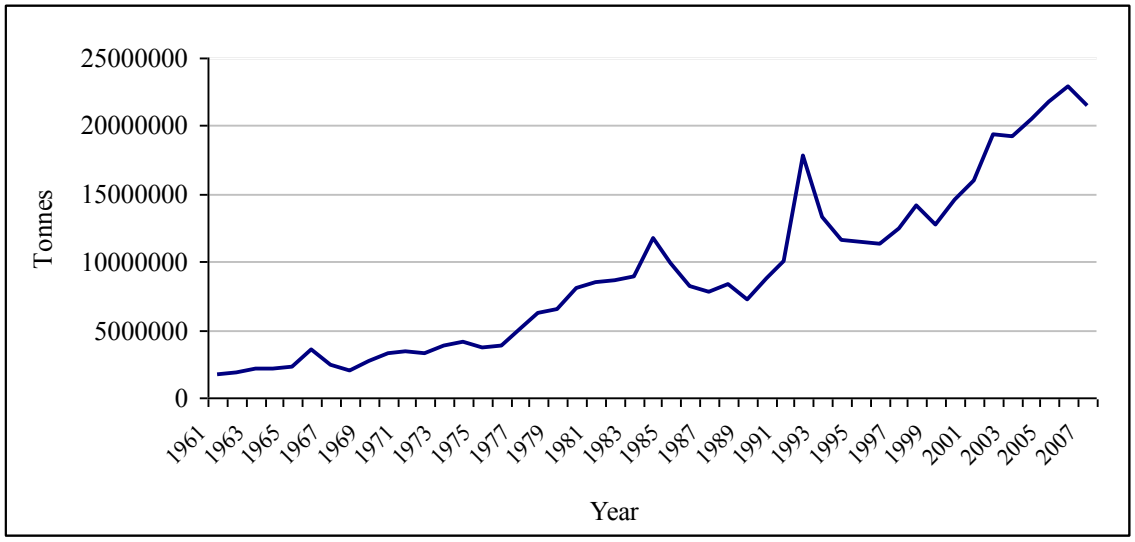
Mandivamba Rukuni (2002) stresses that, given the current population and income growth in sub-Saharan Africa, food supplies need to grow by up to 5% annually in order to meet the region's food security requirements. However, this is an onerous task for sub-Saharan Africa, particularly when considering past trends. The region has been increasingly dependent on food imports, with 16% of sub-Saharan Africa's food supply comprising food imports in the 1990s. This increased to approximately 22% between 2000 and 2006.

The region's heavy dependence on food imports puts a major strain on its balance of payments, because sub-Saharan Africa's share of agricultural exports in world trade has declined to approximately 2% since the 1960s (Adesine, 2009; Kidane et al., 2006). This poor export performance has serious implications for sub-Saharan Africa's food security situation as the availability of foreign exchange to purchase food imports has decreased since the 1960s and the high international commodity prices, along with the volatility of these prices, further challenges the region's ability to sustain these food imports (Rukuni, 2002).

Sub-Saharan Africa's increasing dependence on food imports is evident in Figure 5.7, which plots the region's cereal imports between 1961 and 2007. It is clear that cereal

imports have increased considerably between 1961 and 2007, despite a slight decline between 1984 and 1989 and between 1992 and 1996. The region's cereal imports increased dramatically between 1999 and 2006. The upward trend in cereal imports further indicates the region's failure to produce sufficient food for its growing population.

Figure 5.7: Cereal Imports in Sub-Saharan Africa, 1961-2007 (Tonnes)



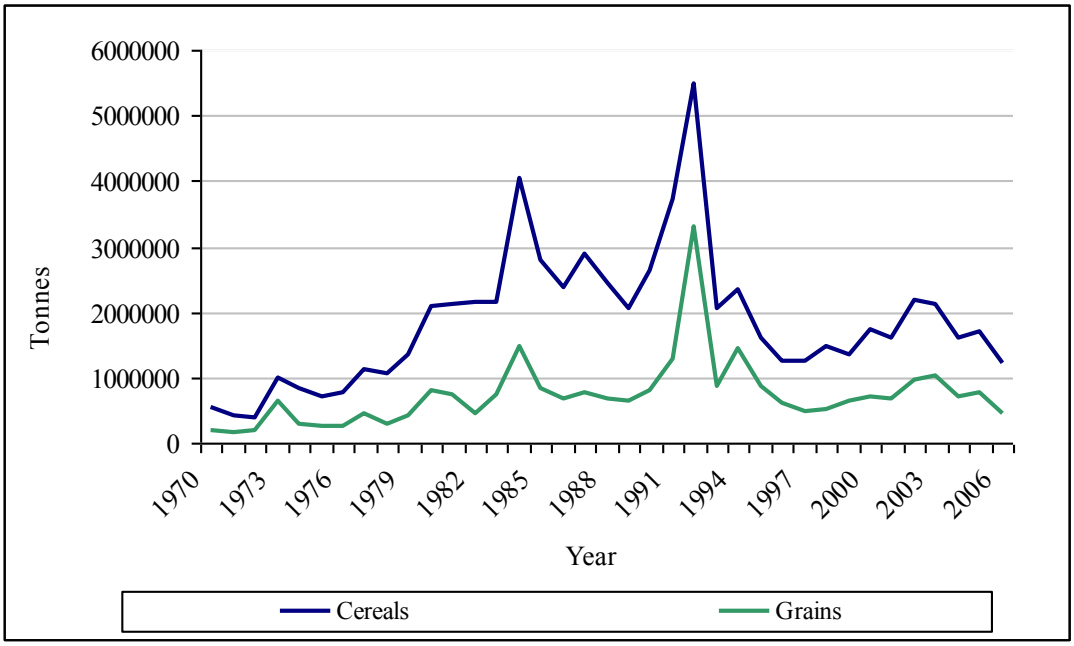
Source: Author's compilation based on FAOSTAT data (FAOSTAT, 2010)

The remainder of sub-Saharan Africa's food supply comprises food aid. This has helped to increase an inadequate food supply. Food aid (which was originally distributed through food aid programmes) increased significantly, from an estimated 2-3% of the food supply in the 1970s to approximately 10% in the 1980s. The early 1990s were characterised by further increases in food aid, which constituted approximately 30% of the food supply. Therefore, the level of food aid in the region in the early 1990s almost matched the level of food being imported. Thereafter, food aid in sub-Saharan Africa began to decline, reaching approximately 18% of the food supply in 2006.

The importance of food aid (and food aid programmes) in sub-Saharan Africa appears to have waned. Currently, food aid in sub-Saharan Africa is provided in response to food emergencies (Kidane et al., 2006; USDA, 2008). Figure 5.8 illustrates the food aid provided to sub-Saharan Africa between 1970 and 2006, in the form of cereals and grains. The cereals and grains aid provided to the region have followed relatively similar trends over the period reviewed. Sub-Saharan Africa's food aid requirement was at its highest in 1992, where food aid almost equalled food imports. Figure 5.8 shows that food

aid has subsequently declined considerably; however, food aid of both cereals and grains was higher in 2006 than in 1970. This provides further evidence that sub-Saharan Africa is still not self-sufficient in terms of producing its own food.

Figure 5.8: Food Aid (Cereals and Grains) to Sub-Saharan Africa, 1970-2006
(Tonnes)



Source: Author's compilation based on FAOSTAT data (FAOSTAT, 2010)

5.2.2. Food Accessibility

Further to food availability and food production, access to food is a vital component in ensuring food security in sub-Saharan Africa. According to Sen's (1981) entitlement approach to food security, access to food results as a combination of factors, such as: individuals' assets, their own produce and the selling thereof, networks and markets, labour and skills. When the combination of these factors is absent, or the factors are in short supply, people are incapable of purchasing the minimum daily food requirements, thus resulting in food insecurity. Access to food is a micro-economic and social concern rather than a macroeconomic focus and can be examined by looking at four main factors, namely economic, physical, political and socio-economic aspects.

5.2.2.1. Economic Access

Economic access to food at national level is determined by a country's ability to acquire sufficient foreign exchange (from exports) to import a satisfactory level of food to sustain its population's dietary requirements. However, sub-Saharan Africa has displayed a poor export performance for a number of decades. The region has long been characterised by its trade deficit and its diminishing share in world merchandise trade, which fell from 3.7% in 1980 to 1.5% in 2002. Sub-Saharan Africa's heavy dependence on the export of primary commodities is largely responsible for the region's plight, as sub-Saharan African economies are subjected to volatile primary commodity prices and falling terms of trade. This results in unstable foreign exchange earnings, which are needed to purchase food imports (UNCTAD, 2003; Kidane et al., 2006).

At household level, economic access refers to an individual's ability to generate adequate income and various other entitlements to purchase food to make up a satisfactory diet that meets an acceptable level of daily calories. The high prevalence of poverty in sub-Saharan Africa is, however, a hindrance to ensuring adequate economic access to food. Table 5.2 summarises sub-Saharan Africa's poverty indicators for specific years between 1981 and 2005. Since 1981, the number of people living below the poverty line (less than US$1.25 per day) has increased by more than 170 million people. However, the percentage of the population living below the poverty line has decreased by 2.46% between 1981 and 2005. This decline is rather modest considering that half of the sub-Saharan African population is still living below the poverty line. Furthermore, by the end of the period reviewed, sub-Saharan Africa had the highest population percentage living below the poverty line relative to other developing regions, such as the Middle East and North Africa, Latin America and the Caribbean, South Asia, and East Asia and the Pacific (World Bank, 2010a).

Table 5.2: Selected Poverty Indicators for Sub-Saharan Africa (1981-2005)

Year	Population (Millions)	Number of Poor People (Millions)	% of Population Living Below the Poverty Line (US$1.25/day)
1981	397.7	212.25	53.37
1984	433.76	242.21	55.84
1987	473.51	258.02	54.49
1990	516.69	297.51	57.58
1993	558.05	317.36	56.87
1996	604.91	355.57	58.78
1999	655.57	382.66	58.37
2002	708.27	389.76	55.03
2005	762.88	388.38	50.91

Source: Author's compilation based on World Bank data (World Bank, 2010a)

The high incidence of poverty severely impacts on food security. The low income received by poverty-stricken people results in reduced purchasing power parity, hence an inability to purchase basic foods necessary for an adequate and healthy diet. Agricultural production is also affected by high poverty levels, as the low incomes of farmers prevents them from purchasing vital inputs (such as fertilizers and seeds) necessary to enhance crop yields (in conventional agricultural systems) and thus improve agricultural output, which positively affects food security. This results in a perpetuating cycle in which farmers cannot trade their surplus or shortage. As such, food insecurity is "both a cause and a result of extreme poverty" (McHarry et al., 2002: 4).

5.2.2.2. Physical Access

At national level, physical access to food is threatened by a number of challenges (both geographical and natural) that hinder trade. Many sub-Saharan African countries are landlocked and therefore do not have direct access to ports. Consequently, the cost of transporting imports and exports is considerably high. These high transport costs are comparable to the high taxes on exports and the tariffs imposed on imports that sub-Saharan Africa faces. The price of food products therefore increases to cover these transport costs. This results in a high percentage of the region's population being unable to afford food (Kidane et al., 2006). Schnepf (2008) points out that the high price of food

is a particularly serious problem for poor countries that depend on food imports. High prices fuel food price inflation, which adversely affects lower-income households and their buying power. In addition, Wodon and Zaman (2010) found that increasing food prices are inclined to induce even higher poverty levels in sub-Saharan Africa, because the negative cost to consumers is greater than the benefits to producers.

At household level, physical access to food is linked to the level of infrastructure pertaining to markets, roads and transportation and storage and handling facilities. Adequate infrastructure is a vital component of agricultural development in sub-Saharan Africa. Insufficient infrastructure inhibits the agricultural sector's productivity because it leads to inadequate research and development, investment and technological advances, disconnected domestic markets, poor roads and inefficient telecommunications and energy resources. Significantly, markets cannot develop without sufficient investment in infrastructure and an efficient transport system (Rosegrant et al., 2005; Sanchez et al., 2005).

A link exists between poor infrastructure and food insecurity. This is because the lack of access to roads contributes to ineffective markets in that food often does not reach the desired destination or individuals are unable to reach these markets to purchase food. In the event of food reaching food insecure households, it is invariably more expensive (due to the high transportation costs) than many food insecure households can afford (Rosegrant et al., 2005; Sanchez et al., 2005).

5.2.2.3. Political Factors Affecting Food Access

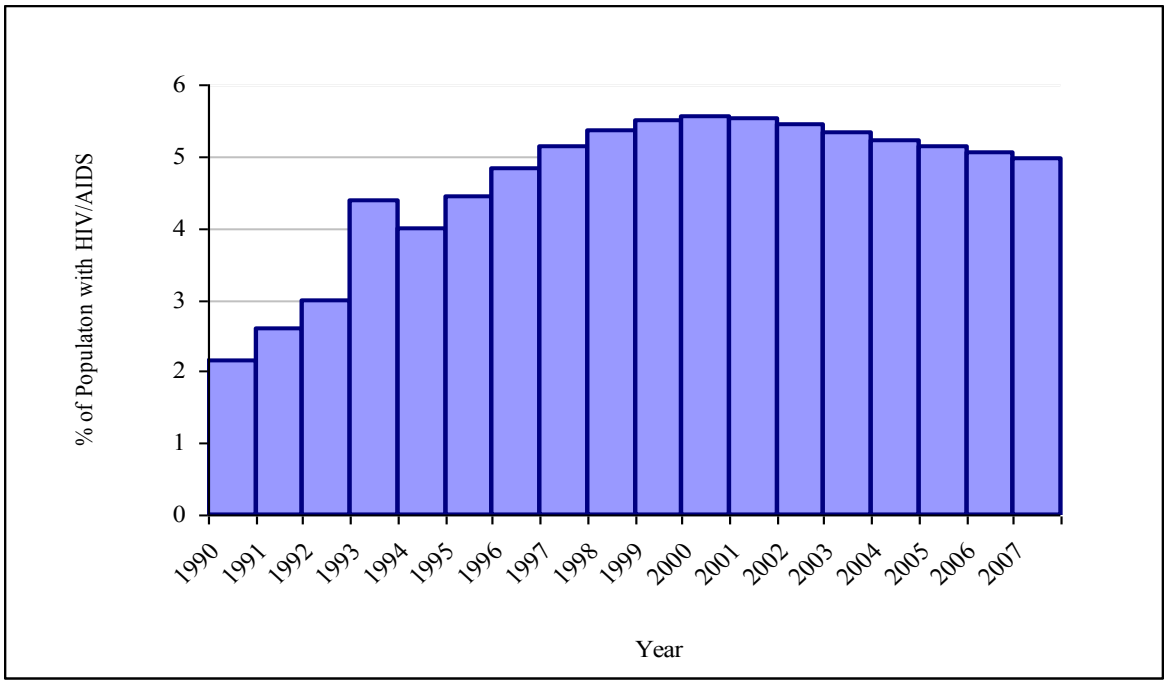
Food insecurity is frequently associated with conflict, as both a cause and effect. The presence of conflict in poor developing countries severely affects food security, as infrastructure, transport systems, markets and employment are destabilised by it and an environment of economic volatility is created. The quality of governance deteriorates when conflict occurs as corruption increases during turbulent times. Accordingly, the implementation of government development strategies and projects becomes more difficult, resulting in an increase in food insecurity. In addition, due to the collapse of infrastructure in times of conflict, it becomes difficult to access sufficient food supplies, at both national and household level (Messer et al., 2001; McHarry et al., 2002; Clover, 2003).

A number of sub-Saharan African countries have experienced food deprivation during conflict. Rebel factions often use food as a political tool, depriving households of food to force government to submit to their demands or the people to support them. In addition, food aid is often denied entry into countries experiencing conflict and this worsens the food security situation (Messer and Cohen, 2004). Benson (2004) adds that conflict in Angola, Burundi, Côte d'Ivoire, the Democratic Republic of the Congo, Guinea, Liberia, Sierra Leone, Sudan and Uganda directly resulted in food emergencies. The long-term effects of conflict on food security are thus detrimental, as infrastructure, a vital component of agricultural development, is damaged. The damage to the environment caused by conflict is also far-reaching, as food production, the health of the population and natural resources are negatively affected.

5.2.2.4. Socio-Economic Factors Affecting Food Access

Many socio-economic factors affect individuals' access to food in sub-Saharan Africa. Some of these socio-economic factors include the high prevalence of HIV/AIDS and gender inequality (UNCTAD, 2003; Rosegrant et al., 2005). Many sub-Saharan African people suffer from devastating diseases, such as HIV/AIDS, malaria and tuberculosis. Specifically, sub-Saharan Africa has one of the most severe incidences of HIV/AIDS in the world and this disease is the main cause of adult deaths (Clover, 2003; Nair, 2008). Figure 5.9 illustrates the prevalence of HIV/AIDS in sub-Saharan Africa as a percentage of the population, across the age group 15-49 years. It is evident that the prevalence of HIV/AIDS in sub-Saharan Africa has increased significantly, from 2.136% in 1990 to 4.954% in 2007.

Figure 5.9: Prevalence of HIV/AIDS in Sub-Saharan Africa, 1990-2007 (% of Population, Ages 15-49)



Source: Author's compilation based on World Bank data (World Bank, 2010b)

The HIV/AIDS pandemic has a significant impact on food insecurity because the HIV/AIDS virus is most prevalent among people between 15 and 50 years of age and this group of the population accounts for a large majority of the workforce. According to Topouzis (1999: 9), the debilitating effect of HIV/AIDS on the productivity of individuals and households is experienced through three channels: the quality and quantity of labour, the level of income and expenditure, and the „dependency ratio'.

HIV/AIDS significantly affects the quality and quantity of labour, as a large number of people are unable to work or are no longer capable of working at maximum capacity. HIV/AIDS therefore reduces both the supply of labour and the productivity of labour and thus affects production levels. It follows that income levels and expenditures are also affected by HIV/AIDS. The inability of HIV/AIDS-infected people to work (and at optimal efficiency) has a distinctly negative impact on the level of households' income, due to either a loss of income or a reduction in income. In addition, HIV/AIDS sufferers incur high medical expenses, thus further straining households' income and individuals' capacity to purchase adequate food. Haddad and Gillespie (2001) highlight that HIV/AIDS-infected people need almost 50% more protein and a 15% higher calorie intake than healthy, uninfected people, as they need to strengthen their immune systems.

The dependency ratio refers to the number of dependants in a household relative to the number of family members who are fit and able to work. The prevalence of HIV/AIDS increases the number of people dependent on productive family members. This puts strain on the entire household, as the household income has to be distributed among a great number of people who are unable to work. In addition, households often take on the burden of orphaned children as their parents have died due to HIV/AIDS; this further exhausts the household income and promotes food insecurity (Topouzis, 1999).

The high level of HIV/AIDS infection adversely affects the sub-Saharan African agricultural sector because the quantity and quality of food production declines. A reduction in cultivated land also occurs due to diminished labour availability and productivity. The HIV/AIDS virus also results in agricultural knowledge and skills not being passed on to younger generations. In addition, since women account for a large proportion of the agricultural labour force, the agricultural sector could suffer an almost 60% reduction in output because women are required to care for infected household members and may be unable to work (Clover, 2003; De Klerk et al., 2004; Rosegrant et al., 2005; Nair, 2008).

Gender inequality also plays an important role in the accessibility of food in sub-Saharan Africa. Hine and Pretty (2008) point out that income and food are distributed unequally amongst men and women, with men receiving more. Despite that women account for the majority of the labour force in the agricultural sector, they are often prohibited from controlling the household income. More pressingly, it has been reported that men-controlled household incomes apportion less money to purchasing food than women-controlled household incomes (Hine and Pretty, 2008). Gladwin et al. (2001: 179) point out "women are the food producers in sub-Saharan Africa". However, many women farmers in sub-Saharan Africa face a number of constraints, such as lack of access to land, finance and capital, fertilizers and seed, and do not receive adequate training because they are uneducated.

Gender inequality and food insecurity are thus linked. Some schools of thought deem gender to be an "invisible factor", despite the fact that various constraints are related to gender. These constraints decrease women's agricultural productivity and thus impact on food insecurity (Gladwin et al., 2001: 179). However, the link between gender issues and

food insecurity is seldom recognised and this affects the food security of women as well as their livelihoods.

5.3. A Partial Potential Solution to Sub-Saharan Africa's Food Insecurity

Sub-Saharan Africa's food security problem is not merely a food availability problem, but also an access to food problem. Despite agriculture's large contribution to the GDP in many countries in the region, sub-Saharan Africa's food production per capita has fallen since the 1960s and the number of undernourished people has increased by 20% since 1990 (Hine and Pretty, 2008). Thus, food insecurity is not only a serious problem in sub-Saharan Africa, but also an escalating one. It has been suggested that the potential answer to combating this problem lies in altering the way in which food is produced in the region (Clover, 2003; El-Hage Scialabba, 2007; UNCTAD, 2009).

Because sub-Saharan Africa has a comparative advantage in terms of its land and natural resources, uses minimal fertilizers and chemicals, and has an agricultural sector comprising mostly smallholder farmers, it has increasingly been suggested that a sustainable agricultural production system is an essential component in remedying the region's food insecurity (Pretty et al., 1996; Wynen, 1998; Rosegrant et al., 2005; Kidane et al., 2006; Hine and Pretty, 2008; ECA, 2008; UNCTAD, 2009). Sustainable agriculture can broadly be defined as:

> Capable of maintaining its productivity and usefulness to society over the long run…it must be environmentally-sound, resource-conserving, economically viable and socially supportive, [and] commercially competitive (Ikerd, 1993: 30).

Sustainability within agricultural systems has adopted various terms, such as: biodynamic, ecoagriculture, permaculture, ecological, environmentally-friendly, organic and low-input systems (Hine and Pretty, 2008). This study specifically focuses on the implications that organic agriculture has for food security in sub-Saharan Africa and its potential to address the host of problems the region faces because of its current food insecurity.

5.3.1. Organic Agriculture and Food Security

A number of scholars have recently recognised the potential of organic farming to tackle the complexity of food insecurity in developing countries, at both an availability and an access level (Wynen, 1998; Boor, 2003; Hine and Pretty, 2006; Parrot et al., 2006; Badgley et al., 2007; Halberg et al., 2007; Kilcher, 2007; El-Hage Scialabba, 2007; Rundgren, 2008). However, in the wake of the growing food security problem worldwide, there is still little empirical evidence to support organic agriculture's potential to increase food security. This lack of empirical evidence is largely due to a lack of statistical data, particularly from Africa, because much organic farming is non-certified and thus organic produce and growth are not correctly represented in available data. The potential impact of organic agriculture on food availability and food access in sub-Saharan Africa will be discussed further.

5.3.1.1. Organic Agriculture's Potential Impact on Food Availability

Despite the currently lacking empirical evidence to establish the impact of organic agriculture on food security, there has been an increase in the literature and case studies examining its economic and socio-economic potential as well as the implications on food security in sub-Saharan Africa and other developing regions. The most prominent argument in support of organic agriculture as a means to improve food security is its potential to increase yields. However, some academics dispute this, based on case studies carried out in developed countries with high-input agricultural systems. However, simulated studies by Badgley et al. (2007) and Halberg et al. (2007) found that yields potentially increase when converting from conventional agricultural systems to organic systems. Importantly, the increase in yields depends on the conventional system that was in place prior to converting to organic farming.

It is estimated that if Africa converts to organic farming, its agricultural productivity will increase by 56% by the year 2030 (El-Hage Scialabba, 2007). Table 5.3 shows estimated yield ratios of organic farming to non-organic farming for selected foods and selected sub-Saharan African countries. The yield ratio is described as the "ratio of organic to non-organic production" (Badgley et al., 2007: 87); for example, a yield ratio of 1.3 for maize in Benin signifies that the organic maize yields are 130% greater than the conventional maize yield in Benin. From Table 5.3, it is evident that the estimated yield

ratios for organic farming in the selected sub-Saharan African countries range from 130% to 583% higher than conventional yields. Although these are only simulated results, they indicate organic agriculture's potential to significantly increase yields across a broad spectrum of foods in sub-Saharan Africa.

Table 5.3: Estimated Yield Ratios of Organic Production to Non-Intensive Agricultural Production for Selected Sub-Saharan African Countries

Crop or Product	Yield ratio	Country
Maize	1.3	Benin
Maize	3.49	Kenya
Millet	1.73	Ethiopia
Rice	3.09	Gambia
Sorghum	1.50	Ethiopia
Sorghum	5.67	Mali
Cassava	1.75	Ghana
Sweet potatoes	5.83	Ethiopia
Peanuts	1.64	Senegal
Vegetables	1.48	Malawi
Vegetables	2.0	Kenya
Bananas/plantains	4.0	Uganda
Milk	1.3	Uganda
Milk	4.57	Tanzania

Source: Badgley et al. (2007, cited in El-Hage Scialabba, 2007)

A similar study by Halberg et al. (2007) uses the IMPACT model, which simulates the production of food, trade and food security at a regional and global level. The study compared the large-scale conversion to organic farming of both high-input agricultural systems and low-input farming systems. The results mirrored those of Badgley et al.'s (2007) study, where the conversion of high-input systems was expected to generate a decline of 15% to 35% in yields, given that the prices of conventional and organic produce were kept the same in the model. On the other hand, in the low-input farming areas (such as sub-Saharan Africa), the results indicate that the potential increase in yields after conversion can be up to 120%, given the same parameters about price. These models further indicate that organic systems have the potential to produce sufficient food at a global per capita level, given the current global population and that the daily per capita calorie intake ranges between 2640 and 4380 calories (Badgley et al., 2007; Halberg et al., 2007). Significantly, the current daily calorie intake in the sub-Saharan African region is lower than 2640 calories.

Parrot and Marsden (2002) highlight numerous cases of developing countries that have experienced increases in yields after converting to organic agricultural methods. For example, maize and wheat yields in Brazil increased between 20% and 250% due to the use of green manure and ground cover crops. Nepal experienced a 175% increase in yields after employing an agro-ecological management approach. Research in Tigray, Ethiopia, was carried out on crops (including barley, wheat and maize) that were firstly, organically composted; secondly, artificially fertilized; and thirdly, untreated. The study revealed that the organically composted crops had yields that were three to five times higher than those of the untreated crops. Furthermore, the yields of the organically composted crops fared better than those of the artificially fertilized crops. Table 5.4 compares the yields of the organically composted crops and the artificially fertilized crops. It should be noted that only half the recommended amount of organic compost was used in these trials due to a shortage. This indicates that, although yields of crops under organic management were higher than those of artificially fertilized crops, the maximum potential of the organic system was not achieved. When applying the correct quantities of compost, yields may increase substantially.

Table 5.4: Yield Comparisons of Selected Organically Composted Crops and Artificially Fertilized Crops

Crop	Yields (%)	
	Organically Composted	**Artificially Fertilized**
Barley	+ 9	- 0.5
Wheat	+ 20	- 0.2
Maize	+ 7	- 21

Source: Adapted from Parrot and Marsden (2002)

The results of these simulated models and case studies indicate that organic agriculture has the potential to improve food security in low-input areas such as sub-Saharan Africa through increasing yields and production. However, increasing yields and production only focuses on the food availability aspect of food security. Access to food is equally important in the food security debate.

5.3.1.2. Organic Agriculture's Potential Impact on Access to Food

It has been argued that organic systems have the potential to improve access to food through various means, which are often interlinked and overlap each other. These means include: developing productive resources, ownership and empowerment; improving income and livelihoods; increasing knowledge; reducing poverty and developing rural areas (El-Hage Scialabba, 2007; Sligh and Christman, 2007).

The essence of organic agriculture is its efficient use of the local environment, natural resources and adapted technologies (Kilcher, 2007). Access to productive resources, such as land, water is pertinent to the effective functioning of an organic system, since external inputs of any form are prohibited. In order to maximise the productivity of natural resources and adapted technologies necessitates the use of scientific as well as local knowledge. Examples of such technologies and knowledge areas are: efficient soil fertility management, pest and disease control through the use of natural elements, land and water management, the use of local seed varieties, crop rotation and multi-cropping. Combining these technologies and practices, specifically in developing regions, potentially plays an important role in increasing the yields of organic systems. This is because the resilience of crops to stress caused by droughts, flooding and plagues is considerably increased when they are grown organically. Organic management practices such as using local seed varieties, multi-cropping, crop rotation and improving soil fertility not only have the potential to increase yields, but also to stabilise and sustain yields over the long term (Wynen, 1998; Buntzel-Cano et al., 2005; Grenz and Sauerborn, 2007; El-Hage Scialabba, 2007; Hine and Pretty, 2008).

Using organic methods and being able to access productive resources can improve food security, particularly in regions such as sub-Saharan Africa. Improving sub-Saharan Africa's soil fertility and quality will enhance the crop yields by an estimated two to four times that of current yields (UNCTAD, 2009). Furthermore, organic methods support food self-sufficiency and can increase farmers' income. In sub-Saharan Africa, for every 10% increase in crop yield, the number of income-poor people declines by an average 7.2% (Byerlee and Alex, 2005). Further, an improvement in household income increases a household's access to food.

Household incomes are further improved under organic methods because the prohibited use of external inputs makes organic farming a low-cost and low-input agricultural option (Sligh and Christman, 2007). This is particularly attractive to smallholder farmers, who comprise 50% of sub-Saharan Africa's food insecure population (Nair, 2008). Smallholder farmers generally lack access to sufficient fertilizers, pesticides, up-to-date hybrid seeds and adequate financial resources to operate lucrative conventional farms and therefore battle to be food self-sufficient. As a result, many of these farmers practise traditional subsistence farming, using little or no synthetic inputs. While their methods mirror those of organic systems, they have poor yields to show for their efforts (Azadi and Ho, 2010).

Organic farming therefore presents smallholder farmers with an opportunity to successfully and cost effectively farm, despite a lack of access to synthetic inputs and financial resources. El-Hage Scialabba (2007) adds that input costs are inclined to decrease by up to 40% under organic systems. This lowers the cost of farming and increases the profit margin for farmers. The low-cost nature of organic farming also reduces the debt requirements of farmers, as fertilizers and pesticides are not required to optimise yields.

The crop rotation and multi-cropping methods of organic farming promote crop diversification, since a variety of crops is required to create a sustainable and a biologically diverse nutrient cycle (El-Hage Scialabba, 2002; Edwards, 2005). An organic farm also produces more crops than a conventional farm of the same size and in the same area (Kilcher, 2007). Using organic systems can therefore raise the nutritional intake among rural smallholder farmers in sub-Saharan Africa, as these households can easily farm more than one or two traditional staple food crops and benefit from increased yields.

Crop diversification also presents sub-Saharan Africa with the opportunity to break away from its heavy reliance on traditional agricultural crops and to move towards non-traditional crops. Breaking into non-traditional crops provides the region with prospects to enter profitable local and international markets through organic certification, which will further raise household income levels and create economic sustainability (Sligh and Christman, 2007; El-Hage Scialabba, 2007; Vaarst, 2010).

In addition to organic agriculture's potential to raise farmers' income, it has spillover effects in that it improves the incomes and livelihoods of those who depend on agriculture but who are not landowners or farmers (for instance, labourers). Organic farming is a labour-intensive agricultural approach that largely depends on human capital to carry out various tasks; for example, protecting the soil from erosion, controlling weeds, rotating crops, harvesting crops and applying nutrients to the soil. FAO (2007a) highlights that organic systems require approximately 30% more labour per hectare than conventional agricultural systems. This therefore presents sub-Saharan Africa with an opportunity to decrease unemployment and poverty levels and hence break free from poverty traps, which are common in countries or regions that are heavily dependent on primary commodities (Buntzel-Cano et al., 2005; Giovannucci, 2005).

Organic agriculture has the potential to reduce unemployment, specifically in sub-Saharan Africa, where 65% of the population is employed in the agricultural sector. The sector thus plays a central role in the livelihoods of the majority of the population, as it is their primary source of household income (Bach and Pinstrup-Andersen, 2008). The employment opportunities of organic agriculture for rural communities and landless people in sub-Saharan Africa strengthen food security, as improving farm labourers' incomes results in increased physical and economic access to food. In addition, organic agriculture requires labour all year round, whereas conventional farming typically requires seasonal labour due to the practise of mono-cropping. Thus, organic farming necessitates a constant demand for labour. This creates a stable income supply for labourers and reduces the migration of people to urban areas in search of employment opportunities (Wynen, 1998).

Organic farming's labour requirements are favourable towards women, as a number of organic crops (for instance tea and spices) require delicate care during the harvesting, cleaning and sorting phase. Women are naturally better suited to such activities; hence, there is high demand for women labourers, which results in a stable income supply for women. When provided with the chance to obtain knowledge and skills in organic methods, women have demonstrated great ability to efficiently utilise land and labour resources, which enhances the quantity and quality of food produced (Edwards, 2005; Bolwig and Odeke, 2007; Sligh and Christman, 2007). When women's incomes improve, they experience improved access to food. This is particularly significant for women in

sub-Saharan African, as the distribution of income and food is more favourable towards men (Hine and Pretty, 2008).

The cost of labour in organic systems may be higher than in conventional farming because it is labour intensive. However, other inputs are minimal and yields are expected to increase, particularly in low-input areas such as sub-Saharan Africa. This means higher income levels are attained than with the traditional, low-input farming currently practised in the region. This increase in income offsets the high cost of labour, making organic agriculture beneficial for both farmers and the surrounding community, provided that the marginal product of labour is higher than the opportunity cost of labour. Since organic systems are reliant on labour, investments in human capital are necessary. Such investments tend to have spillover effects for off-farm communities in terms of improving incomes and bettering food security (Giovannucci, 2005).

Overall, the literature shows that organic farming methods in sub-Saharan Africa have the potential to increase yields, lower the cost of farming, minimise debt requirements, reduce unemployment and increase household income levels. This results in improved access to food from economic, physical and socio-economic levels, while minimising any adverse effects on the environment. Edwards (2005) highlights a number of examples in various sub-Saharan African countries where organic agriculture has improved food security:

- Environmental farming by small-scale farmers in Tigray, Ethiopia, has improved food security in the area, as these farmers have secured increased yields by using compost, which enhanced the resilience of crops during droughts.
- In Uganda, farmers have made use of green manures, such as *Canavalia*, *Crotalaria, Mucuna* and *Tephrosia* (part of the legume family), to control banana root disease. This ensures fertility and stable yields of the organic banana crops and thus maintains food security. These leguminous plants also keep weeds at bay and are useful for animal fodder.
- The South African „Fowls for Africa' programme used four local chicken breeds renowned for their resilience and egg production. Under this programme, chickens were reared using a free range approach and organic feed. The Fowls for Africa programme succeeded in improving food security in rural areas, as the chickens provided both food and income (from selling the chickens and eggs).

- A Tanzanian farmer improved his household's food security and income through converting to organic cashew nut farming. His crop increased from 1300kg per annum to 2600kg per annum after conversion. Furthermore, the price of organic cashew nuts is somewhat higher than conventional cashew nuts, with organic cashew nuts fetching 700 Tanzanian shillings per kilogram as opposed to 300 Tanzanian shillings per kilogram for conventional cashew nuts. This results in a substantial increase in income.
- Benin has developed and established its organic cotton industry. It has contributed to improving food security, as less income is spent on synthetic inputs and chemicals. Further, soil fertility has been enhanced.

5.4. Conclusion

Sub-Saharan Africa's high food insecurity statistics are alarming. The region has the highest prevalence of food insecurity in the world, due to a lack of available food and inadequate access to food. Sub-Saharan Africa's calorie intake per day is below the minimum set out by FAO. The people in sub-Saharan Africa also have inadequate access to food at economic, physical, political and socio-economic levels. Furthermore, the region's agricultural sector has performed poorly for a number of decades and agricultural production cannot keep pace with the region's rapidly increasing population. It is therefore suggested that sub-Saharan Africa move towards adopting a sustainable agricultural system (organic agriculture) in order to begin addressing the growing food security problem in the region.

Organic agriculture has the potential to improve food security through increasing the availability of food and improving access to food. The increase in the availability of food is attributed to the increased yields that result from organic production. In addition, organic farming has the potential to stabilise and sustain yields over the long term. Hypothetical models have estimated that organic agriculture could increase the global food supply on a per capita level as well as the calorie consumption per person. Further, organic agriculture has the potential to improve access to food, especially among rural communities and smallholder farmers, as higher yields, reduced input costs and lower debt requirements boost income levels. This, by extension, improves smallholder farmers' access to food at household level. Organic farming specifically raises income levels for rural communities because it is labour intensive. This means that there is a

constant demand for labour. Consequently, poverty can be reduced. Therefore, organic agriculture can be seen as an attractive solution to increasing the availability of food and access to food, so improving food security in sub-Saharan Africa.

CHAPTER 6: CASE STUDIES OF SUCCESSFUL ORGANIC AGRICULTURAL SECTORS IN SUB-SAHARAN AFRICA

6.1. Introduction

Despite sub-Saharan Africa's small organic agricultural sector, there are some examples of relatively successful organic agricultural sectors. These more established and successful organic agricultural sectors are primarily found in countries situated in Southern and Eastern Africa. The Southern and East African regions account for approximately 75% of Africa's certified organic land (Hine and Pretty, 2006; Lustig and Rundgren, 2007). Kenya, South Africa, Tanzania, Uganda and Zambia have strong organic agricultural sectors relative to those of other sub-Saharan African countries.

The success of organic sectors in sub-Saharan Africa varies greatly across countries. Parrot and van Elzakker (2003) indicate that some countries' certified organic agricultural sectors comprise a small number of large farms that focus on organic export markets. Examples of such countries are South Africa, Zambia and Kenya. The certified organic sectors in other countries (such as Uganda and Tanzania) comprise a number of smallholder farmers who are managed and supervised by commercial exporters, who then export the organic produce. The focus of this chapter is on the organic agricultural sectors of Uganda, Kenya and Tanzania. These countries have engaged in impressive export diversification efforts recently, where "in 2009 the top three products accounted for less than 40 percent of total exports" (Blanke et al., 2011: 16). These diversification levels are above those of most sub-Saharan African countries, with the organic agriculture sectors in the three countries are well ahead of most sub-Saharan African countries.

This chapter analyses various successful organic agricultural sectors within sub-Saharan Africa. Firstly, it discusses Uganda's organic agricultural sector, its development and success. Secondly, it examines Kenya's organic agricultural sector. Lastly, it discusses the organic agricultural sectors of Tanzania and Kenya. Each of the case studies addresses the origin of the sector, the development thereof, the major organic agricultural products, various projects, progress in achieving certification standards, government policies and challenges faced by each country's organic agricultural sector.

6.2. Uganda

Uganda is situated in East Africa and is bordered by Kenya, Tanzania, Sudan and the Democratic Republic of the Congo. Uganda, like many African countries, is heavily dependent on its agricultural sector, with 45% of its GDP being attributable to agriculture and 69% of the Ugandan population being employed in the agricultural sector. Uganda's agricultural sector comprises 4.5 million smallholder farmers and 80% of smallholder farms are an average size of two hectares (Tumushabe et al., 2007). According to Parrot and van Elzakker (2003), the average income per capita is $240.

Uganda's traditional agricultural products include coffee, cotton, tea and tobacco. The non-traditional agricultural products comprise floricultural and horticultural products as well as spices, fish, cereals and legumes. The agricultural sector's share of GDP is declining because of an overall decrease in agricultural productivity, rather than significant growth spurts in other economic sectors. The organic agricultural sector in Uganda, on the other hand, has displayed considerable growth in recent years (Tumushabe et al., 2007).

Organic agriculture in Uganda has grown since the late 1980s, while certified organic agriculture has developed and increased since 1994 (Taylor, 2006; Aigelsperger, 2007; Sligh and Christman, 2007). Uganda is the forerunner of organic agricultural production in Africa, as it has 182 000 hectares of certified organic agricultural land and approximately 40 000 certified organic farms (Lustig and Rundgren, 2002; Yussefi and Willer, 2007; Rundgren, 2008). Gibbon (2006) adds that Uganda has the most certified organic smallholder farmers in Africa. However, Uganda's organic agricultural land forms 1.46% of the country's total agricultural area. This is the highest ratio of organic agricultural land to total agricultural land on the African continent (Yussefi and Willer, 2007). Uganda's organic agricultural sector predominantly targets the export market and the EU and North America are currently Uganda's main export destinations (Tumushabe et al., 2006). The country's major certified organic products are coffee, cocoa, vanilla, avocadoes, cotton, bananas, pineapples, sesame seeds and dried fruit (Parrot and van Elzakker, 2003).

The value of Uganda's total exports in 2005 was US$655 million and agricultural exports accounted for 67% of this (Tumushabe et al., 2006). For the period 2004-2005, organic agricultural exports in Uganda accounted for approximately US$6.2 million of total

exports. This equates to just less than 1% of total exports (Gibbon, 2006). This figure is almost double that of the 2003-2004 period, namely US$3.7 million. Thus, to date, the organic sector in Uganda has experienced considerable growth of 38%. This growth has been ascribed to Uganda's significantly low use of artificial chemicals of less than 2% of overall inputs. Uganda uses the least amount of chemicals of all African countries. The average amount of chemicals used in Africa equates to nine kilograms per hectare. In comparison, the average amount of chemicals used in East African countries amounts to approximately 5% of overall inputs. Uganda is also said to have a comparative advantage in organic agricultural production because of its climate. The weather in the country significantly contributes to its success in organic agriculture (Tumushabe et al., 2006). In addition, Hine and Pretty (2006) point out that a large percentage of Uganda's agriculture is already organic by default due to the minimal use of chemical inputs. However, it is not certified as organic. Tumushabe et al. (2006) add that an estimated 85% of Ugandan farmers practise organic agriculture by default.

Uganda's first crops to be organically certified were traditional crops such as cotton, cocoa and coffee. These traditional crops continue to account for a large share of the certified organic sector, but the certification of non-traditional crops and high value crops (fresh fruit and vegetables, spices and vanilla) is increasingly taking place. By 2006, Uganda had 17 different certified organic food products. Table 6.1 tabulates Uganda's various organic products and the regions in which these products are grown. The number of certified organic exporters has also increased in recent years, from 11 certified exporters in 2003 to 15 in 2006 (Gibbon, 2006; Bolwig and Odeke, 2007; Tumushabe et al., 2007).

Table 6.1: Organic Agricultural Products Currently Exported from Uganda

Category	Type	Region
Fresh Fruit	Pineapple Passion Fruit Banana Pawpaw	Central Uganda Highlands
Fresh Vegetables	Avocado Matooke	Central Uganda Highlands
Dried Fruit	Pineapple Banana Mango Pawpaw	Central Uganda Northern Uganda
Dried Spices	Ginger Vanilla	Central Uganda Highlands Bundibudgyo
Coffee	Arabica Robusta	Highlands Central Uganda
Cocoa		Central Uganda Bundibudgyo
Cotton Lint		Northern Uganda Kasese
Sesame	African Mixed and White	Northern Uganda West Nile
Chillies	Bird's Eye	Northern Uganda Cotton Areas

Source: Taylor (2006)

Uganda has several certified organic projects. A number of these projects are headed by various institutes and non-profit organisations such as the Export Promotion of Organic Products from Africa (EPOPA), which was initiated by the Swedish International Development Agency (Sida), and the National Organic Agricultural Movement of Uganda (NOGAMU). These organisations play an important role in connecting farmers and international markets, communicating market information and purchasing local organic produce to export (Tumushabe et al., 2006). In 1994, Sida's (previously Swedecorp) organic cotton and sesame export project in Uganda merged and developed into a larger programme, EPOPA. Forss and Sterky (2000: 5) indicate that EPOPA's key objective is to "develop the export of organic products from Africa to increase and diversify exports, while at the same time exposing the agricultural and agro-industrial sectors to environmentally sound farming techniques".

Since EPOPA's inception, the programme has implemented seven organic projects. Five of these are based in Uganda. These projects comprise large groups of smallholder farmers and exporters, which manage the trading of the organic produce in various international markets. EPOPA and AgroEco (a Danish consulting firm) work closely together on the various projects in Uganda. They manage and subsidise group certification in the projects' initial phases, oversee the running of the projects, recognise new project opportunities, provide farmer training and integrate activities of importers and exporters (El-Hage Scialabba and Hattam, 2002; Gibbon, 2006; Sligh and Christman, 2007).

One such project is the Lango Cooperative. It was established in 1994 and it focused on organic cotton and sesame. The Lango Cooperative includes more than 12 000 farmers, spans across 266 villages and covers over 40 468 hectares. The Lango Cooperative project is based in Northern Uganda, where the production of organic cotton is ideal due to the rich soil fertility. Northern Uganda is also home to a black ant species that protects the cotton plants from various predatory insects. The organic cotton yields under the Lango Cooperative are the highest of all sub-Saharan African cotton producing projects. The Lango Cooperative relied on EPOPA for support from inception in 1994 to 1998, after which it started operating independently of EPOPA (Crucefix, 1998; Parrot and van Elzakker, 2003; Gibbon, 2006). Sesame was also marketed alongside cotton under the Lango Cooperative project. This marketing of more than one certified organic product from the same "cropping system" was a first in Africa (Parrot and van Elzakker 2003: 104).

In 1994, the Lango Cooperative's organic cotton operation produced 20 tonnes of cotton lint, which was exported, achieving a profit of US$8500. The following year saw the project produce and export 70 tonnes and realise a profit of US$25 000. Between 1996 and 1997, only 300 tonnes of organic cotton were exported. This was below the accepted quantity of 450 tonnes and arose due to difficulties with trade financing. As a result, the profitability of organic cotton under the Lango Cooperative could not be ascertained (Crucefix, 1998). According to Ferrigno et al. (2005), organic cotton accounted for 5% of total cotton exports in Uganda for the period 1997-1998. Parrot and van Elzakker (2003) further indicate that 200 tonnes of both cotton lint and sesame were exported in the 2001-2002 period. Organic cotton in Uganda has produced higher yields than conventional cotton and has demonstrated a greater economic performance because organic cotton fetches higher prices. Organic cotton prices are on average 20% higher than conventional

cotton prices, thus resulting in higher returns for organic cotton farmers (El-Hage Scialabba and Hattam, 2002; Hine and Pretty, 2006).

Uganda's leading organic agricultural commodity is coffee. It is also the forerunner of organic coffee production in the African, Caribbean and Pacific Group of States (ACP). Uganda has 26 000 smallholder coffee farmers, of which approximately 21 000 are certified organic coffee farmers (Tumushabe et al., 2006). Uganda's largest organic project is the Kawacom Organic Coffee Project, which was implemented by EPOPA in 1998. The Kawacom Organic Coffee Project involves approximately 14 000 farmers and encompasses both Arabica and Robusta coffee from three Ugandan regions, namely Bushenyi, Kapchorwa and Nebbi. The average farm size is between two and three hectares, with approximately 200 to 300 coffee trees per farm (Parrot and van Elzakker, 2003; Gibbon, 2006). The Kawacom Organic Coffee Project has provided farmers with training and imparted new knowledge on methods, as well as empowered women farmers. According to farmers interviewed, an overall improvement in the management of the organic coffee plantations has been observed because of the training that has been received and more efficient and improved organic coffee practices that have been employed (Bolwig and Odeke, 2007).

Kawacom is one of Uganda's largest conventional coffee and organic coffee exporters. Kawacom is a subsidiary company of the Swiss-based international trading company, Ecom Agroindustrial Corporation, which supplies green coffee to European markets. Thus, it is probable that Kawacom will benefit from economies of scale in the marketing of organic coffee and improved access to finance, relative to a single, independent exporter of coffee in Uganda (Gibbon, 2006). Parrot and van Elzakker (2003) indicate that the Kawacom Organic Coffee Project initially experienced slow growth, but the project has since grown and now exports 1000 tonnes of organic coffee per annum. The project's main export destinations are Europe and the US.

Uganda also has a number of smaller, successful organic agricultural projects that involve a variety of organic agricultural produce. Table 6.2 provides a summary of key projects.

Table 6.2: Certified Organic Projects in Uganda, 1993-2003

Company Name	Year of Commencement	Export Product	Number of Certified Farmers
Outspan Enterprises Ltd	1999	Sesame	6000
Suntrade/African Organic	1993	Fresh Fruit and Vegetables Dried Fruit	62 (Estate Without Growers)
Ibero (U) Ltd	2001	Robusta Coffee	Targeting 200
ESCO (U) Ltd	2001	Cocoa Vanilla	1700
Kahangi Estate	2001	Passion Fruit Tea Coffee	Individual Farm of 22.66 Hectares
Bark Cloth	2003	Bark Cloth	400

Source: Adapted from Parrot and van Elzakker (2003)

Despite the significant growth of Uganda's organic agricultural sector in recent years, it is a relatively small sub-sector, with organic exports accounting for 1% of total exports. The large majority of farmers practise organic agriculture by default. Consequently, there is considerable potential and a great need for a Ugandan certification body. Uganda does not have an established certification body or its own organic agricultural standards (Gibbon, 2006). At present, Uganda's organic agriculture is certified using EU standards (Taylor, 2006). In addition, the large majority of Ugandan organic produce receives Smallholder Group Certification (SGC), as the organic agricultural sector largely comprises smallholder farmers. Tumushabe et al. (2006: 55) indicate that these groups include a minimum of thirty farmers in order to form a substantial group that can support an internal control system, which manages, controls and inspects the certified group.

Taylor (2006) adds that as Uganda's organic agricultural exports expand in terms of production and supply increases to various markets, this organic produce will need to be certified to meet both the US and Japanese organic standards. Certification according to the EU, the US and Japanese organic standards poses a number of problems for African countries because these standards vary and stipulate a number of regulations that are not suitable for sub-Saharan African countries, their practices and climates. For example, the

US National Organic Program (NOP) stipulates compost requirements that local US farmers have difficulty implementing. The EU organic standards have strict regulations regarding organic seed use and this is problematic for Uganda and many sub-Saharan African countries because organic seeds are often insufficient or unavailable across the region. This further supports the need for Uganda's own organic standards and certification body. In 2002, NOGAMU initiated the development of organic agricultural standards in Uganda, namely the Uganda Organic Standard (UOS), which was supported and guided by EPOPA. The UOS committee comprises representatives from NOGAMU, the Uganda Bureau of Statistics, and the Ministry of Agriculture, Animal Industries and Fisheries. The UOS is derived from the International Federation of Organic Agricultural Movements (IFAOM) Basic Standards, but various modifications have to be made so that this better suits the organic agricultural situation in Uganda.

The Uganda Organic Certification Services (UgoCert) owns UOS as well as NOGAMU and it is Uganda's only local certification body. UgoCert was formed in 2004 and it is anticipated that certification costs within Uganda will decrease. This will encourage more farmers to certify their operations, as high certification costs are a major hindrance to engaging in certified organic agriculture (Parrot and van Elzakker, 2003; UNCTAD, 2004; Taylor, 2006; Tumushabe et al., 2007). EPOPA has provided UgoCert with both technical guidance and financial support, which further advances the efficiency of the certification body and reduces the certification costs incurred by farmers.

The development of both UOS and UgoCert has considerably advanced Uganda's organic agricultural sector, but the country does not yet have a fully functioning national organic agricultural policy in place. The Ministry of Agriculture, Animal Industry and Fisheries drafted a national policy in 2002; however, it has been in draft form for five years. The lack of urgency in formalising the national policy is problematic. Uganda has a clear comparative advantage in the production of organic agricultural crops and the full extent thereof as well as the spillover effects cannot be fully realised without government implementing the appropriate policies. At policy level, Uganda's organic agricultural sector is not sufficiently recognised as a complementary agricultural production system; rather, it is seen as a substitute for biotechnology. As a result, the economy, environment and farmers cannot reap the many benefits of organic agriculture. However, despite the lacking local certification bodies and government policies specific to organic agriculture, Uganda's organic agricultural sector is gaining ground (Taylor, 2006; Tumushabe et al., 2007). The

implementation of appropriate policies should augment this growth and thus increase the share of organic exports from 1% of total exports.

6.3. Kenya

Kenya is situated in East Africa and is bordered by Somalia, Sudan, Ethiopia, Uganda and Tanzania. It has a total area of 582 650 square kilometres and a population of approximately 30 million people. Kenya is one of sub-Saharan Africa's more diverse and developed countries and its economy is highly dependent on its agricultural sector, which accounts for 65% of total exports and employs an estimated 75% of the population. Kenya's agricultural sector largely comprises smallholder farmers, who account for 75% of the country's agricultural production. The country's main export crops include tea, coffee, fruit, vegetables and cut flowers (Parrot and van Elzakker, 2003; Mwaura, 2007).

The Kenyan government's involvement in the agricultural sector is characterised primarily by its promotion of food security and the export of agricultural products. The government has long supported the preservation of soil and water, as Kenya comprises approximately 80% arid and semi-arid land. Therefore, only 20% of the country constitutes arable land (Parrot and van Elzakker, 2003; Mwaura, 2007). Parrot and van Elzakker (2003) add that, since 1998, various government programmes have offered support to farmers converting to organic agricultural methods. This is indicative of the government's aim to increase organic agriculture in Kenya.

Kenya's organic agricultural sector is comparatively small but it is experiencing rapid growth. Organic agriculture has been present in Kenya since the inception of farming, but its formal organic agricultural sector has only been in existence since the 1980s. Approximately 182 586 hectares are under organic management, which constitutes 0.69% of total agricultural land in the country (Taylor, 2006; Bett and Freyer, 2007). According to Yussefi and Willer (2007), Kenya has an estimated 15 815 organic farms. Its organic sector is characterised by a small number of large commercial farms focused on the export market (Mwaura, 2007). This stems from Kenya's common „œolonial land occupation', where large, high input farms were developed (Taylor, 2006: 5).

Kenya's organic agricultural export products mainly include fruits and vegetables. However, in recent years, the number of export products has grown. Kenya now also

exports essential oils, dried herbs and spices and crops used in the production of cosmetic and pharmaceutical products (Taylor, 2006). Parrot and van Elzakker (2003) add that Kenya's certified organic products include French (runner) beans, mange tout peas, tea, hibiscus tea, jam, macadamia nuts and oil. These products are exported to the UK, Japan, Austria and Germany.

Although only 20% of Kenya is classified as arable, the country has a number of regions in which organic produce is cultivated (Mwaura, 2007). Table 6.2 provides a summary of the various certified and non-certified organic products grown in various regions within Kenya. It is clear that the Central, Western, Nzanya and Rift Valley provinces are able to produce a wide array of organic products relative to other regions. The North Eastern Province and the eastern part of the Rift Valley region are also more suited to cultivating wild harvests. The Central Province has the largest percentage of certified organic agricultural land. Taylor (2006) indicates that the large majority of farmers have been exposed to extensive training in organic agricultural methods, but Kenya's organic sector mainly consists of non-certified farms and produce. This is problematic for Kenya because the export potential of the organic sector is largely unrealised and price premiums are not being obtained.

Table 6.3: Organic Agricultural Commodities Produced in Kenya

Regions (Provinces)	Non-Certified Organic Products	Certified Organic Products
Nairobi	Processing of Dried Fruit	Processing of Cold-Pressed Oils Processing of Vegetables
Central	Fruits – Avocadoes, Mangoes, Passion Fruit, Apples, Guavas, Pineapples, Pawpaws Coffee, Vegetables (Exotic & Indigenous), Potatoes (Irish & Sweet), Watermelon, Sweet Melon, Green Peas, Ginger, Green Pepper, Okra	Avocadoes & Mangoes (in conversion), Coffee, Vegetables (Baby Vegetables & Salad Vegetables), Dried Fruit, Bird's Eye Chillies Cane Fruit
Nyanza	Bananas, Fruit, Groundnuts, Sesame, Sugar Cane, Chillies, Sorghum, Millet	Bird's Eye Chillies
Rift Valley	Honey, Tea, Fruits	Honey, Black & Herbal Tea, Dried Culinary Herbs & Spices, Essential Oils, Cold-Pressed Oils, Nutraceuticals, Vegetables (Baby Vegetables & Salad Vegetables)
Eastern	Vegetables, Fruit (Mangoes, Pawpaws & Oranges), Cassava, Millet, Sorghum, Amaranth, Medicinal Plant Products	
North Eastern		Essential Oils
Western	Indigenous Vegetables – Amaranth, Spider Plant, Saghert	Pineapples
Coast	Cashew Nuts, Groundnuts, Turmeric, Ginger	Natural Craft Products as Certified „Non-Timber Forest Products'

Source: Taylor (2006)

Kenya's organic agricultural sector has come to fruition without support or aid from the government, as the sector was initiated by farmers, NGOs and the private sector (Mwaura, 2007). The development and promotion of Kenya's organic sector can be attributed to six institutions, including the Kenya Institute of Organic Farming (KIOF), the Kitale-based Manor House Agricultural Centre, the Thika-based Sustainable Agriculture Community Development Programme (SACDEP), the Molo-based Baraka College, the Nairobi-based Better Land Husbandry (ABLH) and the Sustainable Agriculture Centre for Research and Development in Africa (SACRED) (Bett and Freyer, 2007).

These institutions rely on various international benefactors for financial aid and support. They have remained active in Kenya's organic agricultural sector, with a number of them being involved in various aspects. For example, KIOF implemented a training programme aimed at instituting "organic guarantee systems, standard setting and accreditation certification" (Parrot and van Elzakker, 2003: 81). KIOF has also provided organic farming training and education to over 5000 members since its inception in 1986. In addition, Manor House Agricultural Centre has provided organic agricultural training to approximately 6000 farmers across the country (Mwaura, 2007).

Kenya currently has four international certification bodies operating in the country, including the Soil Association, EcoCert International, the Institute for Marketecology (IMO), and Bio Suisse (Taylor, 2006). Sustainable Agriculture Community Development Programmes (SACDEP) also plays a critical role in Kenya's organic agriculture. It is a training programme with a specific focus on the production, marketing, processing and saving and credit systems of organic agriculture. SACDEP is also prominent in Kenya's Eastern and Central provinces, where the programme is training and assisting 4500 smallholder farmers (Hine and Pretty, 2006).

Kenya has over twelve „organic operators', which include both individual farmers and producers' associations. Some operators are fully converted and accredited as organic, while others are in the process of converting (Parrot and van Elzakker, 2003: 81). Bett and Freyer (2007) point out that the majority of Kenya's smallholder organic farmers operate as a group, which then receives Smallholder Group Certification. The independent NGO, Mount Kenya Organic Farming (MOOF), was developed with a view to assisting and empowering Kenyan smallholder farmers through ensuring food security and promoting sustainable organic farming practices (Hine and Pretty, 2006). In addition, MOOF educates and supports certified smallholder organic farming in accordance with IFOAM regulations and guidelines.

The smallholder farmers have also created the Kenya Organic Farmers Association (KOFA), which serves as a unifying body. The larger, commercial organic farmers in Kenya developed the Kenya Organic Producers Association (KOPA). In 2005, KOFA and KOPA united to form the Kenya Organic Agriculture Network (KOAN), with the objective being to improve and sustain the growth of Kenya's organic agricultural sector. KOAN has recognised the need for a local and simple certification process to facilitate the certification

of smallholder organic farmers, many of whom cannot afford to become certified by the international bodies (Taylor, 2006; Bett and Freyer, 2007; Mwaura, 2007).

Although formal organic agriculture has existed in Kenya for more than 20 years, there is no government policy thereof, as organic agriculture in the country has largely been ignored. The lack of government policies on organic agriculture can be attributed to the shortage of case studies highlighting organic agriculture's economic performance and potential. Kenya's organic sector is relatively small and is driven by NGOs. The sector therefore requires government support and funding to realise its growth potential (El-Hage Scialabba, 2000; Bett and Freyer, 2007). This is further advocated by KOAN, which emphasises the need for government policies on organic agriculture.

Kenya's organic sector has indirectly benefited from two existing government policies: the NGO Coordinating Act of 1990 (which acknowledges NGOs as collaborators in rural development) and the policy on economic liberalisation (which generated a situation in which „free enterprise' could occur) (Taylor, 2006: 24). These policies affect the organic sector indirectly, because they facilitate favourable conditions under which the organic sector can develop and flourish.

It is therefore necessary that the Kenyan government recognise organic agriculture in terms of its social, economic and environmental potential and implement organic agriculture-specific policies to encourage growth within the sector. The potential social benefits include: reduced production costs, improved food security and nutrition, empowerment of women, utilisation of local knowledge and increased employment opportunities. The economic gains include: reduced financial risk, stable yields and improved producer prices. The environmental benefits of organic farming in Kenya are also far-reaching and include: conservation of agro-biodiversity, enhanced soil fertility and water quality, improved pest control and reduced erosion (El-Hage Scialabba, 2000; Mwaura, 2007).

6.4. Tanzania

Tanzania is the largest country in the East African region and has a total land area of 89 million hectares. Tanzania is a coastal country. Neighbouring countries include Kenya, Uganda, Rwanda, Burundi, Zambia, Malawi, Mozambique and the Democratic Republic of the Congo (Kulindwa et al., 2008). Tanzania has a population of 41.5 million people and

the population growth rate is approximately 3% per annum (UNFPA, 2008). Agriculture is a pivotal sector in the Tanzanian economy, accounting for 58% of Tanzania's GDP and employing 80% of the population. Tanzania's major export commodities are cotton and coffee, which account for 50% of its export revenue (Parrot and van Elzakker, 2003).

Tanzania exports various other agricultural crops such as tea, cashew nuts, cloves and tobacco. The country also has a large number of staple commodities, including cassava, maize, millet, sugar, rice, sorghum and potatoes. Smallholder subsistence farmers, who practise low-input, traditional farming methods, carry out most agricultural production. The average farm size per household is less than three hectares. Tanzania has a tropical climate along its coastline and a more temperate climate inland on the Western Highlands. These climatic conditions are conducive to the cultivation of fruit (e.g. pineapples, citrus, peaches, mangoes and bananas), vegetables (e.g. tomatoes, cabbage and spinach) and flowers (tropical and non-tropical). Despite favourable climatic conditions, Tanzania's agricultural sector has performed poorly. This has been attributed to a number of factors, such as the minimal use of inputs; high production costs and low produce prices, which reduce farmers' profit margins; smallholder farmers' low capital levels; numerous pests; crop and livestock diseases; and the large majority of crops being rain-fed, which results in unpredictable crop yields, especially in dry seasons (Parrot and van Elzakker, 2003; Taylor, 2006; Kulindwa et al., 2008).

The decline in agricultural performance coupled with the rise in input prices, prompted various NGOs to attempt to remedy the situation through facilitating sustainable, ecological and organic farming methods. The NGOs that were involved were Inades Tanzania, EGAJ, Sunnhemp, PELUM, ADP-Mbozi, Kilimo Hai Tanzania (KIHATA) and the Seed Bank (Taylor, 2006). Kulindwa et al. (2008) indicates that Tanzania has approximately 23 732 hectares of organically managed land, which accounts for 0.1% of total agricultural land. The large majority of Tanzania's organic production is exported and very little is consumed locally (Mjunguli, 2004; Mwasha and Leijden, 2004). Tanzania's organic agricultural crops include coffee, cocoa, black tea, ginger and spices, cotton, essential oils (lemon grass), cashew nuts, honey, herbs, fresh fruit and dried fruit. Several of these crops have been organically grown by default for a number of decades, therefore presenting Tanzania with a relatively effortless transition to organic methods in terms of crop production. Table 6.4 illustrates where these crops are grown. Tanzania's organic produce is predominantly

exported to Germany, Sweden, Switzerland, the Netherlands, the United Kingdom, Japan, Indonesia and the US (Kulindwa et al., 2008).

Table 6.4: Organic Agricultural Commodities Produced in Tanzania

Product	Region
Honey	Tabora Iringa Rufiji
Pineapples	Njombe (in the Iringa Region)
Coffee	Bukoba Kilimanjaro
Cashew Nuts	Mkuranga (in the Coastal Region)
Turmeric	Mbeya
Cocoa	Kyela
Ginger	Kigoma Tanga Morogoro Iringa
Tea	Njombe Tanga
Cotton	Meatu
Various Herbs & Spices	Zanzibar
Spices	Kimango Farms (in Morogoro region)

Source: Taylor (2006)

The organic products destined for the export market are certified through international certification bodies, namely IMO, EcoCert, the Soil Association, Bio-Inspecta and KRAV. In addition to the certified organic produce, a number of uncertified crops are grown using organic agricultural practices. These non-certified products are generally utilised locally and are subject to the prices of conventional agricultural produce. Many non-certified growers are aiming to achieve certification in order to enter the organic agricultural markets, both locally and internationally (Taylor, 2006).

Organic agricultural production is largely carried out by smallholder farmers, who band together in groups to acquire group certification. Alternatively, these groups are controlled by large commercial companies, which acquire certification and export the produce (Parrot and van Elzakker, 2003). Table 6.5 lists various certified organic companies in Tanzania,

the regions in which they operate and the produce that they trade. These companies are certified through one of the five international certification bodies present in Tanzania (Kulindwa et al., 2008). Mwasha and Leijden (2004) indicate that the certification bodies operate in different regions of Tanzania and the amount of certification they carry out varies. For instance, IMO certifies approximately 50% of organic companies in Tanzania, while KRAV certifies only 25%. KRAV certifies companies such as Premier Cashews Industry Ltd, Biolands International Ltd, the Kagera Cooperative Union and TANICA in the Kyela, Mkuranga and Bukoba regions, certifying only cashew nuts, cocoa, coffee and instant coffee. Bio-Inspecta, on the other hand, operates in the Shinyanga area and certifies cotton.

Table 6.5: Certified Organic Companies in Tanzania, 2004

Company	Region	Products
Kilimanjaro Native Cooperative Limited (KNCU)	Moshi/ Kilimanjaro	Arabica Coffee
Tanzania Organic Products LTD (TAZOP)	Zanzibar Tanga Kigoma	Herbs & Spices
Mufindi Tea Company Ltd (MTC)	Njombe	Black Tea & Herb Teas
Tanzania Tea Packers (TATEPA)	Mafinga/Dar es Salaam	Black Tea & Herb Teas
Zanz-Germ Enterprises Ltd	Zanzibar Tanga Kigoma	Herbs & Spices (Ginger, Pepper, Turmeric, Chillies & Lemon Grass)
Premier Cashew Industry Ltd (PCI)	Coast Mkuranga	Cashew Nuts
Clove Stem Oil Distillery (CSOD)	Pemba	Essential Oils: Lemon Grass Oil, Cinnamon Leaf Oil, Eucalyptus Oil, Sweet Basil Oil
Kagera Cooperative Union (1990) Ltd (KCU)	Kagera	Robusta Coffee
Biolands International Ltd	Kyela (Mbeya Region)	Cocoa
Dabaga Vegetable Can Company Ltd	Iringa/Njombe	Canned Pineapple
Kimango Farm Enterprise Ltd	Morogoro	Herbs & Spices
Tanganyika Instant Coffee Company Ltd (Tanica)	Kagera	Instant Coffee
Biore Tanzania Ltd	Shinyanga/Meatu	Cotton
Matunda Mema/Kipepeo	Karagwe	Dried Fruit
Bombay Burmah Trading Corporation Ltd	Usambara/Soni-Herkulu Estate	Fair Trade & Organic Tea

Source: Mwasha and Leijden (2004)

In addition to Tanzania's certified organic companies, a number of NGOs are involved in the production, certification and exportation of organic agriculture. Environcare and the Tanzanian Organic Agricultural Movement (TOAM) are two prominent NGOs operating in Tanzania. TOAM was developed in 2005 and is the parent organisation to Tanzania's organic agricultural sector. TOAM also carries out research, provides training and support, is a networking base for smallholders and is dedicated to improving and growing Tanzania's domestic organic market. EPOPA has also played a critical role in the development of Tanzania's organic agricultural sector and has implemented various projects (Kulindwa et al., 2008). Some of EPOPA's projects include the Kyela Cocoa

Project and the Kagera Coffee Project, which were initiated in 1997 and 1998, respectively. EPOPA found that the Kyela region was conducive to organic agriculture because the ideal weather and good soil conditions meant that organic production would be relatively successful without fertilisers and chemicals. Thus, the Kyela Cocoa Project was born. It is managed by Biolands International Ltd and involves 7000 farmers (Forss and Sterky, 2000).

The Kagera region of Tanzania is known to be a rich, fertile area and conditions are favourable for agriculture that requires minimal to no inputs. Forss and Sterky (2000) add that various types of crops are cultivated in the Kagera region and that most of the farms there are between one and two hectares in size. Prior to the inception of the Kagera Coffee Project, the coffee plantations were in poor condition and the coffee farmers were struggling to produce good yields. EPOPA's aim for the Kagera Coffee project was to "consolidate and increase the export of organic coffee and to improve the livelihood of the rural population" (Kulindwa, 2008: 22). The Kagera Coffee Project has incorporated 3500 coffee farmers and it encompasses approximately 8400 hectares. It has been certified by KRAV. The project has resulted in exports measuring 300 tonnes of certified Robusta coffee beans per annum and 15 tonnes of instant coffee per annum (Parrot and van Elzakker, 2003).

EPOPA initiated a number of other projects. These involved various organic crops and varying numbers of farmers. An example is the Premier Cashew Industries Ltd project in the coastal region of Mkuranga, which was initiated in 2002. The aim of this project was to increase the export of organic cashew nuts produced by smallholders. Premier Cashew Industries Ltd comprises 500 smallholder farmers and the project generates 400 tonnes of organic cashew nuts per annum. Premier Cashew Industries Ltd also shells and packs the organic cashew nuts. The Kilimanjaro Native Cooperative Union is another project developed by EPOPA. It operates in three areas of Mount Kilimanjaro. The project was started in 2002 with the objective being to improve the lives of smallholder farmers in the Kilimanjaro region by increasing the exportation of organic coffee. More than 2000 farmers are involved in the Kilimanjaro Native Cooperative Union projects and 300 tonnes of organic Arabica coffee per annum are exported to a number of countries, the most prominent being Japan (Parrot and van Elzakker, 2003; Kulindwa et al., 2008).

In 2004, EPOPA undertook to develop a local certification and standards body for Tanzania, namely TanCert. TanCert was formed through the initiatives of an NGO, Participatory Ecological Land Use Management (PELUM), which prompted the development of organic standards and certification, and Kilimo Hai Tanzania (KIHATA), which initially managed the organic sector before TOAM was formed. TanCert resulted from various meetings on proposed organic standards and certification. It established standards for organic certification specifically suited to Tanzania's organic agricultural sector and its needs and provided training to various certifiers and inspectors in the country. EPOPA provides TanCert with considerable financial assistance and support, but TanCert is not yet fully endorsed to certify organic products for export. However, TanCert is working towards gaining this recognition by completing the IFOAM Accreditation programme. This will enable it to certify Tanzanian organic produce for the international market and thus eliminate the need for external international certification bodies (Kulindwa et al., 2008). Taylor (2006: 22) adds that, in the interim, Tanzanian organic producers requiring certification for the export market are provided with „internationally compatible certification' through an arrangement with the IMO. The establishment of TanCert demonstrates the tremendous growth of the organic agricultural sector in Tanzania.

Tanzania, like Uganda and Kenya, lacks an established and comprehensive government policy specific to organic agriculture. An existing agricultural policy, the National Agricultural Policy, incorporates a section pertaining to organic agriculture in Tanzania and this clause provides a platform for the organic agricultural player to maintain their organic farming. TOAM plans to formulate organic policies, provide support and disseminate information as well as market organic produce. However, due to the multi-dimensional nature of organic agriculture, various government departments should be involved in the policy formation process (Taylor, 2006).

Kulindwa et al. (2008) suggest that several government ministries should oversee the various facets of organic agriculture, but cautions that their functions may at time overlap. Eight government departments of responsibility could be involved in overseeing organic agriculture, namely: the Ministry of Agriculture, Food Security and Cooperatives, the Ministry of Livestock Development, the Ministry of Natural Resources and Tourism, the Ministry of Industries and Trade and Marketing, the Ministry of Water, the Ministry of Health and Social Welfare (Tanzania Food and Drugs Administration Authority), the Ministry of Lands and Human Settlement Development, the Vice President's Office

(Division of Environment) and the Prime Minister's Office of Regional Administration and Local Government. Positive interaction between the above ministries and the various organic agricultural stakeholders is necessary in order to develop an integrated organic agricultural policy. This is essential for the organic agricultural sector to grow and develop further and will encourage research on the sector, which currently lacks considerable funding and support from the Tanzanian government.

6.5. Conclusion

Despite the fact that the organic agricultural sectors are relatively small in Uganda, Kenya and Tanzania, they are the organic agricultural leaders in sub-Saharan Africa. Each of these countries has developed their organic agricultural sector around their individual climates, geography and comparative advantages. The organic agricultural sectors in Uganda, Kenya and Tanzania predominantly focus on the export market and they have limited or absent domestic organic agricultural markets. The formal organic agricultural sectors in Uganda, Kenya and Tanzania are relatively embryonic but they have displayed impressive growth rates. In each of these countries, this growth has been achieved without fully functioning local certification bodies or integrated government policies specifically pertaining to organic agriculture. It is clear that rigorous government involvement and appropriate policies are essential in the development of the non-traditional agricultural sectors in these countries.

CHAPTER 7: A SUPPLY-SIDE ANALYSIS OF FOOD SECURITY IN SELECTED SUB-SAHARAN AFRICAN COUNTRIES

7.1. Introduction

The food insecure population in sub-Saharan Africa is estimated to be 212 million people (Lal, 2009). Food security is a complex issue and is considered to be both a supply (food availability) and demand (food accessibility) problem. Sub-Saharan Africa has long been associated with a severe food security problem, which has resulted from both an inadequate food supply and poor access to food. Despite agriculture being the dominant sector in sub-Saharan Africa, the region is still struggling to meet its food requirements (the supply side of the food security equation). The sub-Saharan African region is also characterised by low agricultural production and below-average daily per capita calorie intakes (Salih, 1994; Breman and Debrah, 2003).

Sub-Saharan Africa's food security problem is further exacerbated by the poor access its population has to the region's food supply. However, this study takes a supply-side approach to the food security equation. As the East African region is considered to be one of the most food insecure sub-regions of sub-Saharan Africa (FAO, 2006; Dorélien, 2008), this study therefore focuses on three East African countries: Kenya, Tanzania and Uganda.

Kenya, Tanzania and Uganda are party to the food security plight of the sub-Saharan African region. These countries have long been plagued by droughts, conflict and poor agricultural productivity, which have collectively contributed to the increasing food security problem each of these nations face (Dorélien, 2008). The three nations have a number of similarities and differences at economic and socio-economic levels. A key feature in the economic history of each of these countries is the adoption of structural adjustment programmes at the beginning of the 1980s to curb region-wide economic deterioration. These structural adjustment programmes have affected the agricultural sectors of Kenya, Tanzania and Uganda and have potentially influenced the food security situation in these countries.

The principal objective of this chapter is to examine the aggregate food security situation in Kenya, Tanzania and Uganda from a supply-side perspective and to establish the impact of

structural adjustment programmes on food security in these countries with respect to food production, food availability, per capita food availability, import dependence and population growth.

This chapter is organised as follows: The first section discusses structural adjustment programmes in three sub-Saharan African converters and exporters of organic produce - Kenya, Tanzania and Uganda. The second section outlines the methodology used to assess the aggregate level of food security in these three countries. A presentation and an analysis of the empirical results then follow.

7.2. Structural Adjustment Programmes

Many sub-Saharan African developing countries have experienced economic crises in the mid-1970s and early 1980s. These crises resulted from a number of factors, including oil price shocks, declining terms of trade, high real interest rates and dwindling foreign capital (Elbadawi et al., 1992). In addition, inappropriate policies and a lack of export diversification in sub-Saharan African countries further aggravated their economic situations (Jaycox, 1989; Busingye, 2002).

In an attempt to improve their economic situations, many sub-Saharan African countries adopted structural adjustment programmes. These structural adjustment programmes were implemented in the 1980s under the guidance of the World Bank and the IMF. According to Busingye (2002: 7), the structural adjustment programmes aimed to "improve the incentive structure, the trade regime, allocation of resources, and efficiency in the use of resources to stimulate growth and enhance impulses in the economy". Overall, the major objectives of the structural adjustment programmes were to restore and/or improve economic growth and reduce poverty (Logie and Woodroffe, 1993).

A number of sub-Saharan African countries have engaged in two or more phases of the structural adjustment programmes. Given the importance of the agricultural sector in the region, more than half of the sector-specific structural adjustment programmes focused on agriculture (Thiele, 2002; Elbadawi et al., 1992). However, there is evidence to suggest that these programmes have not yielded the desired results, at both economic and socio-economic levels (Logie and Woodroffe, 1993; Mosley, 1993; Noorbakhsh and Paloni, 1998; Stein and Nissanke, 1999; Busingye, 2002; Havnevik et al., 2007).

Many of the structural adjustment programmes focused on reforming the agricultural sector. According to Kherallah et al. (2000: 7), this reform saw to the:

- removal of price controls;
- deregulation of agricultural marketing;
- closure of state-owned enterprises that monopolised agricultural trade; and
- changes in the foreign exchange market to provide greater incentive for exporting.

The rationale behind reforming the agricultural sector was that, by addressing the price incentives for farmers as well as minimal government involvement, markets would operate freely, causing a positive impact on supply and agricultural production. Under the structural adjustment programmes, the increase in agricultural production (and improvements in other sectors) was below expectation. In addition, smallholder farmers in the region have been further marginalised (Businge, 2002; Rosegrant et al., 2005; Havnevik et al., 2007).

The reformation of the agricultural sector has resulted in the removal of marketing boards, subsidies, credit for farmers and price controls. The elimination of price controls has raised the price level of major inputs in the agricultural sector. A noteworthy point is that the large majority of sub-Saharan African farmers are smallholder farmers and these reforms have negatively affected their production severely, as they were heavily reliant on credit from government, input subsidies and the marketing boards. The removal of fertiliser subsidies has been particularly detrimental to smallholder agricultural production in sub-Saharan Africa and it has adversely affected the region's food security (Lele, 1992; Kherallah et al., 2000).

An important determinant in the success and impact of structural adjustment programmes in a country or region is the adequate assessment of socio-economic indicators, such as food security, poverty, health and literacy rates (Mosley, 1993). Since sub-Saharan Africa has one of the world's highest levels of poverty and is considered the most food insecure region in the world (Nair, 2008; FAO, 2009), a possible conclusion is that the structural adjustment programmes have not yielded the anticipated results at regional level.

7.2.1. Kenya

Kenya adopted structural adjustment programmes before Uganda and Tanzania did. The first adjustment programme was implemented in 1980. Kenya accepted financial assistance from the IMF with the aim of improving its use of external resources and boosting public investment and exports. These objectives, however, were not realised and Kenya's economic situation deteriorated further, most likely due to Kenya's overall lack of commitment to these programmes. Examples of Kenya's noncommittal approach to initial structural adjustment programmes manifested in the fact that neither trade reforms nor marketing boards were liberalised (Swamy, 1994). This resulted in the government acquiring a second adjustment loan from the IMF in 1982, in an attempt to realise the objectives set out for the first structural adjustment programme (Kabubo-Mariara and Kiriti, 2002; Rono, 2002).

The 1986-1991 period (the adjustment period) saw a number of loans being allocated to various sectors. The industrial sector received a sectoral loan in 1989, the agricultural sector obtained a loan in 1990 and export development received sectoral loans in 1990 and 1991. Overall, the structural adjustment programmes have not generated an environment conducive to achieving stable economic growth at the levels achieved in the 1960s and 1970s. In addition, Kenya's socio-economic indicators of poverty have increased and life expectancy has fallen (Kabubo-Mariara and Kiriti, 2002).

The reformation of the agricultural sector under the structural adjustment programmes centred on liberalising markets and eliminating price controls (Alila and Atieno, 2006). However, these reforms did not really improve the performance of the agricultural sector. The growth of the Kenyan agricultural sector fell from 5% per annum for the period 1964-1973 to 3.5% per annum between 1975 and 1985. Thereafter, between 1986 and 1990, the country's agricultural sector had an average annual growth rate of 4% (Gibbon, 1992). The structural adjustment programmes in Kenya have therefore not yielded the intended results of boosting agricultural growth. Additionally, the agricultural sector's growth was further exacerbated by major droughts in the 1979/1980 and 1983/1984 seasons and, consequently, a considerable increase in food imports occurred (Gibbon, 1992).

7.2.2. Tanzania

The Tanzanian economy was rapidly declining at the beginning of the 1980s. It was characterised by a plummeting real GDP, population growth that exceeded agricultural growth, increasing fiscal deficits and high levels of inflation (Meertens, 2000). In an attempt to remedy this economic deterioration, Tanzania adopted the structural adjustment programmes in the early 1980s. However, these programmes initially began as domestic strategy adjustments (also known as ‚home-grown adjustment programmes'), as the Tanzanian government was opposed to the adjustment requirements stipulated by the World Bank and the IMF. These adjustment requirements were in line with the international financial institutions. In 1986, having failed in its adjustment attempts, the Tanzanian government agreed to adopt the structural adjustment programmes under the guidance of the World Bank and the IMF. These programmes were primarily aimed at stabilising the macroeconomy and reforming the structure of the economy. These activities included adjusting the exchange rate, eliminating price controls and lowering tariffs on imports (Agrawal et al., 1993; Kapunda, 1994).

Tanzania's first attempt at structural adjustment in the early 1980s did not improve the economy's GDP as expected. For example, between 1961 and 1976, the Tanzanian economy experienced moderate growth, while in 1977 and 1978 the average GDP growth dropped to 1% per annum. However, thereafter, the country's GDP growth showed signs of recovery in 1979 and 1980 and reached levels achieved between 1961 and 1976. Nevertheless, the following three years (1981-1983) were characterised by a notable decline in GDP growth, which fell to -0.5% in 1981 and -2.4% in 1983. Tanzania's GDP experienced further sharp fluctuations in 1984 and 1985, achieving 3.4% and 4.6% growth, respectively (Wobst, 2001).

After the adoption of a more aggressive structural adjustment programme in 1986, there was a significant increase in the country's GDP growth, but it did not improve in the long term. At the start of the 1990s, Tanzania experienced another considerable decline in GDP growth (Wobst, 2001). It is evident that Tanzania's economic growth levels experienced short bursts of improved performance after these reform programmes were initiated, but each of these spikes has been followed by a decline in performance.

As the agricultural sector significantly contributes to the Tanzanian economy, it was included in the reform processes of the 1980s. The reformation of the agricultural sector

was expected to increase food production and exports via improved producer prices, better marketing and increased government expenditure on agriculture. However, these objectives have not been attained. The fall in production per capita, the decrease in per capita calorie intake and the decline in foreign exchange derived from cash crops per person attest to this. The rapidly increasing population has also further aggravated the poorly performing agricultural sector. The removal of input subsidies (e.g. fertilizer subsidies to smallholder farmers) and credit services as part of the structural adjustments have caused the price of inputs to increase and the per capita real return of staple food production to decrease in Tanzania (Meertens, 2000; Havnevik et al., 2007).

7.2.3. Uganda

After achieving independence in 1962, Uganda represented one of East Africa's most successful economies and had a strong agricultural and mining sector (Aggrey, 2009; Baffoe, 2000). The country averaged a GDP growth of approximately 4.8% per annum as well as positive terms of trade. However, economic decline set in when Idi Amin took power in 1971 and continued on a downward spiral well into the 1980s. This economic deterioration prompted the call for economic reform. The first of these reforms was implemented in 1981 and was supported by the IMF. This economic reform centred on stabilising the economic situation, improving the economy's openness and liberalising the exchange rate. The reform process appeared to be successful as it was accompanied by the devaluation of the Ugandan shilling. However, in 1984, reform efforts collapsed and the economy rapidly declined again. This failure was largely attributed to importers abusing the depreciated Ugandan shilling, an increasing budget deficit and a deteriorating standard of living (Tumusiime-Mutebile, 2000).

The failure of the first economic reform efforts induced a second round of reforms in 1987. The World Bank and the IMF guided these reforms. The objectives were to promote economic growth, improve inflation targeting (through more stringent monetary policies), increase reserves of foreign exchange, improve the country's budget deficits and institutional structure as well as redevelop prominent sectors of the Ugandan economy (Belshaw et al., 1999; Baffoe, 2000).

The structural adjustment programmes implemented in Uganda in 1987 have been dubbed the most successful in sub-Saharan Africa (Belshaw et al., 1999; Holmgren et al., 1999;

Dijkstra and van Donge, 2001). The liberalisation of Uganda's trade regime and the removal of price controls and exchange rate controls created an economic environment conducive to investment and that was competitive within the private sector. The implementation of these structural adjustment programmes also opened Uganda up to foreign competition and an increased inflow of technology, which further encouraged steady growth in the economy (Bahiigwa et al., 1999).

Uganda's macroeconomic performance after the introduction of these reform programmes resulted in its real GDP growth rates being restored. Negative growth rates in the 1970s and 1980s have transformed into positive growth rates averaging 5.7% per annum, having achieved approximately 7% in 1995 (Belshaw et al., 1999). Both agriculture and manufacturing have been positively affected by the structural adjustment programmes, with real agricultural GDP and real manufacturing GDP experiencing growth rates of 4% per annum and 16% per annum, respectively. Uganda has also managed to curb inflation, decrease its budget deficit, facilitate appreciation of the real rate of exchange and tighten the growth of the money supply. In addition, the positive real interest rate has boosted the level of domestic savings (Brett, 1998).

The agricultural sector embarked on a series of reforms, which entailed the liberalisation of prices for both agricultural inputs and outputs and the elimination of „œcommodity boards' (Bahiigwa et al., 2005: 484). Uganda's agricultural sector has performed well overall under the structural adjustment programmes, although some scholars contest this (such as Belshaw et al.), and there has been an upward trend in both agricultural production and exports since 1987 (Bahiigwa et al., 2005).

The socio-economic situation in Uganda appears to have improved since the implementation of reform programmes (Akiyama et al., 2003). This improvement is evident in the decline of poverty since 1987 – the number of poor people living below the poverty line has fallen from 59.7% in 1992 to 39% in 2000 (Balihuta and Sen, 2001). Towards the end of the 1980s, the Program to Alleviate Poverty and the Social Costs of Adjustment (PAPSCA) was established; it received financial support of US$28 million from the World Bank. In 1997, the Ugandan government launched another programme, the Poverty Eradication Action Plan (PEAP), to reduce poverty further (Holmgren et al., 1999: 26). Both programmes have been beneficial in reducing Uganda's poverty levels.

7.3. Methodology and Data

The concept of food security is a multidimensional problem consisting of both supply (food availability) and demand (access to food) constraints. This study, however, focuses on the supply side of the food security equation. The objective of this study is to assess the food security achievements of Kenya, Tanzania and Uganda for the period 1961-2007 using annual data. Since cereals are one of the major staple food groups in all three countries, the researcher has therefore seen fit to use cereals as a basis for comparison in the analysis of the national food security of these countries. All of the data on food has been gleaned from the FAO statistics database. The trends and variability of cereal data over the period under review reflects that of aggregate food.

Two types of food security, chronic and transitory, are analysed by breaking down decomposing the time series data on food availability, trade and stocks into its trends and fluctuations. Sadoulet and de Janvry (1995: 130) describe chronic food insecurity as "situations where access to food is, on average, below the required level and is rooted in poverty". Transitory food insecurity, on the other hand, refers to a short-term decline in food caused by drought and/or fluctuations in income or prices (Sadoulet and de Janvry, 1995; FAO, 2008).

Availability can be defined as:

Availability = production – intermediate use and waste + net imports – closing stocks.

Data on intermediate use and waste is often unavailable and is thus estimated as a given percentage of production.

According to Nichola (1998) and Broca (2002), food self-sufficiency is frequently misinterpreted as food security. Food self-sufficiency implies that "the domestic food production of a country must be adequate to meet her food demand" (Kalibawani, 2005: 7). Being food self-sufficient is only one aspect of the concept of food security, which takes into account a number of other variables such as food aid and food imports (Kalibawani, 2005). However, countries that are not food self-sufficient run the risk of being open to volatilities in the global food market, as such countries depend on food imports to supplement their domestic food supply. In order to assess a country's food self-sufficiency, it is important to identify the percentage of domestic food supply that has been imported.

This is calculated through import dependency ratios. The import dependency ratio is calculated as:

$$\text{IDR} = \frac{\text{Imports}}{\text{Production} + \text{Imports} - \text{Exports}} \text{ x } 100 \qquad (7.1)$$

The outcome of this ratio indicates the percentage of food that is imported and the remainder of this ratio refers to the percentage of domestic food supply that has been produced within the country. However, according to FAO (2001a), there is a caveat to this ratio as it only holds true if the imports are used for domestic consumption and are not then re-exported.

The trend of net food availability and its components are measured by an estimated growth rate for the period 1961-2007. The model estimated is a semi-log growth model and is given by (Gujarati, 2006):

$$\ell nX_t = a + bt + u_t \qquad (7.2)$$

where X is the variable whose growth rate is estimated and it represents production, net availability, per capita availability of cereals and imports; t represents time and a and b are the estimated regression coefficients.

The estimated growth rates are further calculated for the two sub-periods of the time series. The first sub-period is from 1961 to 1980 and the second sub-period is from 1981 to 2007. This break in the time series is substantiated by the introduction of the structural adjustment programmes.

Furthermore, the coefficient of variation (CV) measures the fluctuation of the data around the trend and is a measurement for transitory food insecurity (Nichola, 2006). The coefficient of variation is defined as:

$$CV = std\left[\frac{x_t - \hat{x}_t}{x_t}\right] \tag{7.3}$$

where $\hat{x}_t = e^{(a+b_t)}$ is the estimated value for x_t.

7.4. Empirical Discussion of Results

7.4.1. Import Dependency Ratios

The calculation of import dependency ratios provides an indication of how dependent the domestic food supply of a country is on food imports to meet its food demand. The dependency on imports has risen in Kenya, Tanzania and Uganda between 1961 and 2007. This is clear from Figure 7.1, which provides a graphical representation of the growth in import dependency ratios for the 1961-2007 period and for the two sub-periods, 1961-1980 and 1981-2007.

The growth in import dependency for Kenya, Tanzania and Uganda has been calculated for the entire time series (1961-2007) and the two sub-periods (1961-1980 and 1981-2007), using the natural exponential function of:

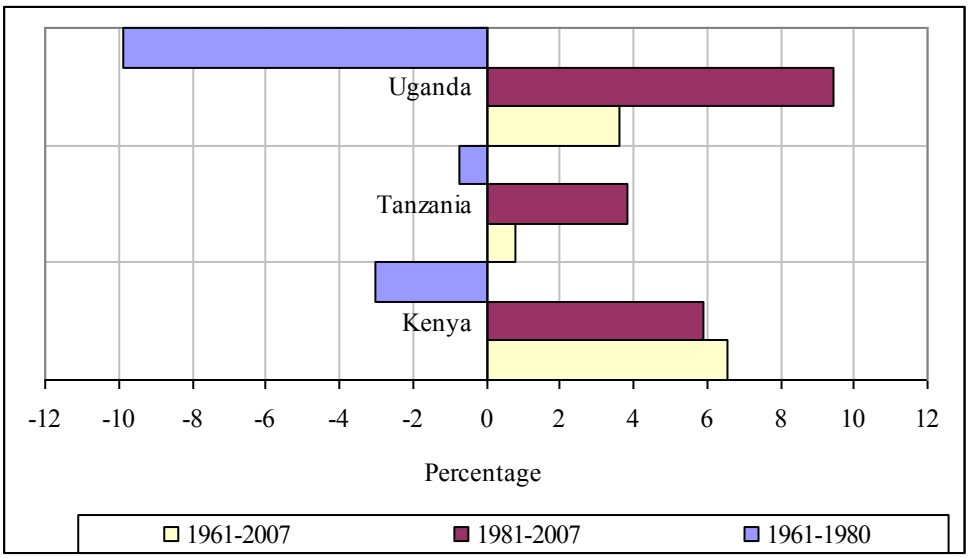
$$y = Ae^{rt} \tag{7.4}$$

where ***r*** can be interpreted as the "instantaneous rate of growth of the function Ae^{rt}" (Chiang and Wainwright, 2005: 264). This growth rate was obtained by plotting the import dependency data against time in a line graph and adding an exponential trend line with an equation in the form of $y = Ae^{rt}$ (See Appendix A). The slope of this trend line is given by the value of ***r*** and thus provides the instantaneous growth rate for the data plotted on the graph. The instantaneous growth rate is that growth (Gujarati, 2006). However, in practice, the instantaneous growth rate is generally quoted.

The growth rates for Kenya, Tanzania and Uganda for each period were plotted in a bar chart (Figure 7.1). It is clear that Kenya, Tanzania and Uganda's dependence on imports increased over the period 1961-2007. Kenya experienced the largest growth in import independence, namely 6.57%. Tanzania, on the other hand, has experienced the slowest

growth in import dependency, only 0.8%, and Uganda displayed growth of 3.6% in import dependency over the period 1961-2007.

Figure 7.1: Growth in Import Dependency for Kenya, Tanzania and Uganda, 1961-2007



Source: Author's calculation based on FAOSTAT data (FAOSTAT, 2010)

Kenya's strong growth (6.57%) in import dependency can be attributed to large fluctuations in the import dependency ratios. For example, in 1983, Kenya's import dependency was calculated to be 5.936%. This rose sharply to 24.990% in 1984 and declined significantly to 2.695% in 1988. Kenya experienced further fluctuations of its import dependency in the 1990s, with import dependency comprising 24.951% of the domestic cereal supply in 1994, plummeting to 10.385% in 1995 and peaking at 37.717% in 1997. It should be noted that the years 1984, 1994 and 1997 experienced sharp increases in the dependence on cereal imports but were also plagued by severe droughts, which may have contributed to these significant increases.

On a similar note, Tanzania and Uganda have also experienced large fluctuations in import dependency, but not as frequently or as severely as Kenya. For instance, Tanzania's largest fluctuation in import dependency was from 4.077% in 1973 to 25.544% in 1974; thereafter, a rapid decline of 6.219% followed in 1976. Uganda experienced large and significant fluctuations in import dependency towards the end of the 1990s, with import dependency rising rapidly from 9.28% in 1996 to 16.147% in 1998. This was followed by a sharp

decline to 7.324% in 1999 and a further fall to 3.464% in 2001. However, by 2004, import dependency reached 20.634% and further rose to an all-time high of 21.073% in 2006.

Interestingly, after the implementation of structural adjustment programmes (1981-2007), all three countries experienced a general upward trend in their dependence on imports relative to the period prior to the structural adjustment programmes (1961-1980). However, these structural adjustment programmes adversely affected domestic production. It is therefore fitting to discuss the growth in import dependency before structural adjustment programmes were adopted (1961-1980) and to compare the growth with that experienced in the period subsequent to these reform programmes (1981-2007) being implemented.

The growth in import dependency for the period prior to the structural adjustment programmes is significantly different to the growth experienced in the period after these programmes were adopted and in the 1961-2007 period overall. Between 1961 and 1980, all three countries displayed a negative growth in import dependency. Tanzania's growth in import dependence was -0.76%, while Uganda's and Kenya's were -9.89% and -3.03%, respectively. These negative growth rates indicate that all three countries reduced their reliance on food imports to meet food demand. A possible deduction is that these countries were making progress in becoming food self-sufficient during this period. In the case of Uganda, this large decrease in import dependency growth resulted from a civil war (1971-1986), Idi Amin's dictatorship, the depletion of foreign reserves and zero cereal exports between 1977 and 1981 (Southall, 1980; Collier, 1999; FAOSTAT, 2010).

The early 1980s, however, revealed a different scenario. The growth in import dependency during the 1981-2007 period rose significantly for Kenya, Tanzania and Uganda from the negative growth experienced in the previous period. Of the three countries, Uganda experienced the largest growth (9.43%), Kenya displayed growth of 5.89% and Tanzania experienced the lowest growth, 3.82%. According to Tibaijuka (2004: 171), the African continent became a „net agricultural importing region' in 1980. This may partly explain the significant growth in import dependency from 1961-1980 to 1981-2007 in Uganda, Kenya and Tanzania, as shown in Figure 7.1.

7.4.2. Estimated Growth Rates of Food Security Indicators

The estimated growth rates of the supply-side food security indicators in this study vary across Kenya, Tanzania and Uganda. Table 7.1, 7.2 and 7.3 summarise the regression results of the food security indicators examined in this study for Kenya, Tanzania and Uganda, respectively. The regression results and the food security situation of each country are discussed below, beginning with Kenya.

7.4.2.1. Kenya

Kenya's food supply comprises domestic production, food imports and food aid. The country's regression results are summarised in Table 7.1.

Table 7.1: Estimated Growth Rates of Food Security Indicators in Kenya, 1961-2007

Period	Population Growth Rate (%) [1]	Estimated Growth Rates (%) [2]			
		Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	3.326	3.251 ***	3.250 ***	-0.259 N.S.	0.437 N.S.
1981-2007	2.978	1.119 ***	1.939 ***	-1.122 **	8.063 ***
1961-2007	3.207	1.474 ***	2.026 ***	-1.370 ***	8.794 ***

* statistically significant at 10%
** statistically significant at 5%
*** statistically significant at 1%
N.S. statistically non-significant

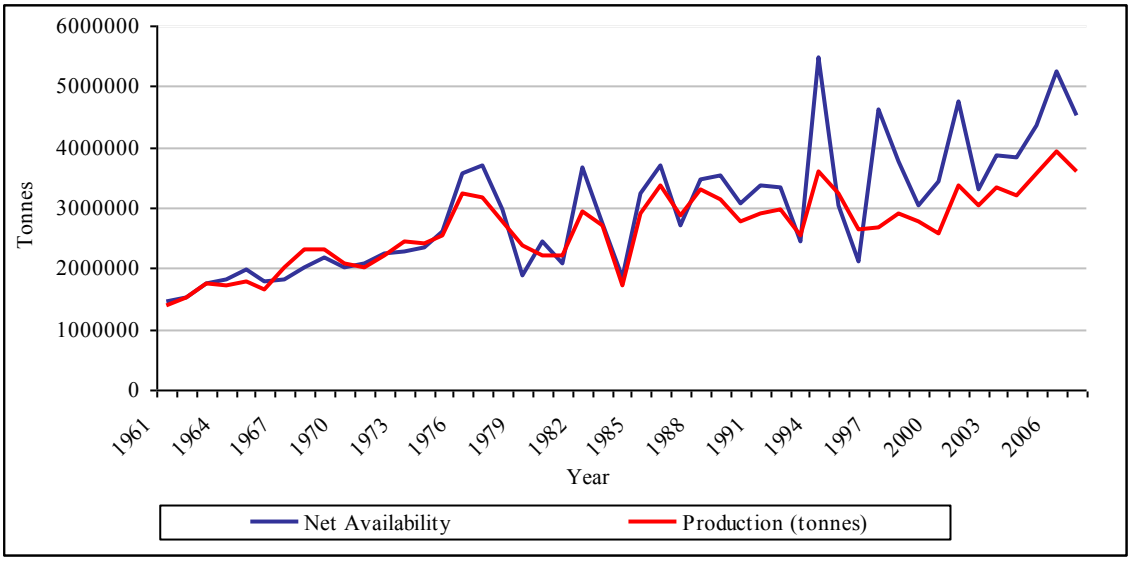
[1] Calculated using the growth rate formula: $r = \ln(x_n/x_1)/n$
[2] Refer to Appendix B for full set of regression results

Source: Author's calculation based on FAOSTAT data. FAOSTAT 2010.

The regression results in Table 7.1 show that cereal production in Kenya grew an estimated 1.474% per annum for the whole period (1961-2007). This appears to be acceptable, as the sub-Saharan African region has been characterised by a decline in production since the 1960s. However, when compared to the population growth, calculated to be 3.207% per annum for the same period, it is clear that the population grew 2,175 times faster than cereal production. This is indicative of Kenya's diminishing ability to meet its food requirement through domestic production.

The estimated growth in the net availability of cereals (2.026%) is higher than the growth of cereal production in Kenya, but lower than the population growth rate for the period 1961-2007. This illustrates that even with the inclusion of cereal imports, the country's food supply does not match its population growth. The population growth is estimated to have grown 1.58 times more than the net availability of cereals. This is further confirmed by the analysis of the per capita availability of cereals. The results indicate that the estimated growth over the 1961-2007 period was -1.370%. Furthermore, the estimated growth in imports (8.794%) over this period was robust. However, this failed to raise the growth in the net availability of cereals to being higher than the growth in population. Given the performance of the supply-side food security indicators and the heavy dependence on imports in Kenya, it is likely that food insecurity will persist, unless domestic production improves significantly and thereby supports the rapidly increasing population. The increasing dependence on cereal imports is reflected in the 6.57% growth in Kenya's import dependence and in the net availability of cereals exceeding cereal production. This is depicted in Figure 7.2. It is clear that during the period analysed, the net availability of cereals in Kenya was greater than cereal production for a number of years.

Figure 7.2: Production and Net Availability of Cereals in Kenya, 1961-2007



Source: Author's calculations based on FAOSTAT database information (FAOSTAT, 2010)

Deconstructing the period into two sub-periods (1961-1980 and 1981-2007) provides further insight into the food security situation in Kenya and the effects of structural adjustment programmes on food production. The estimated annual growth in cereal

production and net availability of cereals was 3.251% and 3.250%, respectively. These estimated growth rates are impressive relative to the growth rate for the whole time series (1961-2007). The growth in cereal production and net availability of cereals was only slightly below the population growth rate. This indicates that between 1961 and 1980, Kenya was almost able to meet its food demand through domestic production and thus was close to being food self-sufficient. The estimated growth in the availability of cereals per capita was, however, negative, but this coefficient was also statistically insignificant. This period was further characterised by a low estimated growth in imports, namely 0.437%. This coefficient, however, was also statistically insignificant.

Isolating the 1961-1980 period (the post-independence period), it is evident that Kenya's food security situation from the supply side was more impressive during this time than over the whole period, which spans 47 years. The next sub-period, 1981-2007, is characterised by the implementation of structural adjustment programmes and economic reforms. It reveals a different and worsening food security situation. The estimated growth in the production of cereals declined from 3.251% per annum in the 1961-1980 period to 1.119% per annum in the 1981-2007 period. This estimated growth is lower than the overall growth of the whole 1961-2007 period and is well below the population growth rate, 2.978%, for this period.

The Kenyan population grew 2.66 times faster than domestic cereal production. The robust growth in cereal production experienced in the previous period dwindled considerably in the 1981-2007 period, which worsened Kenya's food security situation. The net availability of cereals also experienced a considerably low estimated annual growth for the 1981-2007 period (1.939%). This was in contrast to the strong growth of 3.250% per annum in the 1961-1980 period. Considering the low growth achieved and the increasing growth in population, Kenya has failed to meet its food requirements through domestic supply for the 1981-2007 period. Kenya's per capita availability of cereals declined between the 1961-1980 period and the 1981-2007 period, during which time the estimated growth was -1.122% per annum. However, this is a statistically insignificant coefficient. Cereal imports, however, have considerably increased, achieving an estimated growth of 8.063% per annum. This large increase in import growth in the 1981-2007 period has reversed any positive moves towards food self-sufficiency that occurred in the 1961-1980 period.

It is clear that the food security situation between 1980 and 2007 was significantly worse than during the 1961-2007 period, as well as the whole period (1961-2007). The poor performance of the food security indicators in the 1981-2007 period is consistent with, and stems from, the poor performance of the agricultural sector after the implementation of structural adjustment programmes. This poor agricultural performance can be attributed to increased input costs due to the removal of input subsidies, the collapse of credit facilities on which farmers relied and the removal of extension services and marketing boards with the adoption of economic reforms associated with the structural adjustment programmes (Karugia, 2003).

7.4.2.2. Tanzania

The food security situation in Tanzania appears to be somewhat better than in Kenya for the entire 1961-2007 period (Table 7.2).

Table 7.2: Estimated Growth Rates of Food Security Indicators in Tanzania, 1961-2007

Period	Population Growth Rate (%)[1]	Estimated Growth Rates (%)[2]			
		Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	2.937	5.783 ***	6.064 ***	2.953 *	5.124 **
1981-2007	2.824	2.189 ***	2.140 ***	-0.797 N.S.	6.386 ***
1961-2007	2.938	3.942 ***	3.934 ***	0.881 ***	4.813 ***

* statistically significant at 10%
** statistically significant at 5%
*** statistically significant at 1%
N.S. statistically non-significant

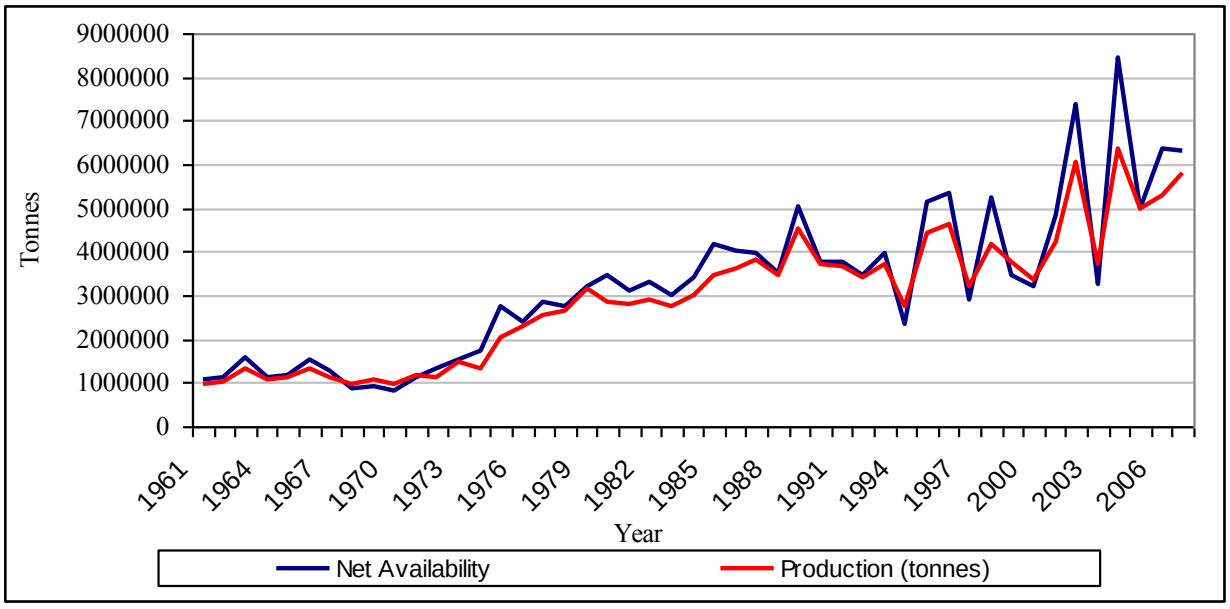
[1] Calculated using the growth rate formula: $r = \ln(x_n/x_1)/n$
[2] Refer to Appendix C for full set of regression results

Source: Author's calculation based on FAOSTAT data. FAOSTAT 2010.

Tanzania's cereal production grew an estimated 3.942% per annum. This estimated growth exceeded the population growth rate of 2.938% for the same period. Furthermore, the estimated growth of the net availability of cereals for this period was 3.934% per annum. This illustrates Tanzania's ability to meet the food requirements with domestic production.

In addition, this shows that Tanzania is relatively more food self-sufficient than Kenya. The per capita availability of cereals in Tanzania grew at an annual rate of 0.881%. Although low, this is a better result than results achieved by a number of sub-Saharan African countries, which have experienced a continual decline in per capita food availability since 1960. Over and above the strong estimated growth in cereal production, cereal imports have grown at an estimated 4.813% per annum. This may suggest that Tanzania is not heading towards being food self-sufficient. However, when analysing the growth in import dependency ratios for the period 1961-2007, it is clear that Tanzania's growth in import dependence was 0.8%. In addition, Tanzania's reliance on cereal imports to meet food demand is significantly lower than in Kenya and Uganda. This is depicted in Figure 7.3, where it can be seen that the differences between cereal production and net availability are much smaller than in Kenya.

Figure 7.3: Production and Net Availability of Cereals in Tanzania, 1961-2007



Source: Author's calculations based on FAOSTAT database information (FAOSTAT, 2010)

Cereal production and the net availability of cereals had an estimated annual growth rate of 5.783% and 6.064%, respectively, between 1961 and 1980. This robust growth was 2.85 times that of population growth for cereal production, and 3.13 times that of population growth for the net availability of cereals. This shows that Tanzania could more than adequately meet its food demand for this period. The annual estimated growth of per capita availability of cereals for the 1961-1980 period was positive (2,953%) and exceeded the

population growth rate, which further reiterates Tanzania's ability to satisfy its food demand with domestic production. In addition, cereal imports had a robust estimated growth of 5.124%, but this does not accurately reflect the reliance of Tanzania's food supply on cereal imports to meet food demand, since the growth in import dependency was -0.76% over this period.

The introduction of structural adjustment programmes in Tanzania appears to have dampened the strong growth in cereal production, net availability of cereals and per capita availability of cereals between 1961 and 1980. The production of cereals between 1981 and 2007 grew modestly at 2.189% per annum, but this growth was less than half that experienced in the 1961-1980 period. Furthermore, the estimated annual growth of cereal production is now lower than the growth rate of the population. The net availability of cereals has also experienced a decline in estimated annual growth; it is now at 2.140%. This is considerably lower then the strong estimated growth of 6.064% in the 1961-1980 period. In addition, this estimated growth is lower than the population growth rate.

Since the estimated growth of cereal production and net availability of cereals are both lower than the population growth, it is evident that Tanzania's ability to meet its food demand has been reversed and it is no longer as food self-sufficient as it was in the 1961-1980 period. The per capita availability of cereals has moved from having a strong, positive estimated growth to having a negative and declining growth rate, -0.797. Despite this considerable decline in growth from 1961-1980 to 1981-2007, the coefficient of the per capita availability of cereals was found to be statistically insignificant. Not surprisingly, cereal imports grew an estimated 6.386% per annum during the period. This increase in the growth of cereal imports indicates that the growth of domestic production was too low to sustain Tanzania's food needs and, thus, an increase in cereal imports was necessary to reduce the deficit between the supply and demand for food during this period.

7.4.2.3. Uganda

Uganda's food security situation between 1961 and 2007 is characterised by poor growth in the supply-side food security indicators. Table 7.3 summarises the estimated growth rates of various supply-side food security indicators for Uganda.

Table 7.3: Estimated Growth Rates of Food Security Indicators in Uganda

Period	Population Growth Rate (%)[1]	Estimated Growth Rates (%)[2]			
		Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	2.956	2.632 ***	2.381 **	-0.706 N.S.	-7.281 **
1981-2007	3.163	3.509 ***	4.149 ***	0.8515 N.S.	13.532 ***
1961-2007	3.139	1.781 ***	1.778 ***	-0.142 ***	5.578 ***

* statistically significant at 10%
** statistically significant at 5%
*** statistically significant at 1%
N.S. statistically non-significant

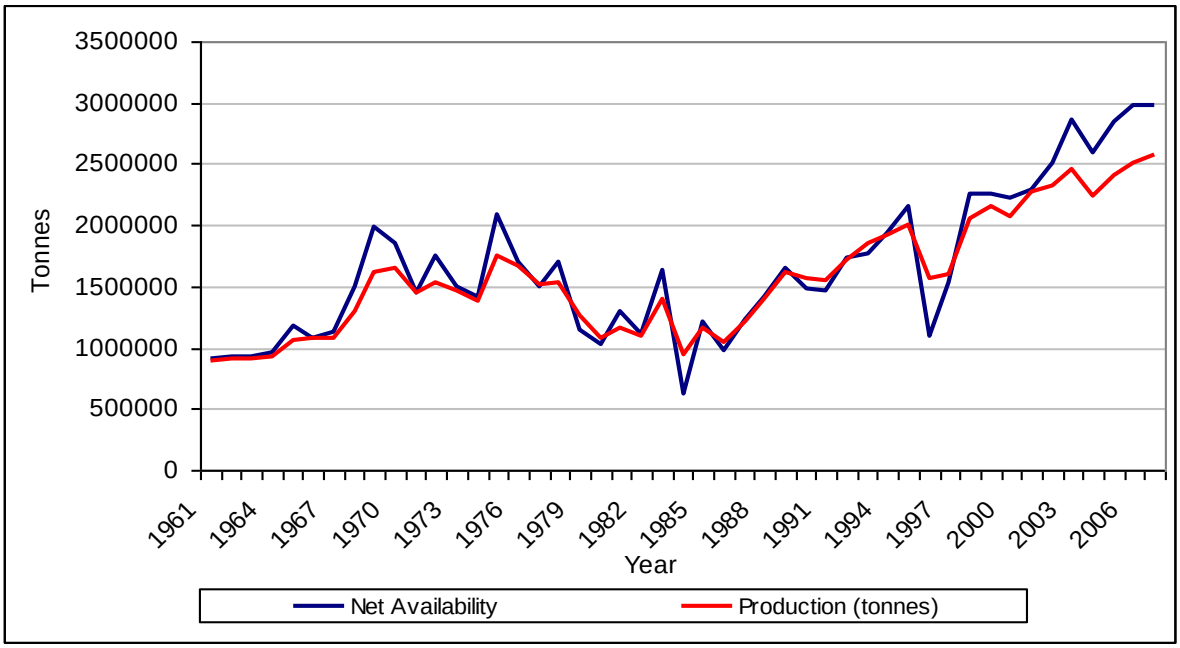
[1] Calculated using the growth rate formula: $r = \ln(x_n/x_1)/n$
[2] Refer to Appendix D for full set of regression results

Source: Author's calculation based on FAOSTAT data. FAOSTAT 2010.

The production of cereals is estimated to have grown annually by a modest 1.781%. The growth in population, 3.139%, far exceeds the growth in cereal production. The net availability of cereals had a similar estimated growth, 1.778%. This illustrates that Uganda, like Kenya, has not been able to satisfy its food requirements with domestic production alone.

Not surprisingly, the estimated growth of per capita availability of cereals is negative (-0.142%). This declining growth in per capita availability of cereals accords with the predicament experienced by many sub-Saharan African countries: their food production cannot keep pace with their population growth. The strong estimated growth in cereal imports, 5.578% per annum, further validates Uganda's poor ability to meet food requirements through domestic production. The robust growth of cereal imports is indicative of the increasing need for imports to supplement food supply, which is corroborated by the 3.6% growth in import dependency over the 1961-2007 period. Figure 7.4 illustrates the large differences between the net availability of cereals and cereal production. This highlights Uganda's reliance on imports to supplement its food supply.

Figure 7.4: Production and Net Availability of Cereals in Uganda, 1961-2007



Source: Author's calculations based on FAOSTAT Database information (FAOSTAT, 2010)

The food security situation in Uganda during the 1961-1980 period and the 1981-2007 period differ; in addition, the trends experienced in these periods differ from those experienced in Kenya and Tanzania. The 1961-1980 period demonstrated fair growth in terms of the food security indicators. For example, cereal production and the net availability of cereals achieved estimated annual growth rates of 2.623% and 2.381%, respectively. These estimated growth rates are slightly lower than the population growth rates and thus indicate that Uganda was close to meeting its food requirements through domestic production in this period. The growth in per capita availability of cereal is not only negative (-0.706%), but is also a statistically insignificant coefficient. Uganda experienced a considerable decline in the growth of cereal imports over this period (-7.281%). This, along with negative growth in the dependency on imports (-9.89%) for this period, strongly indicates that Uganda's domestic supply was not heavily reliant on imports to supplement its food supply; rather, it was moving towards becoming a food self-sufficient country.

The period characterised by structural adjustment programmes (1981-2007) saw deteriorating food security situations in both Kenya and Tanzania. Uganda, however, experienced an improvement in the growth of food security indicators over this period. The estimated growth in cereal production of 3.50% per annum surpassed the growth of the

population (3.163%). Uganda is thought to represent how structural adjustment programmes should benefit a country, as it experienced improved economic growth and enhanced performance of various major sectors. The agricultural sector has not performed as well as other sectors of the Ugandan economy, but it has performed better than other agricultural sectors in sub-Saharan Africa. This improved performance of the agricultural sector may be a major contributing factor to the growth in cereal production. The net availability of cereals demonstrated a strong estimated annual growth of 4.149%. This is almost double the growth of the net availability of cereals in the 1961-1980 period; it has also exceeded the population growth. The per capita availability of cereals experienced positive growth during this period, but this coefficient was found to be statistically insignificant. Interestingly, cereal imports grew rapidly, at an estimated 13.532% per annum. Uganda's import dependence grew 9.43% over this period. This shows that, despite strong growth in cereal production over this period, Uganda was increasingly reliant on cereal imports.

7.4.3. Variability of Food Security Indicators

The variability of food security indicators is measured by the size of the coefficient of variation and it provides an indication of the presence of transitory food insecurity. Table 7.4 provides a summary of the calculated coefficient of variations for each food security indicator in Kenya across the various periods. The variability in the production of cereals increased from 11.88 in the 1961-1980 period to 13.24 in the 1981-2007 period; it was 14.98 for the whole period (1961-2007). The variability in the net availability of cereals and per capita availability of cereals had similar trends, with variability for both indicators being higher than that of cereal production; they increased by approximately 6.55 from 1961-1980 to 1981-2007. However, the variability of both the net availability of cereals and per capita availability of cereals over the whole period were lower than in the 1981-2007 period. The high variability in the net availability of cereals relative to cereal production demonstrates that Kenya has not managed to use cereal imports and stocks to stabilise the availability of food during all periods reviewed. The variability of all food security indicators, with the exception of cereal imports, is highest during the period characterised by structural adjustment programmes (1981-2007), followed by the period prior to these adjustment programmes. Thus, this suggests that Kenya has experienced transitory food insecurity during this period.

Table 7.4: Variability of Food Security Indicators in Kenya, 1961-2007

Period	Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	11.88	15.6	15.66	168.48
1981-2007	13.24	22.15	22.11	54.57
1961-2007	14.98	20.72	20.53	113.38

Source: Author's calculations based on FAOSTAT data (FAOSTAT, 2010)

The variability of food security indicators in Tanzania differs somewhat from that in Kenya. Table 7.5 summarises the coefficient of variation results for Tanzania. There have only been slight changes in the variability of food security indicators, bar cereal imports, across the various periods, with each indicator experiencing the greatest variability over the whole period (1961-2007).

When analysing the variability of food security indicators for the 1961-1980 period and the 1981-2007 period, it is clear that the 1961-1980 period demonstrates greater variability across all indicators, except for cereal imports. This suggests that Tanzania experienced transitory food insecurity in the 1961-1980 period. The high variability in the net availability of cereals and per capita availability of cereals illustrates Tanzania's inability to stabilise food availability through imports and stocks, which increases its vulnerability to food insecurity. The presence of transitory food insecurity in the 1981-2007 period can be attributed to declining staple food production and the removal of vital agricultural input subsidies due to economic restructuring under the structural adjustment programmes.

Table 7.5: Variability of Food Security Indicators in Tanzania, 1961-2007

Period	Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	21.08	26.49	26.31	26.31
1981-2007	20.88	24.64	24.93	51.93
1961-2007	22.49	28.17	27.92	68.44

Source: Author's calculations based on FAOSTAT data (FAOSTAT, 2010)

Table 7.6 provides the coefficient of variation calculations for food security indicators in Uganda. The variability of all food security indicators is greatest over the whole period, 1961-2007. It is clear that Uganda, like Kenya and Tanzania, has not stabilised the availability of food through imports and stocks, since the variability in the net availability of cereals and the per capita availability of cereals are 7.51 and 7.11 times greater than the variability in cereal production, respectively.

The period prior to the adoption of structural adjustment programmes (1961-1980) demonstrates the largest variability in all of the food security indicators, but the variability in food security indicators for the period after structural adjustment programmes were implemented (1981-2007) has declined considerably. Therefore, this indicates that Uganda experienced transitory food insecurity between 1961 and 1980. However, between 1981 and 2007, this short-term risk of food insecurity declined significantly. This is consistent with the positive performance of the agricultural sector under structural adjustment programmes. This positive performance is supported by the decline in the variability of cereal production, which experienced the greatest decline between the 1961-1980 period and the 1981-2007 period relative to the variability in both the net availability of cereals and the per capita availability of cereals.

Table 7.6: Variability of Food Security Indicators in Uganda, 1961-2007

Period	Cereal Production	Net Availability of Cereals	Per Capita Availability of Cereals	Cereal Imports
1961-1980	16.58	23.25	22.79	84.77
1981-2007	10.29	18.58	18.63	73.91
1961-2007	18.13	25.64	25.24	95.66

Source: Author's calculations based on FAOSTAT data (FAOSTAT, 2010)

7.5. Conclusion

The trend and variability in supply-side food security indicators at an aggregate level varies across countries and periods, as does import dependency. The growth in the cereal production of Kenya and Uganda is lower than the population growth over the 1961-2007 period. This is problematic as these countries have not been able to meet food demand

through domestic production over the long term and, therefore, are not food self-sufficient. It is also worrisome that the growth in per capita availability of cereals has declined overall.

Kenya has experienced faster growth in import dependence than Tanzania between 1961 and 2007. Therefore, one can deduce that Kenya is becoming increasingly more dependent on cereal imports to supplement its food supply. In addition, Kenya has experienced the highest growth in cereal imports relative to both Tanzania and Uganda. Cereal production in Uganda, on the other hand, has exceeded population growth over the 1961-2007 period. This indicates that Uganda has the ability to meet its food demand through domestic production and this may account for the low growth in its import dependence over this period.

The adoption of structural adjustment programmes appears to have negatively affected the food security situation in Kenya and Tanzania, as the growth obtained for 1981-2007 was considerably lower than in the previous period (1961-1980) and in the overall period. This shows that the declining agricultural performance synonymous with structural adjustment programmes has heavily impacted on food security in many sub-Saharan African countries. Although this study only examines the supply side of food security, the demand side is also expected to have been adversely affected by the structural adjustment programmes. This compounds the supply-side food security problem, as it signals diminished access to food. However, structural adjustment programmes have not negatively affected the food security of some countries. In the case of Uganda, the introduction of structural adjustment programmes resulted in the country achieving high growth rates in the 1981-2007 period. This indicates that the country has good policies in place and that the agricultural sector's performance improved.

Given the results of this study, it is rather unlikely that Kenya and Tanzania can become food secure in the short term, as both countries failed to increase cereal production to sufficient levels to keep pace with the rapidly increasing population. Droughts and erratic rainfall compound their food security problem. Both countries need to reduce their heavy reliance on food imports to meet food demand. Uganda has an optimistic outlook: Its long-term aggregate food security may improve, as the country has demonstrated that its long-term growth in cereal production can exceed the growth in population and it has benefited from structural adjustment programmes.

CHAPTER 8: CONCLUSION AND RECOMMENDATIONS

Sub-Saharan Africa lags behind the rest of the world in terms of its trade performance. This is partly attributed to its continued dependence on primary commodities exports. The region's heavy dependence on primary commodities has brought with it a number of problems, including price shocks, poor governance, increased risk of civil wars, food insecurity and a susceptibility to poverty traps. We now provide some conclusions of the dissertation for its three (section 1.4 in chapter 1) stated research areas, namely, dependence, diversification through organic production and a quantitative analysis.

An analysis and discussion of sub-Saharan Africa's trade and economic performance between 1960 and 2008 in chapter 2 as part of the dependence research issue shows that the region's performance is well below that of the rest of the world and, more importantly, lower than other developing regions. The region's export structure has not changed much since the 1980s and it still largely comprises primary commodities. As a result, sub-Saharan Africa's share in world merchandise trade has been considerably lower than that of other developing regions, whose shares in world trade have increased substantially since the 1960s. The region has experienced a falling share in world trade as well as declining terms of trade since the 1980s. This has been exacerbated by the volatility of primary commodity prices. In addition, the economic growth of the region has not been impressive relative to that of other regions, such as Asia.

Export diversification is a widely acknowledged solution to combating and reducing primary commodity dependence and this can take the form of vertical export diversification or horizontal export diversification. Given sub-Saharan Africa's heavy dependence on primary commodities, it is evident that the region has failed to diversify its export base away from primary commodities. This is further substantiated by sub-Saharan Africa's high score using the Normalised Hirschman Index. However, there have been sporadic export diversification attempts in Kenya, Tunisia, Uganda, Mauritius and Tanzania, but these efforts have not transformed the region's overall export structure. The above summarises the findings of the dissertation in chapters 2 and 3 concerning the first research area; the causes and economic problems associated with food security.

We now turn to the second research issue concerning organic product diversification. Because agriculture is a significant contributor to most sub-Saharan African economies, it

has been suggested that horizontal export diversification may be a more viable option for the region than vertical export diversification. Thus, this study proposed that sub-Saharan Africa should focus its export diversification efforts on diversifying within its agricultural sector, since the region is land, labour and resource abundant. The export diversification strategy advocated in this study focuses on moving toward non-traditional agricultural commodities and, specifically, on the potential diversifying role that organic agriculture can play.

Organic agriculture in sub-Saharan Africa could be profitable for smallholder farmers. This issue was critically examined in the study by looking at the interaction of three variables, namely price, quantity and total costs. In regions such as sub-Saharan Africa, organic agriculture fetches higher prices than non-organic equivalents; it also has lower production costs than conventional farming and higher yields than those associated with the traditional subsistence farming methods practised in the region. This is substantiated by case studies. However, the number of case studies based on sub-Saharan African countries is limited due to the small size of the certified organic sector in the region. In addition to the economic benefits organic agriculture offers are the many environmental benefits. These include improved soil structure and fertility, reduced soil erosion, enhanced biodiversity, the potential to mitigate climate change and the substantially reduced energy consumption needed relative to that of conventional agricultural practices.

Organic agriculture has the potential to improve the worsening food security plight of sub-Saharan Africa through increasing the availability of food and improving access to food. Organic agriculture increases the availability of food because it can increase and stabilise yields over the long term. A limited number of simulation models have found that in areas such as sub-Saharan Africa, organic agriculture has the potential to increase the food supply. Organic agriculture can potentially improve access to food in sub-Saharan Africa as improved yields, lower input costs and reduced debt requirements raise income levels, resulting in better access to food at household level for smallholder farmers. For rural communities, an improvement in income can result due to the high and constant demand for labour (as organic agriculture is more labour intensive than conventional agriculture).

Further, as regards the policy aspects of the second research area we found sub-Saharan Africa faces a number of challenges and constraints that may hamper the growth and development of a certified organic agricultural sector. These include a number of non-tariff

barriers that impede market access, high certification costs, lacking local certification boards and limited government support, education and infrastructure. At present, much of sub-Saharan Africa's organic sector has been developed through the private sector and NGOs; however, in order to develop a successful region-wide certified organic agricultural sector geared for the export market, it is essential that governments become more involved and provide more support. This is contrary to policies implemented under the failed structural adjustment programmes of the 1980s, which encouraged governments not to be involved in major sectors.

The analysis of the dissertation in chapters 4 and 5 concerning the research issue of organic product diversification shows that it is essential that governments include organic agriculture within their policy framework and budgets. This will improve public sector and government awareness of organic agriculture and stimulate financial support for farmers. Furthermore, research and training are vital components in the growth of the sector, as is establishing integrated supply chains that link farmers and export markets. The embryonic organic agricultural sector must focus on producing quality goods, as organic markets and prices focus on quality. A long-term objective for sub-Saharan African governments should be to establish a local certification body that addresses the needs of the region but in accordance with international standards. Having local certification bodies would lower the certification costs and could make organic agriculture more attractive to farmers.

Despite sub-Saharan Africa's small and relatively untapped organic agricultural sector, countries such as Uganda, Kenya and Tanzania have succeeded in developing their organic production and an analysis of these developments in chapter 6 introduces the quantitative research issue on food security. Their organic agricultural sectors primarily focus on the export market and these countries are making headway in establishing local certification bodies to further improve and grow the sector. From the literature review, it is apparent that the organic agricultural projects implemented in these countries by various local and international NGOs have been successful. They still operate efficiently because they incorporate extensive research and training, internal control systems, extension officers and financial assistance to emerging farmers. Because farmers in these countries are predominantly smallholders, a number of these projects involve group certification, which appears to benefit both farmers and exporters. The success of the small organic agricultural sectors in Uganda, Kenya and Tanzania indicate that organic agriculture could be

successful in sub-Saharan Africa and provide the region with a feasible way to enter the niche global market.

This dissertation conducts an empirical analysis of Kenya, Tanzania and Uganda to cover part of the final research area, addresses the supply side of food security between 1961 and 2008. The supply-side food security situation was further analysed according to two sub-periods: 1961-1980 and 1981-2008. The break in the times series was substantiated by the implementation of structural adjustment programmes in the 1980s. The results show that Kenya and Tanzania experienced worse food security in the 1980-2008 period than in the period before the structural adjustment programmes were implemented (1961-1980) and that they have become increasingly dependent on food imports. In addition, Kenya and Tanzania's cereal production and cereal availability have not kept pace with their population growth.

The empirical results related to Uganda reveal a different scenario. Uganda's food security appears to have been positively affected by the introduction of structural adjustment programmes, as its cereal production and cereal availability exceeded the population growth for the 1981-2007 period. This can be attributed to the growth of Uganda's agricultural sector in the post-structural adjustment period. This study therefore concludes that, given the trend and variability of the supply-side food security indicators for Kenya and Tanzania, their food security outlook is dire. With Uganda, on the other hand, it is relatively optimistic.

The food security situation in Kenya, Tanzania and Uganda mirrors that found in many sub-Saharan African countries and it is evident that organic agriculture has been relatively successful in these three countries. However, these countries' organic sectors are still small and they have not yet positively influenced the aggregate food security; these countries are, to varying degrees, still food insecure. If organic agriculture has access to improved research and development, increased government involvement, sound policies, finance and local certification bodies, it can potentially reduce food insecurity and improve sub-Saharan Africa's status in world trade which covers the last research area.

A major limitation to this study is the lack of available real data on certified organic agriculture in sub-Saharan Africa. This is partly due to the fact that agricultural export data does not distinguish between conventional produce and organic produce as well as sub-

Saharan African governments' ignorance of organic production, which results in poor data collection at country level. The limited case studies support the promising potential of organic agriculture in sub-Saharan Africa; however, these studies are largely of a short-term nature, as organic agriculture is still in its infancy in sub-Saharan Africa. This is problematic when attempting to identify trends and the long-term profitability of organic agriculture. Therefore, there is a great need for further empirical research on the profitability of organic agriculture in countries other than Kenya, Tanzania and Uganda. There is a further need for research on the long-term impact of government involvement in certified organic sectors. The lack of local certification bodies calls for research on the feasibility of such bodies at a regional level. However, the results of the work in all three research areas suggest that there are unexploited gains in the nexus between food security and organic production, thus government has an important policy role to play to ensure these gains are optimised.

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APPENDICES

Appendix A: Calculation of Import Dependency Ratios Growth Rates

Figure A.1: Import Dependency of Kenya, 1961-1980

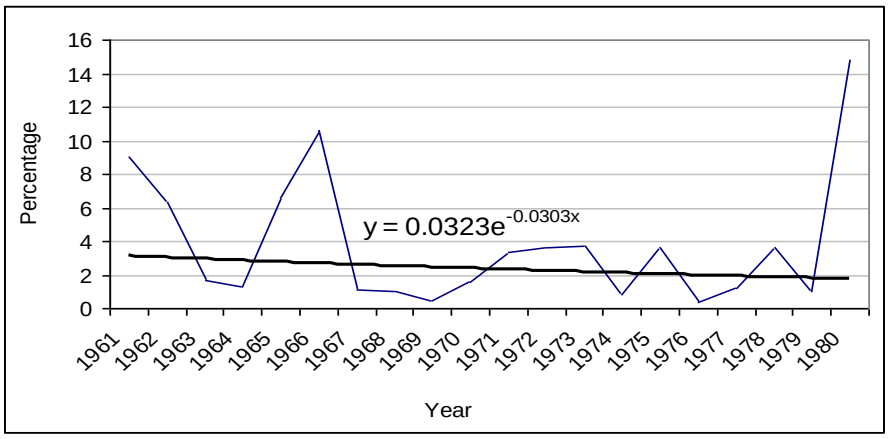


Figure A.2: Import Dependency of Kenya, 1981-2007

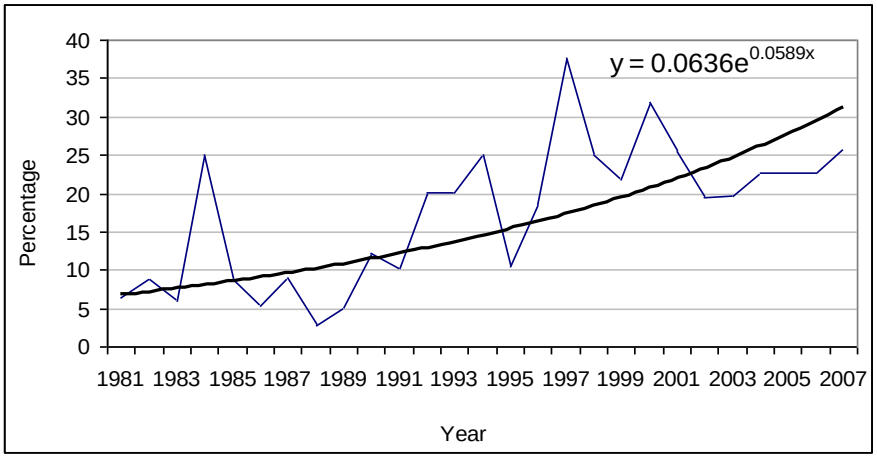


Figure A.3: Import Dependency of Kenya, 1961-2007

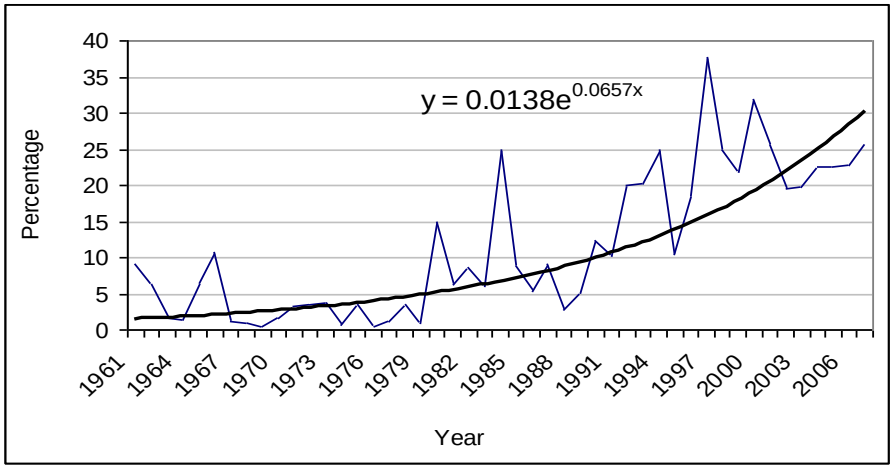


Figure A.4: Import Dependency of Tanzania, 1961-1980

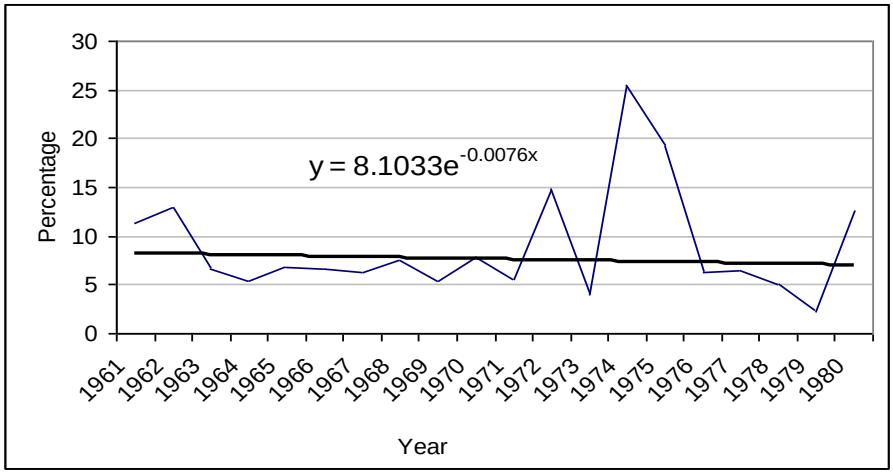


Figure A.5: Import Dependency of Tanzania, 1981-2007

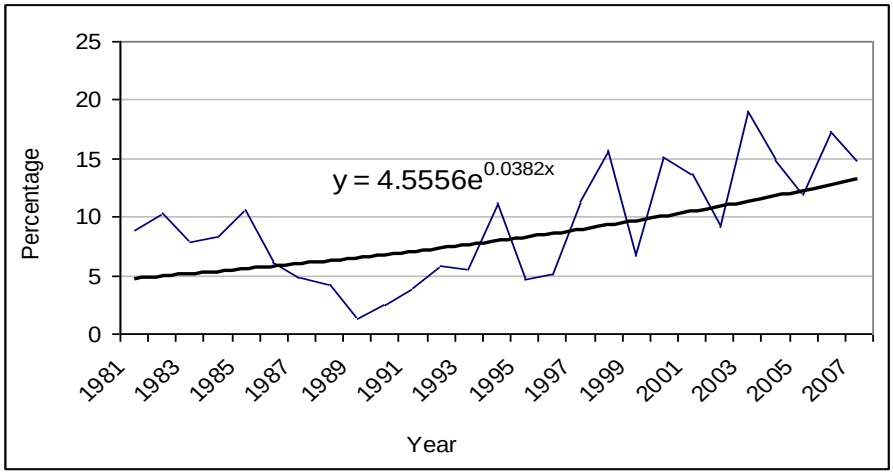


Figure A.6: Import Dependency of Tanzania, 1961-2007

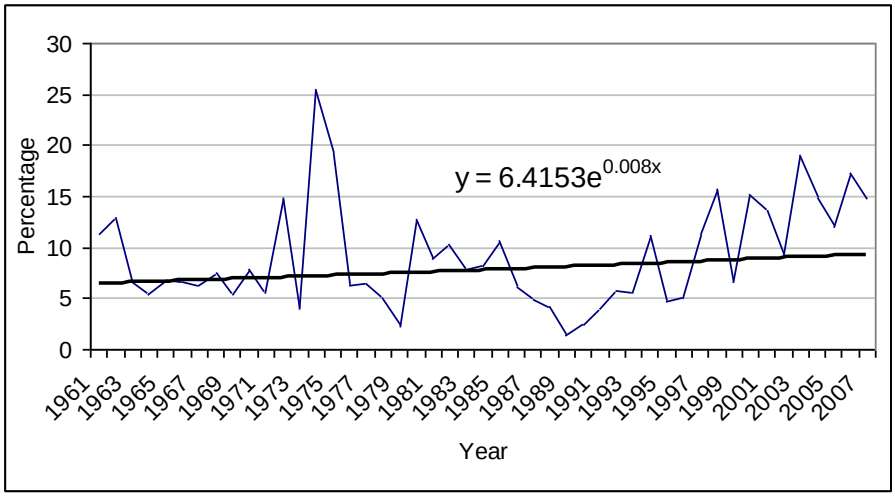


Figure A.7: Import Dependency of Uganda, 1961-1980

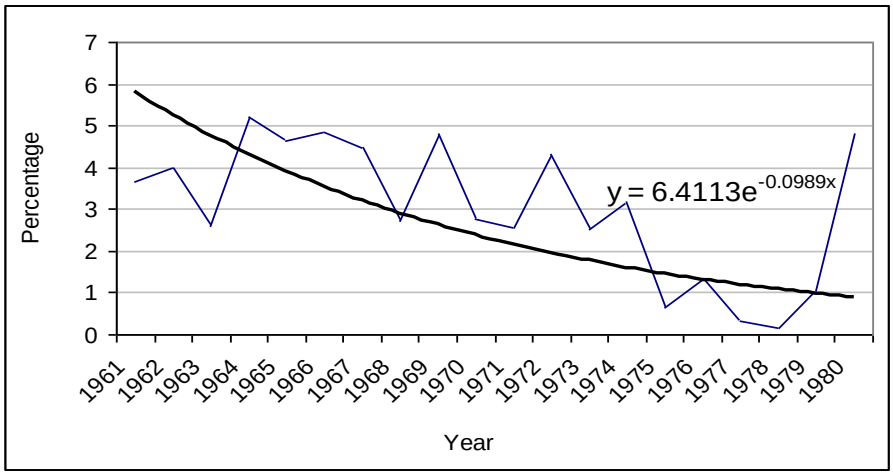


Figure A.8: Import Dependency of Uganda, 1981-2007

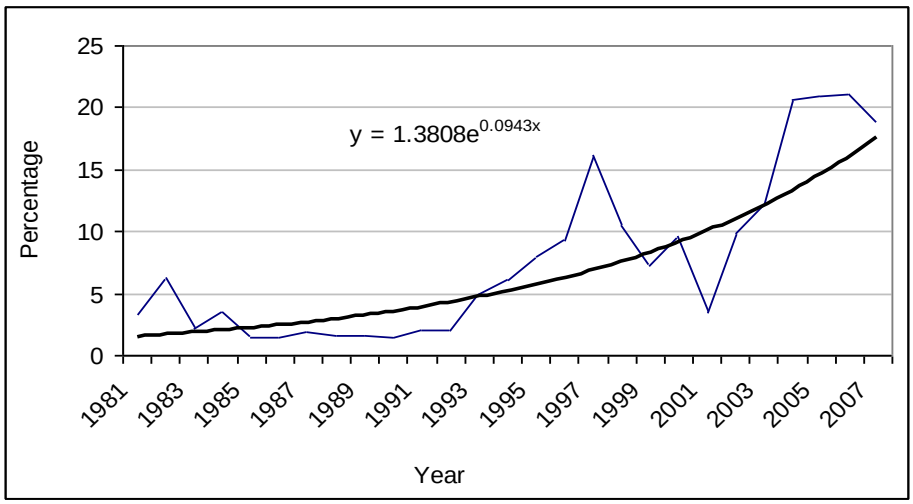
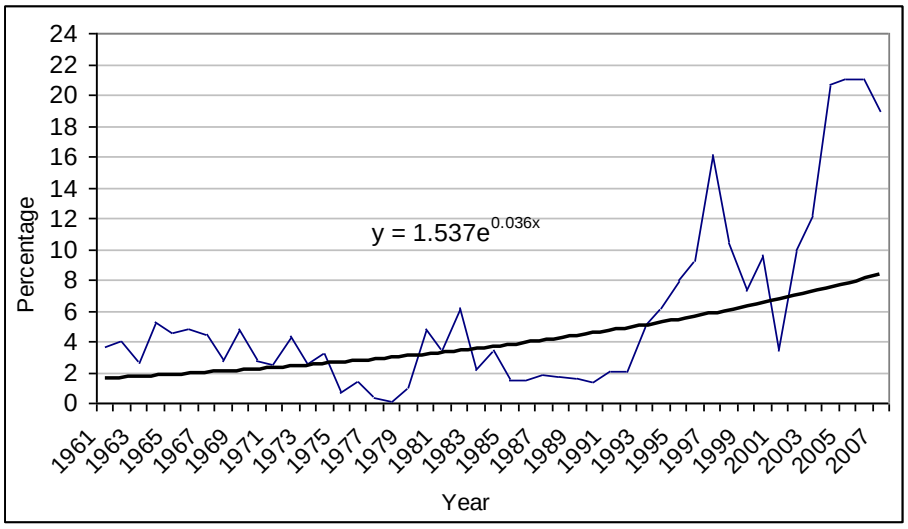


Figure A.9: Import Dependency of Uganda, 1961-2007



Appendix B: Regression Results: Kenya

Table B.1: Regression Results: Production, 1961-1980

Regression Statistics	
Multiple R	0.844831436
R Square	0.713740154
Adjusted R Square	0.69783683
Standard Error	0.125138149
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.702799849	0.702799849	44.87993332	2.77972E-06
Residual	18	0.281872016	0.015659556		
Total	19	0.984671865			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.23289437	0.058130607	244.8433821	3.66963E-33	14.1107665	14.35502224
X Variable 1	0.032509105	0.004852649	6.699248713	2.77972E-06	0.022314067	0.042704142

Table B.2: Regression Results: Net Availability, 1961-1980

Regression Statistics	
Multiple R	0.77526466
R Square	0.601035293
Adjusted R Square	0.578870588
Standard Error	0.160962463
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.702566144	0.702566144	27.11677275	5.9397E-05
Residual	18	0.466360459	0.025908914		
Total	19	1.168926603			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.24049406	0.074772127	190.4519051	3.37093E-31	14.0834037	14.39758447
X Variable 1	0.032503699	0.006241857	5.207376763	5.93971E-05	0.01939004	0.045617353

Table B.3: Regression Results: Per Capita Availability, 1961-1980

Regression Statistics	
Multiple R	0.09640134
R Square	0.00929322
Adjusted R Square	-0.04574605
Standard Error	0.16260157
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.004464193	0.004464193	0.168847052	0.685989
Residual	18	0.475906884	0.026439271		
Total	19	0.480371077			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.25614102	0.075533545	69.5868439	2.43479E-23	5.0974509	5.414831105
X Variable 1	-0.00259096	0.006305419	-0.410910029	0.68598902	-0.0158382	0.010656233

Table B.4: Regression Results: Imports, 1961-1980

Regression Statistics	
Multiple R	0.02626
R Square	0.00069
Adjusted R Square	-0.05483
Standard Error	1.013007
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.012746074	0.012746074	0.012420854	0.91249376
Residual	18	18.47130109	1.026183394		
Total	19	18.48404716			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	10.7591	0.470573665	22.8637914	9.44809E-15	9.77045954	11.7477367
X Variable 1	0.004378	0.039282731	0.111448885	0.912493756	-0.07815194	0.08690797

Table B.5: Regression Results: Production 1981-2007

Regression Statistics	
Multiple R	0.531944392
R Square	0.282964836
Adjusted R Square	0.25428343
Standard Error	0.144209052
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.205171517	0.205171517	9.86579357	0.00429251
Residual	25	0.519906269	0.020796251		
Total	26	0.725077786			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.51796401	0.124285762	116.81116	9.46675E-36	14.26199269	14.77393533
X Variable 1	0.011191842	0.003563162	3.140986082	0.00429251	0.003853373	0.018530312

Table B.6: Regression Results: Net Availability, 1981-2007

Regression Statistics	
Multiple R	0.567897804
R Square	0.322507916
Adjusted R Square	0.295408233
Standard Error	0.227523932
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.616070386	0.616070386	11.90080018	0.00200218
Residual	25	1.294178494	0.05176714		
Total	26	1.91024888			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.37371659	0.196090223	73.30154634	1.04902E-30	13.9698612	14.77757197
X Variable 1	0.01939359	0.005621732	3.44975364	0.002002176	0.00781542	0.030971764

Table B.7: Regression Results: Per Capita Availability, 1981-2007

Regression Statistics	
Multiple R	0.369128
R Square	0.13625548
Adjusted R Square	0.1017057
Standard Error	0.22883229
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.206511048	0.206511048	3.943743682	0.0581158
Residual	25	1.309105412	0.052364216		
Total	26	1.51561646			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.24625356	0.197217823	26.60131563	7.39252E-20	4.8400759	5.652431269
X Variable 1	-0.01122832	0.005654059	-1.98588612	0.058115768	-0.0228731	0.000416435

Table B.8: Regression Results: Imports, 1981-2007

Regression Statistics	
Multiple R	0.802034
R Square	0.643259
Adjusted R Square	0.62899
Standard Error	0.486075
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10.65072172	10.65072172	45.07888484	4.9013E-07
Residual	25	5.906713175	0.236268527		
Total	26	16.55743489			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	10.38034	0.418920673	24.77877092	4.09485E-19	9.51755613	11.2431227
X Variable 1	0.080637	0.012010082	6.714081087	4.90131E-07	0.05590144	0.10537189

Table B.9: Regression Results: Production, 1961-2007

Regression Statistics	
Multiple R	0.802645165
R Square	0.644239261
Adjusted R Square	0.636333467
Standard Error	0.151877219
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.879693141	1.879693141	81.48950579	1.16007E-11
Residual	45	1.038001035	0.02306669		
Total	46	2.917694176			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.40667753	0.045023743	319.9795646	3.43162E-77	14.31599505	14.49736
t	0.014742992	0.001633183	9.027153804	1.16007E-11	0.011453593	0.018032391

Table B.10: Regression Results: Net Availability, 1961-2007

Regression Statistics	
Multiple R	0.809454223
R Square	0.65521614
Adjusted R Square	0.647554276
Standard Error	0.203771141
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.550876179	3.550876179	85.51655024	5.6859E-12
Residual	45	1.86852051	0.041522678		
Total	46	5.419396689			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.35473048	0.060407607	237.6311717	2.22296E-71	14.2330633	14.47639765
X Variable 1	0.020263288	0.002191214	9.247515895	5.68586E-12	0.01584996	0.02467662

Table B.11: Regression Results: Per Capita Availability, 1961-2007

Regression Statistics	
Multiple R	0.67908001
R Square	0.46114966
Adjusted R Square	0.44917521
Standard Error	0.20536337
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.624172756	1.624172756	38.51112898	1.545E-07
Residual	45	1.897835144	0.042174114		
Total	46	3.5220079			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.34847808	0.060879621	87.85334046	5.56522E-52	5.2258602	5.471095932
X Variable 1	-0.01370434	0.002208336	-6.205733557	1.54459E-07	-0.0181522	-0.009256528

Table B.12: Regression Results: Imports, 1961-2007

Regression Statistics	
Multiple R	0.831618
R Square	0.691589
Adjusted R Square	0.684735
Standard Error	0.814163
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	66.88888031	66.88888031	100.9092088	4.5122E-13
Residual	45	29.82879017	0.662862004		
Total	46	96.71767048			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	10.02534	0.241357344	41.53734995	1.56392E-37	9.53922583	10.5114631
X Variable 1	0.087947	0.008754951	10.04535757	4.51218E-13	0.07031324	0.10557999

Appendix C: Regression Results: Tanzania

Table C.1: Regression Results: Production, 1961-1980

Regression Statistics	
Multiple R	0.83978374
R Square	0.70523673
Adjusted R Square	0.68886099
Standard Error	0.22727221
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.224470851	2.22447085	43.06595	3.64E-06
Residual	18	0.929747805	0.05165266		
Total	19	3.154218656			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.5746637	0.105575089	128.578283	3.95E-28	13.35286	13.79647
X Variable 1	0.05783657	0.008813238	6.56246547	3.64E-06	0.039321	0.076352

Table C.2: Regression Results: Net Availability, 1961-1980

Regression Statistics	
Multiple R	0.7839
R Square	0.6145
Adjusted R Square	0.593083
Standard Error	0.291955
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.445684268	2.445684	28.692571	4.31979E-05
Residual	18	1.53427577	0.085238		
Total	19	3.979960039			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.62183	0.135622139	100.4395	3.348E-26	13.33689354	13.9067566
X Variable 1	0.060644	0.011321517	5.356545	4.32E-05	0.036858589	0.08442984

Table C.3: Regression Results: Per Capita Availability, 1961-1980

Regression Statistics	
Multiple R	0.526511269
R Square	0.277214116
Adjusted R Square	0.237059345
Standard Error	0.289846635
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.579982261	0.579982261	6.903640764	0.017082
Residual	18	1.512199295	0.084011072		
Total	19	2.092181556			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	4.411313406	0.13464288	32.76306495	1.68676E-17	4.1284392	4.694188
X Variable 1	0.02953225	0.01123977	2.627478023	0.017081986	0.0059184	0.053146

Table C.4: Regression Results: Imports, 1961-1980

Regression Statistics	
Multiple R	0.4454707
R Square	0.19844415
Adjusted R Square	0.15391327
Standard Error	0.62603877
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.74654377	1.74654377	4.45632658	0.04902136
Residual	18	7.0546418	0.39192454		
Total	19	8.80118557			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	11.1453384	0.2908147	38.3245354	1.0421E-18	10.5343593	11.7563174
X Variable 1	0.05124824	0.02427674	2.11100132	0.04902136	0.00024469	0.10225178

Table C.5: Regression Results: Production, 1981-2007

Regression Statistics	
Multiple R	0.73528958
R Square	0.54065077
Adjusted R Square	0.5222768
Standard Error	0.1633481
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.785130831	0.78513083	29.42482	1.25E-05
Residual	25	0.667065069	0.0266826		
Total	26	1.452195901			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.4250521	0.140780645	102.464739	2.49E-34	14.13511	14.715
X Variable 1	0.02189344	0.004036056	5.42446512	1.25E-05	0.013581	0.030206

Table C.6: Regression Results: Net Availability, 1981-2007

Regression Statistics	
Multiple R	0.55604
R Square	0.309181
Adjusted R Square	0.281548
Standard Error	0.258998
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.750555411	0.750555	11.188923	0.002598992
Residual	25	1.677005556	0.06708		
Total	26	2.427560967			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	14.51167	0.223216402	65.01167	2.076E-29	14.05194881	14.9713944
X Variable 1	0.021406	0.006399415	3.344985	0.002599	0.008226104	0.03458579

Table C.7: Regression Results: Per Capita Availability, 1981-2007

Regression Statistics	
Multiple R	0.239004848
R Square	0.057123317
Adjusted R Square	0.01940825
Standard Error	0.262358803
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.104253301	0.104253301	1.51460202	0.2298922
Residual	25	1.720803537	0.068832141		
Total	26	1.825056838			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.250675658	0.226112461	23.22152275	1.94396E-18	4.7849883	5.716363
X Variable 1	-0.00797789	0.006482443	-1.230691684	0.229892179	-0.021329	0.005373

Table C.8: Regression Results: Imports, 1981-2007

Regression Statistics	
Multiple R	0.68777849
R Square	0.47303926
Adjusted R Square	0.45196083
Standard Error	0.54563869
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	6.68142712	6.68142712	22.441864	7.3611E-05
Residual	25	7.44303939	0.29772158		
Total	26	14.1244665			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	10.5400843	0.47025564	22.4135204	4.5313E-18	9.57157471	11.5085939
X Variable 1	0.06386717	0.01348181	4.73728446	7.3611E-05	0.03610086	0.09163348

Table C.9: Regression Results: Production, 1961-2007

Regression Statistics	
Multiple R	0.92205931
R Square	0.85019337
Adjusted R Square	0.84686433
Standard Error	0.22941618
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	13.44148568	13.4414857	255.3872	3.6E-20
Residual	45	2.368430211	0.05263178		
Total	46	15.8099159			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.8030371	0.068010034	202.955891	2.67E-68	13.66606	13.94002
X Variable 1	0.03942446	0.002466983	15.9808398	3.6E-20	0.034456	0.044393

Table C.10: Regression Results: Net Availability, 1961-2007

Regression Statistics	
Multiple R	0.875528
R Square	0.766549
Adjusted R Square	0.761362
Standard Error	0.300979
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	13.38535467	13.38535	147.76025	8.17085E-16
Residual	45	4.076474917	0.090588		
Total	46	17.46182959			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.87787	0.089224698	155.5384	4.166E-63	13.69815892	14.0575744
X Variable 1	0.039342	0.00323652	12.15567	8.171E-16	0.032823375	0.04586075

Table C.11: Regression Results: Per Capita Availability, 1961-2007

Regression Statistics	
Multiple R	0.378870133
R Square	0.143542578
Adjusted R Square	0.12451019
Standard Error	0.298517696
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.67209032	0.67209032	7.542016481	0.0086353
Residual	45	4.010076676	0.089112815		
Total	46	4.682166996			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	4.658053	0.088495062	52.63630424	4.55274E-42	4.4798148	4.836291
X Variable 1	0.008815683	0.003210053	2.746273198	0.008635308	0.0023503	0.015281

Table C.12: Regression Results: Imports, 1961-2007

Regression Statistics	
Multiple R	0.75590261
R Square	0.57138876
Adjusted R Square	0.56186407
Standard Error	0.57795695
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	20.0387964	20.0387964	59.990247	8.1133E-10
Residual	45	15.0315406	0.33403424		
Total	46	35.070337			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	11.1187836	0.17133435	64.8952383	4.1589E-46	10.7736985	11.4638687
X Variable 1	0.04813688	0.00621495	7.74533712	8.1133E-10	0.03561933	0.06065444

Appendix D: Regression Results: Uganda

Table D.1: Regression Results: Production, 1961-1980

Regression Statistics	
Multiple R	0.671583
R Square	0.451024
Adjusted R Square	0.420525
Standard Error	0.176522
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.460802	0.460802	14.78832	0.001185
Residual	18	0.560878	0.03116		
Total	19	1.02168			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.77736	0.082	168.017	3.21E-30	13.60509	13.94964
X Variable 1	0.026324	0.006845	3.845559	0.001185	0.011942	0.040705

Table D.2: Regression Results: Net Availability, 1961-1980

Regression Statistics	
Multiple R	0.519442
R Square	0.26982
Adjusted R Square	0.229254
Standard Error	0.238077
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.377008777	0.3770088	6.651449	0.0189138
Residual	18	1.02025258	0.0566807		
Total	19	1.397261357			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.85589	0.110594295	125.28576	6.299E-28	13.6235407	14.08824
X Variable 1	0.02381	0.009232233	2.5790403	0.0189138	0.0044141	0.043207

Table D.3: Regression Results: Per Capita Availability, 1961-1980

Regression Statistics	
Multiple R	0.1806656
R Square	0.03264
Adjusted R Square	-0.0211022
Standard Error	0.2337079
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.033173	0.033172793	0.607345	0.44591547
Residual	18	0.983149	0.054619396		
Total	19	1.016322			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.0213764	0.108565	46.25239303	3.65E-20	4.79329051	5.249462
X Variable 1	-0.0070629	0.009063	-0.77932314	0.445915	-0.0261031	0.011977

Table D.4: Regression Results: Imports, 1961-1980

Regression Statistics	
Multiple R	0.4805502
R Square	0.2309285
Adjusted R Square	0.1882023
Standard Error	0.8084089
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	3.5322019	3.5322019	5.4048458	0.031977
Residual	18	11.76345	0.653525		
Total	19	15.295652			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	11.057477	0.3755314	29.444882	1.115E-16	10.26852	11.84644
X Variable 1	-0.072881	0.0313488	-2.324832	0.0319769	-0.13874	-0.00702

Table D.5: Regression Results: Production, 1981-2007

Regression Statistics	
Multiple R	0.933216
R Square	0.870893
Adjusted R Square	0.865729
Standard Error	0.109371
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.017231	2.017231	168.6378	1.3E-12
Residual	25	0.299048	0.011962		
Total	26	2.316279			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.15344	0.09426	139.5437	1.12E-37	12.95931	13.34758
X Variable 1	0.035093	0.002702	12.98606	1.3E-12	0.029527	0.040659

Table D.6: Regression Results: Net Availability, 1981-2007

Regression Statistics	
Multiple R	0.843824
R Square	0.712039
Adjusted R Square	0.700521
Standard Error	0.213586
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.820035777	2.8200358	61.817388	3.2192E-08
Residual	25	1.140470295	0.0456188		
Total	26	3.960506072			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	12.9544	0.184077557	70.37471	2.892E-30	12.5752898	13.33352
X Variable 1	0.041493	0.00527734	7.8624034	3.219E-08	0.03062369	0.052361

Table D.7: Regression Results: Per Capita Availability, 1981-2007

Regression Statistics	
Multiple R	0.307307
R Square	0.0944376
Adjusted R Square	0.0582151
Standard Error	0.2134432
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.118777	0.118776676	2.607153	0.11893476
Residual	25	1.13895	0.045557995		
Total	26	1.257727			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	4.1681351	0.183955	22.65847236	3.5E-18	3.78927305	4.546997
X Variable 1	0.0085155	0.005274	1.614668158	0.118935	-0.0023462	0.019377

Table D.8: Regression Results: Imports, 1981-2007

Regression Statistics	
Multiple R	0.8782464
R Square	0.7713168
Adjusted R Square	0.7621695
Standard Error	0.5964182
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	29.994409	29.994409	84.321546	1.74E-09
Residual	25	8.8928662	0.3557146		
Total	26	38.887275			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	6.8367836	0.5140197	13.300627	7.673E-13	5.77814	7.895427
X Variable 1	0.1353204	0.0147365	9.1826764	1.741E-09	0.10497	0.165671

Table D.9: Regression Results: Production, 1961-2007

Regression Statistics	
Multiple R	0.796734
R Square	0.634786
Adjusted R Square	0.62667
Standard Error	0.187315
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.744341	2.744341	78.21529	2.11E-11
Residual	45	1.578915	0.035087		
Total	46	4.323256			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.79446	0.055529	248.4176	3.02E-72	13.68261	13.9063
X Variable 1	0.017814	0.002014	8.843941	2.11E-11	0.013757	0.021871

Table D.10: Regression Results: Net Availability, 1961-2007

Regression Statistics	
Multiple R	0.667975
R Square	0.446191
Adjusted R Square	0.433884
Standard Error	0.274665
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2.735145108	2.7351451	36.255387	2.9037E-07
Residual	45	3.394848045	0.0754411		
Total	46	6.129993153			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	13.82801	0.081424082	169.82706	8.035E-65	13.6640162	13.99201
X Variable 1	0.017784	0.002953562	6.0212446	2.904E-07	0.01183534	0.023733

Table D.11: Regression Results: Per Capita Availability, 1961-2007

Regression Statistics	
Multiple R	0.5895387
R Square	0.3475559
Adjusted R Square	0.3330572
Standard Error	0.2699899
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1.747386	1.747386254	23.97143	1.2993E-05
Residual	45	3.280254	0.072894542		
Total	46	5.027641			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	5.0071345	0.080038	62.55943137	2.13E-45	4.84592958	5.168339
X Variable 1	-0.0142147	0.002903	-4.896062474	1.3E-05	-0.0200622	-0.008367

Table D.12: Regression Results: Imports, 1961-2007

Regression Statistics	
Multiple R	0.623404
R Square	0.3886326
Adjusted R Square	0.3750466
Standard Error	0.9700146
Observations	47

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	26.915715	26.915715	28.605491	2.86E-06
Residual	45	42.341773	0.9409283		
Total	46	69.257488			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	9.6113275	0.2875592	33.423826	2.042E-33	9.032154	10.1905
X Variable 1	0.0557886	0.0104309	5.3484101	2.86E-06	0.03478	0.076797

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19 May 2010

Ms P Koch
P O Box 376
WARTBURG
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Dear Ms Koch

PROTOCOL: Primary Commodity Dependence and Agricultural Diversification: The Role of Organic Agriculture in Trade and the Implications for Food Security in Sub-Saharan Africa
ETHICAL APPROVAL NUMBER: HSS/0265/2010 M: Faculty of Management Studies

In response to your application dated 13 May 2010, Student Number: **204506119** the Humanities & Social Sciences Ethics Committee has considered the abovementioned application and the protocol has been given **FULL APPROVAL.**

PLEASE NOTE: Research data should be securely stored in the school/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Professor Steve Collings (Chair)
HUMANITIES & SOCIAL SCIENCES ETHICS COMMITTEE

SC/sn

cc: V Tang
cc: Ms. G Ponsford