AGRICULTURAL PRODUCTION AND ECONOMIC GROWTH IN SOMALIA FROM 1986 TO 2016

BY

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DECLARATION

I **IDIRIS ADAM YUSUF hereby** declare that "This dissertation is my original work and has not been presented for a degree or any other academic award in any university or institution of learning".

Signed .....

Date: 14/09/2018

APPROVAL

This is to certify that this dissertation was prepared under my supervision and guidance and is submitted to the University with my approval.

Signature: .....

Supervisor: Dr. James Wokadala

Date: 14/09/2018

DEDICATION

I dedicate this proposal to my families whose resources I used in my studies.

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All praise is to Allah Almighty, the most Compassionate/sympathetic and the Merciful, Who bestowed and granted on me the potential and ability to complete this research work. I would also like to send and pay my homage, honor and sweet sensation of respect to my loving and caring parents whose love, prayers and encouragement kept me steadfast, dedicated and enabled me to attain this target and complete my studies successfully. Words are unlimited to pay special thanks to my mama nimco Mohamed and my daddy adam yusuf who helped me financially during my studies.

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Needless to say that for any errors and omissions which might still be there in this thesis, the researcher is solely responsible for the same.

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ABBREVIATIONS AND ACRONYMS

ADF Augmented Dickey- Fuller

AGD PRO Agricultural production

AU African Union

BoU Bank of Somalia

CBR Central Bank Rate

CPI Consumer Price Index

EAC East African Community

EP Export Promotion

EXC exchange rate

GDI Gross Domestic Income

GDP Gross Domestic Product

GNP Gross National Product

IJDO International Jobs and Diaspora Office

IMF International Monetary Fund

INF Inflation

IS Import Substitution

LDCs Low Developed Countries

MENA Middle East and North Africa

OECD Organization for Economic Co-operation and Development

PP Phillip Perron

PPI Producer Price Index

SAPs Structural Adjustment Programmes

SIC Schwartz Information Criterion

SPS Sanitary/Phytosanitory System

SSA Sub Saharan Africa

UN United Nations

VAR Vector Autoregression

ABSTRACT

The study aimed at examining the effect of agricultural production on economic growth in Somalia from the period of 1986 to 2016 using time series data. Specifically, the study examined the causality and the effect of agricultural production on GDP growth. The objective was motivated by the fact that the problem statement emphasized that agricultural production has not yielded expected economic growth in Somalia. The study hypothesized that no casualty between agricultural production and economic growth and that there is no significant effect of agricultural production on economic growth in Somalia. The study followed a multiple linear regression analysis which gives best linear unbiased estimates to establish relationships between GDP and the independent variables. Prior to the regression stationarity among variables was tested using ADF tests. The test results showed that all the study variables were nonstationary at level except agricultural production that only became stationary at level. The granger causality test showed that in Somalia, agricultural production does not granger cause GDP growth. The regression model showed that there is a significantly positive effect of agricultural production (β_1=0.5058) and growth at 5% level, interest rate, inflation rate and exchange rate effects were positively insignificant. The study concluded there is no causality between economic growth and agricultural production. The further concluded that agricultural production has a significantly positive effect on economic growth. Thus sustained economic growth in Somalia can be achieved through expansion of agricultural production combined with good exchange rates. This study therefore recommends that government should enabling economic and political environment to promote agricultural productivity in the country.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter consists of the background, problem statement, purpose of the study, research objective, research questions, hypothesis, scope and significance of the study

1.1 Background to the study

1.1.1 Historical perspective

Economic growth is measured as the percent rate of increase in real GDP. Economic growth (GDP) was first developed by Simon Kuznets for US congress report in 1934, who immediately said not to use it as a measure for welfare. After the Britain Woods conference in 1944, GDP became the main tool for measuring the country's economy. GDP per capita income is an indicator of country's standard of living and is not a measure of personal income. Under economic theory, GDP per capita exactly equals the gross domestic income (GDI) per capita GDP can be determined in three ways, all of which should in principle give the same results: they are product (output) approach, income approach, and expenditure approach (Kasozi, 1997).

The history of agriculture records the domestication of plants and animals and the development dissemination of techniques for raising them productively. Agriculture began independently in different parts of the globe, and included a diverse range of tax. At least eleven separate regions of the Old and New World were involved as independent centers of origin (Kelly, 1987). In many regions including Europe, North America, Australia and recently Brazil, chine and India humanity has also become adept at raising yields through using inputs like fertilizers and pesticides. Yet in many poorer countries with low productivity rates and growing populations, agriculture continues to extend into marginal and fragile lands. The agriculture is therefore the father of all other economic activities if it is well maintained. (Deininger, 1994). In the most

developed countries of the economic world, the agriculture has been the main pillar stone of social-economic development through their people's strong commitment; it has launched industrialization due to its abundant outputs. It has also contributed much in the national economic growth of these countries (Alberto, 1998).

The nature of the divergence in Africa and elsewhere is comprised by a mix of different processes which will be discussed in detail in the latter parts of this thesis. Involved are interlinked problems of economic stagnation, expanding poverty and food insecurity due to low agricultural productivity, all of which are often exacerbated by high population growth (Johnston & Mellor 1984, Sacks 2005). Addressing these problems and reversing the trends is the key to significantly reducing the number of people living in poverty and reaching the Millennium Development Goals. The remedy, at least in part, is growth, and the challenge at hand is to identify with which means it is best created and converted into poverty reduction and improved standards of living for the rural poor (Aremu. 2009).

In Sub-Saharan Africa, the agricultural sector is a prime candidate to benefit from innovation. Agriculture continues to be Sub-Saharan Africa's dominant economic activity, accounting for 40 percent of GDP, 15 percent of exports, and 60 to 80 percent of employment. But by world standards, its productivity levels for many products are low and the importation of foodstuffs is higher than it needs to be in some countries. Higher agricultural productivity is thus a precondition for growth and development in most African countries, and increasing yields is a key to raising incomes (and reducing poverty) in rural areas. Within the agricultural sector, market-oriented production – frequently referred to as agribusiness or agro-industry is where innovation is likely to have the biggest economic (and social) impact. Farmers and commercial producers may benefit especially if they can diversify their production into higher value, but knowledge-demanding, products. This requires agricultural innovation (world bank, 2008). In the area of Eastern Africa economies like Kenya, Uganda, Tanzania, and even in Zimbabwe, the agriculture revolution is needed for the poverty alleviation program

as the households depend on it for their daily diet and income through the export made of agriculture products to the external markets. The land has been therefore exploited with their new modern technologies in order to export for abroad (ghulam, 1965).

Somalia's economy consists of both traditional and modern production, with a gradual shift in favor of modern industrial techniques taking root. Its agriculture accounted for 65%of GDP(Gross Domestic Product) in 2006. The challenges currently facing the country are: building up its infrastructure; provisions of agriculture extension services and; development of its labor force (UN, 2004).

The Somali economy is dominated by livestock as the basis for livelihoods in most parts of the country. Given the average rainfall of 500 mm and its variable pattern, rainfed crop production whilst widely practiced is successful only in areas which have slightly higher rainfall. Even under maximum irrigation development before the war, Somalia remained a food deficit country. During this pre conflict period export crops such as banana, grapefruits and sesame were produced. Other economic activities were extremely limited and were confined to services and trade and were mainly the preoccupation of urban dwellers. Crops grown under irrigated agriculture are maize, sesame and rice but also include fruit trees, such as mango, papaya, lime and bananas. Historically, many riverine smallholder farming communities along both rivers have been sedentary farmers of Bantu origin. Prior to the civil war, large privately owned and big state farms grew sugar cane, cotton, bananas and rice, and provided employment opportunities and essential services to significant number of smallholder farmers and their communities (Abdallah, 2005).

According to the FAO, Somalia exported a record 5 million units of livestock to markets in the Gulf region in 2014. Valued at $300 million USD, the exports included 4.6 million sheep and goats, 340,000 cattle and 77,000 camels. The enhanced trade was facilitated by greater sectoral investment by the Somali government in conjunction with the FAO, which centered on livestock infrastructure, livestock vaccination and treatment services,

and fodder production. Additionally, modern slaughterhouses, meat and animal husbandry markets have buttressed the livestock commerce. In order to tap into value added livestock products, a program aimed at ameliorating the quality of milk production was also launched in the country's northwestern region, with assistance provided by the EU In May 2015 (Aladejana, 2016).

Somalia Vision 2030 builds on the progress that has been made in addressing the strategic bottlenecks that have con-strained Somalia's socio-economic development since her independence, including; ideological disorientation, under-development of agriculture , underdeveloped human resources, inadequate infrastructure, small market, lack of industrialization, underdeveloped services sector and poor democracy, among others. The implementation of Vision 2030 will depend on the actions and measures that shall be undertake as Government, agricultural sector, civil society and as individuals through short and medium-term National Development Plans. Therefore, the commitment and dedication of all Somalia towards its realization is of paramount importance. The national development plan for Somalia is also intended to accelerate growth of the country for enhancing economic growth. Vision 2030 is conceptualized on harnessing strategic opportunities by strengthening the relevant fundamentals capable of maximizing returns to the economy. The identified opportunities in this Vision include; oil and gas, minerals, abundant labour force, geographical location and trade, water resources, industrialization, and agriculture Somalia Vision, 2040 (Aremu, 2014).

1.1.2 Theoretical perspective

This study is based on Endogenous growth theory developed by Arrow, Romer, and Lucas (1962). The theory holds that economic growth is primarily the result of endogenous and not external forces. Endogenous growth theory holds that investment in agricultural production, innovation, and knowledge are significant contributors to economic growth. The theory also focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The endogenous growth theory primarily holds that the long run growth rate of an economy

depends on policy measures. For example, subsidies for research and development or education increase the growth rate in some endogenous growth models by increasing the incentive for innovation.

Harrod and Domar (2003) assign a key role to investment in the process of economic growth. But they lay emphasis on the dual character of investment. Firstly, it creates incomes, and secondly, it augments the productive capacity of the economy by increasing its capital stock. The former may be regarded as the "demand effect" and the latter the "supply effect" of investment. Hence so long as net investment is taking place, real income and output will continue to expand. However, for maintaining a full employment equilibrium level of income from year to year, it is necessary that both real income and output should expand at the same rate at which the productive capacity of the capital stock is expanding. Otherwise, any divergence between the two will lead to excess or idle capacity, thus forcing entrepreneurs to curtail their investment expenditures. Ultimately, it will adversely affect the economy by lowering their incomes and employment in subsequent periods and moving the economy off the equilibrium path of steady growth. Thus, if full employment is to be maintained in the long run, net investment should expand continuously. This further requires continuous growth in real income at a rate sufficient enough to ensure full capacity use of a growing stock of capital. This required rate of income growth may be called the warranted rate of growth or "the full capacity growth rate (Gerdien, 2007).

1.1.3 Conceptual perspective

Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation. For comparing one country's economic growth to another, GDP or GNP per capita should be used as these take into account population differences between countries (Gordon, 1999).

Economic growth is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP, usually in per capita terms. Growth is usually calculated in real terms i.e, inflation-adjusted terms to eliminate the distorting effect of inflation on the price of goods produced. Measurement of economic growth uses national income accounting. Since economic growth is measured as the annual percent change of gross domestic product (GDP), it has all the advantages and drawbacks of that measure (Dennis, 2000).

According to Easterly and Rebelo (2009) defined economic growth as the total market value of all final goods and services produced annually within the boundaries of the country whether by national or foreigner-supplied resources. Dele (2007) argued that economic growth is the increase in the level on goods and services of a country within a fixed period of time, in this case economic growth will be measured in term of Gross Domestic Product expressed in the percentage change. Economic growth is measured by an increase in gross domestic product, or GDP, which is defined as the combined value of all goods and services produced within a country in a year. Many forces contribute to economic growth; unfortunately, no one is 100% clear about what these forces are or how to put them into motion. If this information was known, the economy, spurred by these forces, could grow at a constant rate unencumbered by recessions and stagnation (Barro, 2007).

Ireen (2010) defined agricultural production as the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products.

Agricultural production refers to vegetable and animal production that is made available for human consumption and animal feed (Dailami 2013).

Agricultural production is the cultivation and breeding of animals, plants and fungi for food, fiber, biofuel, medicinal plants and other products used to sustain and enhance human life (crowford 1999).

1.1.4 Contextual perspective

Agricultural production in Somalia in 2014/2015 was valued at $316,128,000. Findings from Somalia agricultural Authority indicate that Over the past 30 years, this value has varied between $789 in 2013 and $ 489 in 1958 when Somalia was about to get her independence. Due to a peaceful political environment, the statistics from Somalia agricultural authority indicate that in 2011/2012, the country received 302 million dollars of agricultural production. The part of external sources, the agricultural production received lower funding through foreign direct investments, which is estimated to have declined from US$ 21 million to US$ 12 million between FY 2014/15 and FY 2015/16, and from remittances that decreased from US$ 12 million to an estimated US$ 7.2 million over the same period. In addition, Somalia realized lower than usual receipts from export of goods and services, due to a combined effect of civil wars and droughts. Under these circumstances, agricultural productions are estimated to have reached levels that are far lower than had been anticipated. (BOS Abstract, 2013/2014. If this can be compared to the early years before Somalia affected civil wars, the sub-period of 1975-1985 was deteriorated period to civil wars and it included years of intensified economic activity. This was a period when uncertainties about stability and economic policies of Somalia diminished and this was coupled with unfavorable climatic conditions, uncertainty about political instability affected economic activities and subsequently agricultural production declined over the sub-period. The average ratio of agricultural production to GDP fell to 20.2 percent from 42.1 percent of GDP over the preceding sub-period (Bank of Somalia, 2015).

According the bank of Somalia Seeds are only available in limited quantities and are not certified for quality or suitability to the region. Farm equipment is run down: it can be

60 years old and there is a particular shortage of tractors. Finally, land disputes are common due to the outmigration of many rural families during the drought and land grabbing during regime change and the general breakdown of law and order (aremu, 2014).

1.2 Statement of the Problem

In 2013, the Somalia's GDP growth declined from 5% the previous year to 3.1%. Over the course of the year, inflation averaged 20.5%, up from 8.1% in 2010, the exchange rate depreciated by 7.3% against the US dollar of GDP, (African outlook, 2015).

Somalia's economic has been facing problems and still characterized by a low levels of real GDP growth rate, this is due to low performance of agricultural production and other factors which may also influence economic growth, such as macroeconomic performance and poor infrastructure, low growth of the nation's stock of the capital, low technological improvements, (UN, 2014).

Since then agricultural production became part of the economic recovery program that was launched to bring this change aimed at generating economic growth. Though Somalia's macroeconomic performance remains impressive, outcries heightened poverty and human suffering remains and the standard of living of the majority of the people is very low (world bank, 2014). Somalia remains of lower developing countries in the world (IMF, 2005). The real GDP growth rate of Somalia (1.8$) is lower than that of Ethiopia (5.4$) and Kenya (4.6$) in 2012 (World Bank)

In 2013, Somalia saw the consolidation of macroeconomic stability and a gradual recovery of economic growth in which Real GDP growth in 2013 reached 3.6% compared to the 1.8% growth in 2012, this was mainly due to under execution of externally financed agricultural production and depressed exports as demand from trading partners stalled. The economic growth further to 3.9% in 2014 up from 3.6% in 2013 and it is forecasting to improve in this year 2015, (BOS, 2016).

This study trial the effect of agricultural production on growth and recovery of economy in Somalia and examine the relationship between agricultural production and economic growth.

1.3 Purpose of the study

The purpose of this study is to investigate the effect of agriculture production on economic growth of Somalia from 1986 to 2016.

1.4 Research Objectives

i) To determine the effect of agricultural production on economic growth in Somalia.

ii) To examine the causal relationship between agricultural production and economic growth in Somalia.

iii) To assess the effects of other variables (exchange rate, interest rate, inflation) on economic growth in Somalia.

1.5 Research Hypotheses

Ho_1: agricultural production does not have any significant effect on economic growth Somalia.

Ho_2: There is no significant causal relationship between agriculture production and economic growth in Somalia.

1.6 Scope of the Study

1.6.1 Geographical scope

The study has been conducted in Somalia using time series data of agricultural production and economic growth from 1986-2016.

1.6.2 Content scope

This study has been examined independent variable as agricultural production and economic growth as the dependent variable.

1.6.3 Time scope

This study will use time series data from 1986-2016.

1.7 Significance of the Study

A number of studies on agriculture especially in developing countries have been carried out. Nevertheless, empirical evidences on the role of agricultural production on growth have been limited in Somalia; the presence of little empirical analysis in this context makes this study vital to show the role of the agricultural production in the economy and to help the policy formulation incentive provision to the sector.

Moreover, analysis of the role of agricultural production in Somalia is of interest both from a policy and academic point of view. Thus in due course, as policy is concerned, if agricultural production does have a markedly stronger impact on growth, it would further underscore the need to rationalize other production, as well as provide additional support for the agricultural production of state-owned activities.

The study is also an important addition to the existing literature on the effects of agricultural production on economic growth.

CHAPTER TWO
LITTERATURE REVIEW

2.0. Introduction

This chapter shows theoretical review, concepts opinions and ideas, and empirical review, about agricultural production and economic growth. The literature review is to evaluative report of studies found in the literature related to the study. The review should describe, summarize, evaluate and clarify this literature. It should give a theoretical basis for the research and help us determine the nature of our own research. Select a limited number of works that are central to our area rather than trying to collect a large number of works that are not as closely connected to your topic area.

2.1. Theoretical Review

This study is based on Endogenous growth theory developed by Arrow, Romer, and Lucas (1962). The theory holds that economic growth is primarily the result of endogenous and not external forces. Endogenous growth theory holds that investment in human capital, innovation, and knowledge are significant contributors to economic growth. The theory also focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The endogenous growth theory primarily holds that the long run growth rate of an economy depends on policy measures. For example, subsidies for research and development or education increase the growth rate in some endogenous growth models by increasing the incentive for innovation. Meanwhile, endogenous growth model assumes that growth depends on savings and investment in human capital on the one hand (Lucas, 1962) and investment in research and development on the other (Mattana, 2004) In addition, it is argued that the free market leads to less than optimal level of capital accumulation in human capital, research and development. Therefore, the government may improve the efficiency of resource allocation through investment in human capital and

encouraging agricultural production in high-tech industries. The endogenous growth models emphasise technical progress resulting from the rate of investment, the size of the capital stock, and the stock of human capital. Romer in his first paper on endogenous growth in 1986 presented a variant on Arrow's model which is known as learning by investment. He assumes creation of knowledge as a side product of investment.

Those that stressed investment showed that agricultural production since this will tend to enhance the absorptive capacity of the economy and the profitability of agricultural production. However, it has been hypothesized that the response of agricultural production depends on the stage of the economy's business cycle, these condition obtains if the government sector produces marketable output that competes with agricultural output. Similarly, the financing of public sector investment either through taxes, exchange rate or inflation will reduce the resources available to the agricultural sector or hence dampen agricultural sector activities (Chibber A. Dailami, 2010).

It is generally agreed in the literature that investment stimulates growth within a market economy; as a result, agricultural production remains the engine of growth with the economic growth providing the enabling environment. The Harrod - Domar Model (1939, 1946) highlights the importance of determining the rate of investment (S/Y), which is necessary to achieve a certain rate of economic growth. Their model also shows the possibility of increasing the rate of growth, by either reducing a factor (capital/income) or increase the rate of investment (savings/income). Thus romer and lucas model is based on the theory of optional capital allocation. Solow's model of economic growth assumes that the relationship between per capita income and the rate of economic growth is negative (crafts and Toniolo, 1996). The justification is that countries with low per capita income have a weak capital formation and therefore, investment will achieve growing returns contrary to the countries with high per capita incomes. This leads to the conclusion that developing countries are able to converge in

income with developed countries if they succeed in increasing domestic and foreign investment.

In this study the method of vector autoregressive model (VAR) is adopted to estimate the effects of economic growth on agricultural production and interest rate, inflation, Exchange rate. The use of this methodology let us recognize the cumulative effects taking into account the dynamic response between economic growth and the other variables (Pereira and Hu 2000).

2.2. Concepts, opinions and ideas

2.2.1. Agricultural production

Raising crops accounts for a smaller share of Somalia's economy than livestock, it is the third largest sector in Somalia, for example, where semi-arid conditions favor livestock. It plays an even smaller role in the economy, which is even drier. But agriculture plays a central economic role in Somalia, where rainfall is greater and two rivers as well as irrigation systems provide a more consistent supply of water. In Somalia, agriculture may be the largest single industry (BOS Annual Report, 2005).

The discussion here focuses on horticulture in Somalia rather than other segments of the agriculture sector. Horticulture has a lot of potential for labor-intensive growth, produces higher income per acre of land than traditional crops, and has drawn considerable Somali investor interest. The agricultural areas of Somalia have been an important recruiting ground for Al-Shabaab, which has been able to capitalize on the relative poverty of the area and the grievances of the minorities who live there. Increasing demand for labor, rising wages and growing incomes would improve the prospects for change in the political dynamic of the region (shakir, 2006).

There is a particular problem with poor quality inputs sold to farmers by private dealers. Pesticides may be past their shelf life or, worse, mislabeled. Flour may be repackaged

and sold as fertilizer. Seeds are only available in limited quantities and are not certified for quality or suitability to the region. Early- and late-germinating varieties that would help prevent oversupply at harvest time are unknown (Okidi, 2003).

Finally, land disputes are common due to the outmigration of many rural families during the drought and land grabbing during regime change and the general breakdown of law and order. The virtual absence of post-harvest processing means that produce not sold immediately is often lost, as are opportunities to increase incomes through adding value. The advanced age of farm equipment in Somalia is a good indicator of the almost complete absence of finance in the sector. Credit of any kind, including supplier credit, is rare or absent. There are no leasing companies supplying tractors, trucks or pumps (shakir, 1999).

Insurgency and drought have forced an exodus of rural Somalis to cities. Though some IDPs are renting out their unoccupied farm land to others, the departure of so many farming families has left a lot of land fallow in Somalia. Although unused farmland represents an economic loss today, it means that agricultural output could increase rapidly when conditions are right. That, however, will not necessarily cause a proportional increase in the employment of Somalis. Despite the country's 75 percent unemployment rate, the departure of IDPs has created labor shortages in rural areas, including in Somalia, and Ethiopians are working in some agricultural jobs that Somalis could perform. If observers are correct that a large number of IDPs will not return to their farms, consolidation of some farmland into larger operations is likely, which will mean fewer but larger farming operations and a partial shift from smallholder farming to agribusiness in affected areas (Duygan, 2006).

Somalia's agricultural production potential exceeds local demand, which means that export markets will ultimately drive the sector. Successful exports will require, in turn, improved quality control and a sanitary/phytosanitary (SPS) certification system acceptable to foreign buyers. Somalia has exported bananas and pineapples in the past, but food safety standards have tightened considerably since then and there is no

system in place today. Somalia does export high-quality sesame seeds overseas, though sometimes relabeled to indicate another country of origin. Exporters from Somalia will also have to overcome buyers' concerns about depending on production from an unstable country (Craumer, 1992).

Developing a quality control and SPS certification system will be necessary for the horticulture industry to grow. The most widely used system today is Global Gap, which establishes specific practices and standards for food products. Under Global Gap, firms that seek certification apply to have their processes and facilities approved. They are then audited by an appointed third party and certified if they pass. The government in the producing country the FGS in the case of Somalia must appoint a "competent authority" to make sure that certified firms remain in compliance with GlobalGap standards (Edwards, 2007).

The Ministry of Agriculture in Somalia is keenly aware of the need for standards and SPS assurance. Its staff remembers setting and enforcing SPS standards before the civil war. They are eager to start again, but they lack laboratories, testing equipment and even desks and chairs. The African Development Bank is expected to support general capacity building at that ministry, but it is not yet known what that will include or when it will happen. With regard to the poor quality of other inputs, the Ministry of Agriculture in Mogadishu believes there should be a licensing system for distributors. This requires replacing traders with professional suppliers of agricultural inputs and may not happen quickly or easily. Distributors will need significant help to develop expertise and practices perhaps through partnerships with known international manufacturers and suppliers of inputs. An association of input suppliers could also help to develop and enforce standards in the industry while providing technical support to its members (BOS, 2006).

Solar and wind energy in Somalia are discussed in detail later, in brief, both are already in use in small ways in agriculture but have tremendous potential to increase

productivity and incomes whether through powering conventional and drip irrigation, running ice-making and refrigeration equipment to remove field heat from harvested crops, or lighting processing sheds when night work is required to prepare produce for markets the next morning. The shortage of technical skills for the installation, maintenance and repair of renewable systems will deepen as the renewable energy industry grows. They are not included in standard vocational training programs. Knowledge and skills in refrigeration technology critical to the successful application of renewable (and conventional) energy to agriculture are also lacking and will limit the use of renewables in the industry unless addressed. At the moment, those skills are imported from other countries in the region (oshea, 2006).

Livestock is Somalia's largest sector, its largest employer, and is often described as the backbone of the economy. Pastoralism lies at the heart of the Somali nomadic culture and identity. Livestock in Somalia means goats, sheep, camels and cattle in descending order of headcount. The majority of livestock produced are exported almost exclusively to the Middle East and mostly as live animals (Aremu, 2014).

The livestock industry is concentrated in the arid and semi-arid north Somalia. Periodic severe drought is the main problem facing the industry. Other problems reflect the challenges of moving herds, herders with little education and the collapse of government functions during the war, which weakened the supply chain for veterinary medicines, reduced the availability of veterinary services and caused the loss of laboratory facilities for livestock testing. Other issues include poor practices and facilities for fattening animals before sale and the failure to establish a fodder industry to stabilize livestock food supply (Gustavo, 2007).

As much as 80 percent of Somalia's livestock production is exported, which means that the food safety concerns of importing countries are critically important to the industry's survival. Also, Somalia's livestock exports go to just a handful of countries. The industry paid a large penalty for that dependence when Saudi Arabia banned the import of live

animals from Somalia for nine years in 2000 and the United Arab Emirates (UAE) banned the import of frozen meat in 2005. Despite the central importance of food safety standards and certification, Somalia has not succeeded in establishing its own control systems. Instead, it imports safety controls from importing countries that send their own people to monitor the supply chain in Somalia (Hezell, (2009).

Livestock production may not be as important as commonly thought since it may also be declining in relative importance. A calculation of Somaliland's GDP by the World Bank in January 2014, for example, concluded that livestock makes up 29.5 percent of GDP – a large proportion, to be sure, but not the 60 percent that is frequently cited.19 Other sources suggest that land degradation from overgrazing is putting an upper limit on the industry. The question for USAID is whether the livestock industry has the capacity to create tens of thousands of new jobs. Most observers say it does not even if herds could grow without stressing the land, more livestock doesn't necessarily require more herders, and even a dramatic increase in meat processing would add a few thousand jobs at most (Isabelle, 2007).

Somalia is dangerously dependent on a few export products and a small number of overseas markets. Livestock accounts for more than half of Somalia's export earnings.4142 The UAE takes in more than half of Somalia's total exports and three countries (UAE, Yemen and Oman) alone account for over 80 percent of all exports from Somalia.43 With such level of dependence, a single disruption in an export market can create havoc, as it did when the Saudis banned animal imports from Somalia. Somalia needs to diversify its exports and seek a more diverse range of countries to which goods can be exported. The lack of quality and safety controls for food exports is a critical trade issue for Somalia because growth in the industries with the greatest short and medium-term potential fisheries and agriculture will depend on growing export markets. This is discussed in more detail elsewhere in this report (Jose, 2013).

2.2.2. Economic growth

Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It can be measured in nominal or real terms, the latter of which is adjusted for inflation. Traditionally, aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP), although alternative metrics are sometimes used. Barro, R. J. (1991).

During 2015/2016, the Somali economy faced a number of developments with anticipated challenges for economic management. This included the staging of a national election, and a slowing global economy and subsequent declining commodity prices. The latter developments were associated with policy adjustment in UAE and structural impediments to growth in big emerging market economies. During the year, the somalia authorities also commenced the implementation of a new NDP, which necessitated some adjustments in strategy. With such developments, some degree of macro volatility was inevitable, not least due to the uncertainties surrounding the civil wars, given the experiences when agricultural production rose to a decade-high. Somalia's economic policy makers focused on managing these volatilities (mccagreth. 2009).

Collier and Tom (2012) argued that Somalia's external position remained weak, largely due to the impact of the weak global economy; the associated sustained decline in global commodity prices; and the uncertainties related to a civil war. The impact of reduced cost of oil imports lowered the goods trade deficit, but this was more than offset by the increased volume of imports required to support construction. Meanwhile, the declining global incomes and commodity prices also reduced the value of total exports receipts, which led to a widening of the trade deficit, increasing from an estimated value of 4.5 percent of GDP during 2015/2016 to 5.3 percent. With the additional negative impact of the decline in services, income and transfers, the external

current account is estimated to have reached a value of 5.3 percent of GDP during 2015/2016

According to figures released by the Ministry of food and agriculture in May 2015, fiscal revenues and expenditures remained largely on target throughout the year. The anticipated fiscal expansion materialized, with the deficit remaining at high levels, at an estimated value of around 4.4 percent of GDP, which is only slightly lower than the originally expected value of 4.6 percent of GDP. Prudent fiscal management by the authorities was complemented by good performance in the area of revenue collection, for which the value reached 9.9 percent of GDP, compared to the budgeted level of 9.6 percent. With construction of two large energy projects taking off, the execution of the development budget was much better than in previous years, recording a small shortfall from the budget of 0.5 percentage points of GDP. Therefore, even though there was overspending in the recurrent budget, largely due to expenditure on civil war and security related measures, total expenditure is expected to have reached 22.1 percent of GDP, the level that was planned for in the budget. The estimated growth is also more than half a percentage point lower than the forecast in the previous World Bank Economic Update. This was the result of a stronger than anticipated impact of macroeconomic volatilities on private sector activities during the year. The main driver of growth was public investments, which however represents a smaller share of the economy where services account for close to half (Bercal &Stones, 2013).

With macro-fiscal uncertainties related to civil war now dissipating, the economic outlook is positive, with the rate of growth projected to reach approximately 4.9 percent in 2016/17, and to remain on an upward trajectory into the near future. The weak global economy will continue to affect economic activity in Somalia, as it has done during 2015/16. However, from this perspective, the economy will also benefit from the low energy prices, particularly if investors take advantage of the associated low cost of imported inputs. In addition, growth will also be driven by an intensification of investments by the agriculture sector in the post-civil war, particularly in oil-related

activities. Yet the predominant driver of growth will be an increase in the economic activities of the construction sector, with this growth driven by somalia's significant investments in public infrastructure projects. The stimulus effects from this large public investment program will offset those of a weak external sector on the somalia economy, with carry-through to 2017/18, when the rate of economic growth is expected to increase to above 5 percent (economic policy Centre, 2015).

The Somalia economy is estimated to have grown at a rate of 3.6 percent during 2015/16, which was much slower than the projected rate of 4.8 percent. With the take-off of a number of the energy projects boosting public investment, the slower than anticipated growth can be attributed to the adverse impact of both domestic and external volatilities. The tightening of monetary policy was necessary to address inflation pressures, but raised the cost of credit, which affected agricultural consumption and investment. Fiscal policy was implemented well, keeping overall expenditure within the budgeted levels, even though there were reallocations of funds to recurrent expenditures, mainly on account of civil war-related pressures (Kelly and Steiner, 2013).

In 2014/15, the rate of growth was 2.9 percent per annum. This growth rate sustained the momentum achieved after the economic growth rate had increased to 4.2 percent in 2013/14, from 2.6 percent recorded in 2012/13, according to the (Somali bank) revised GDP series. This recovery was mainly driven by a growth in consumption, since there was a deceleration in the rate of growth of gross investments over this period. To a certain extent, the economy stabilized, with the rate of inflation declining from 18.5 percent in 2011/12 to 6.0 percent in 2014/15, even though increasing food prices and currency depreciation began to exert an influence towards the end of the year. It was also challenging for policymakers to manage the impact of the unpredictable global environment, with somalia's external current account deficit increasing from a value of around 6.8 percent of GDP in 2012/13 to 7.6 percent in 2014/15. In addition, Somalia's economy operated in the context of significant regional political challenges, mainly due

to the unrest in neighboring Ethiopia and the Republic of Djibouti and to isolated terrorist incidents in Kenya.

Somali bank (2016) argued that during 2015/16, Somali recorded a rate of growth of 2.6 percent (preliminary estimate) as a result of both domestic and external uncertainties. This was lower than 4.8 percent, the rate which had been forecast in our previous economic update released September 2015, with the largest shortfall in growth coming from agricultural sector investments. On the basis of revised data from the Somali bank this rate is lower than 5.0 percent recorded for 2014/15.

The services sector remains the main driver of growth, accounting for an estimated 42 percent of all economic activities. However, increased construction activities also significantly boosted the contribution of the industrial sector. During 2015/16, the services sector grew by 4.6 percent, with the bulk of this growth driven by activity in the information and technology sub-sectors. The rate of growth of the construction sector, increased to approximately 3.7 percent, more than doubling the rate recorded in 2014/15, when the sector grew by a mere 1.0 percent. This development is largely attributed to the take-off of large public construction works. With a deceleration in the rate of growth of all other subsectors, particularly manufacturing, the overall rate of growth of the industrial sector during the year was significantly lower than in the corresponding period in the previous year (Economic Policy Centre, 2015).

The agricultural sector grew at a rate of 3.2 percent during the year, after benefitting from favorable weather conditions, particularly during the first half of the year. This is a higher rate of growth than the rate of 2.3 percent recorded during the corresponding period in 2014/15. The impact of low commodity prices at the international market, the sector's performance during the year was better than might have been expected. This is because the average global prices for Somalia's major export commodities, particularly livestock, bananas and fish, were generally lower than in the corresponding period in the previous year (Bercal & Tom. 2012).

2.3. Empirical Literature

Most growth studies began their framework of analysis with the most influential works of Solow (1956 and 1957) in economic growth theory, which ignored the role of any capital formation to economic growth and took technical productivity as the only source of economic growth. In this analysis technical progress was explained outside the model and considered as manna from heaven. Following this work there have been various studies by different researchers that attempted to trace the possible source of a growth of nation. In these studies, a variable that is taken as a determinant of growth in one study is considered as a controlling variable in another study.

Most of these growth analyses tried to show the relative contribution of various factors of production to the growth process. Cross country analysis and time series were used in all attempts to show possible sources of growth. Usually, growth related analyses are undertaken by using cross section and panel data evidence. Such data sets are criticized for taking samples of varies countries differing widely in social, political and institutional characteristics on a common surface.

The good performance of economies, which were governed by the state led economics in post war Europe and other socialist countries motivated most LDCs in Africa and Latin America to implement similar types of policy to public sector investment in 1950s. These LDCs invested scarce capital of their economy in large and medium scale industries, farming, mining, trade etc. However, excessive involvement of the public sector in every sector of the economy caused great crisis to these economies. Consequently, there have been frequent calls towards agricultural production especially since late 1970s. Following the structural Adjustment Program of the International Monetary fund and the world bank for newly liberalized market economies of LDCs most of these countries adopted privatization and private sector led growth as an alternative development strategy to boost economic growth (Lukia hernandes, 2016)

It is now widely accepted that the expansion of agricultural production should be the main impetus for economic growth, allowing other production resources gradually to

focus on social areas including alleviation of poverty and the upgrading of social capital and services (Chiber and Dailami, 2017).

Empirical studies addressing the impact of agricultural production on economic growth in developing countries started to appear in economic literature following the 1980s and 1990s structural adjustment program. The robustness of production to GDP ratio in explaining economic growth and economic policy through production variables led most studies to focus their analysis from economic policy towards explaining cross-country differences in production level Mankiw et al (2016) using the augmented Solow model, which includes accumulation of human as well as physical capital in the growth regression found that 80% of the cross country growth variation in the model is explained by these variables.

In contrast, agricultural production has statistically significant effect on growth. However, the problem in this analysis was the quality of the methodology employed. The causal correlation between dependent variables and the independent variables was not addressed properly. The causality runs directly from agricultural production to economic growth.

Although Coutinho and Gallo (2018), Serven and Solimano (2017) came to a similar conclusion, they have used a relatively small sample size and limited time period. Ram (2014) extended Khan and Reinhart's (2015) work by estimating their growth models to cover a considerably larger cross sectional sample and by including data for the 1970's and 1980's.

Another similar study, which tried to show the role of the agricultural production in economic growth, is that of Ghura (2016) for Cameroon. He used more than three decades data to test the hypothesis and employed modern econometric tools of time series to avoid any spurious correlation. He found that agricultural production plays a crucial role in output expansion. The analysis established a significant robust causal linkage between agricultural production and economic growth implying that increases in

agricultural production ratio boost economic growth. An increase in the agricultural production ratio by one percentage point raises economic growth by about 1.4 percentage points.

Ghali (2017) also attempted to adders this issue in the neoclassical growth framework. He employed a Co-Integrated Vector Autoregressive model to account for potential endogeneity and non-stationarity problems. Results suggest that agricultural production has stimulated economic growth in Tunisia over the period from 1963-93.

Badawi (2018) by using the same methodology as Ghali (2017) for Sudan found a positive contribution of agricultural production to economic growth.

Khan and Kumar (2016) using pooled time series cross section data, which has a relatively larger number of country coverage (95 developing countries including Ethiopia) and a long time period (1970-1990) came up with similar positive contribution of agricultural production to economic growth. agricultural production had a much larger impact to economic growth especially during the 1980s.

Ramirez and Nazmi (2017) also suggested that agricultural production positively contribute to economic growth for nine major Latin American countries. Ashipala and Haimbodi (2003) observed that agricultural production plays a crucial role in long-term stabilization policies in South African countries.

Calamitsis, Basu and Ghura (2016) using data for 1981-1997 for Sub-Saharan Africa found that agricultural production is large and statistically significant in growth analysis. This result underscores the crucial role played by agricultural production in boosting growth. Although the magnitude of the impact of agricultural production declines once other factors influencing growth are taken into account, the coefficient remains statistically significant. The effect of other production is not robust. In most of the above studies except Ghura (2016), Ghali (2017) and Badawi (2018), the relationship between agricultural production and growth relationship is analyzed by using a cross section sample.

There are also studies conducted in Ethiopia, which show various determinants of economic growth. Most of them, like others, focused on investigating the macro economic factors of growth.

Another study by Easterly (2015), which used a growth accounting framework, supports the statistically insignificant contribution of capital to economic growth. However, Alemayehu and Befekadu (2017) in their analysis of factors characterizing the Ethiopia economy using a growth accounting framework found that capital has contributed positively to economic growth.

The contrast between the findings of Alemayehu and Befekadu (2017), and Esterly (2015) arose from the authors 'assumption for the factor share of human and physical capital (0.65 and 0.35 respectively) based on cross country regression results as a benchmark instead of estimating them empirically (Seid and Berhnu, 2003).

Paterson (2018) used data from 1981 to 2000 to analyses the relationship between growth in real GDP and agricultural production in a simple Harrod-Domar growth model and found a positive connection between production and GDP growth rate in Ethiopia. The result also suggests that investment from exports and capital inflow is a viable way to promote growth. However, the analysis and the conclusion are based on three explanatory variables (the ratio of production to GDP, the ratio of export to GDP and the ratio of capital inflow to GDP) for a short period, which exposes the analysis to econometric problem like multicollinearity and endogeneity. Furthermore, the Harrod-Domar model is criticized for its assumption of a fixed coefficient production function, which does not allow for factor substitution and the saving ratio is assumed to be fixed.

Though there exist a vast economic literature, which demonstrates the relationship between agricultural production and economic growth for groups of developing countries, country specific studies lack in most of these countries including Ethiopia. It is obvious for countries like Ethiopia agricultural production is good, for sustained economic growth. Given this fact, it is useful to investigate the contribution of

agricultural production to economic growth using long time series data and suggest what has to be done for this sector to enhance the country's development endeavor.

2.4 Research gaps

There is literature gaps on agricultural production and economic growth in Somalia (khan 2016), the previous studies despite existence are not particularly anchored on the Somalia environment as most are outside Somalia. This study explored the literature gaps and added a value on the existing literature by exploring the significance of the relationship between agricultural production and economic growth in Somalia. More over most studies used previous data and don't included the latest on the topic. Therefore, this study provided an update to previously conducted studies (Symer 2014).

This implies that this study addressed both timeframe gap and economic reform problems, as combining both regulated and deregulated eras in a study may cause spurious result. This is because the factors that interplay in market based economy (market forces) do not surface in Somalia economy (Symer 2014).

CHAPTER THREE

METHODOLOGY

3.0. Introduction

This chapter comprises the research design, data type and sources, data analysis, ethical consideration and limitations of the study.

3.1. Research design

This study were used an ex-post factor and descriptive design as part of the non-experimental research design. The reason it is non-experimental because it does not involve manipulating the variable of interest. The correlational design simply aimed to determine the effects between two variables, as well as how strongly these variables relate to one another (Kazdin, 1992).

Furthermore, the research design is chosen because data is attained from the international statistical publications in UN data reports and world economic outlook were used as data sources. The data sheets presented on and it focuses on specific area of investigation within a specific period of time with the intension that the researcher attains and analyzes time series data.

The data were collected from the published data sets recognized under international and world bodies' therefore descriptive statistics and t statistics will be used to establish the distribution of data. This data were obtained from online or by visiting the UN data, IMF and World economic data for Somalia over the period of 30 years. The analysis of data will took into consideration the table analysis on agricultural production and economic growth. The correlations and regressions analysis were be used to determine the effects between agricultural production and economic growth. The design enabled determination of the effects and nature of the effect between the agricultural production and economic growth. From 1995-2014 (Mugenda and Mugenda,1999). Saunders et al. (2007) contend that secondary data analysis were be done on data time series data to determine the relationships and effects of one variable on another.

3.2. Nature and Sources of data

Time series data were attained through secondary data sources were used. Time series analysis comprises methods for analyzing in order to extract meaningful statistics and other characteristics of the data. Time series forecasting is the use of a model to predict future values based on previously observed values. While regression analysis is often employed in such a way as to test theories that the current values of one or more independent time series affect the current value of another time series which focuses on comparing values of a single time series or multiple dependent time series at different points in time Cowpertwait (2009). The time series analysis is, used the data for analysis is historical and known; (Durbin, 2011) it is available and can be accessed through websites from published authenticated sources like International monetary fund and UN data. Time series analysis is used when the data or information required for the study is available and reliable. Time series data was used in this study.

The data used were collected among time series available in the UN data development indicators from 1986 to 2016 www.undata.com.

3.3. Model specification

The model intended to establish a relationship between agricultural production and economic growth. This study adopted and modified the model used by Endogenous growth theory developed by Arrow, Romer, and Lucas (1962). The study modified the model by highlighting the importance of agricultural production which is necessary to achieve a desired rate in economic growth. The model according to Endogenous growth theory assumes that economic growth can be spurred by other factors other than agriculture production like interest rate, exchange rate, inflation rate.

literature reviewed and their theories suggests that these variables can contribute in determining the type of effect that agricultural production has on economic growth therefore in this study the method of vector autoregressive model (VAR) is adopted to specification and estimate of variables so that now the effects of economic growth on agriculture production, interest rate, exchange rate, inflation rate. The use of this

methodology let us recognize the cumulative effects taking into account the dynamic response between economic growth and the other variables (Pereira and Hu 2000).

ECG= f (AGP, ITR, ECR, IFR) ----------3.1

Economic growth that represents the total production of period of time is equal function of agricultural production, interest rate, exchange rate, inflation rate. I was use this variable in this study but it may increase variables, if it necessary and further research on the future. The above equation can further be expanded with the following regression equation:

$ECGt=\alpha_0+\beta_0$ ITR $+\beta_1$ AGP$+\beta_2$ ECR$+\beta_3$IFR$+\varepsilon_i$----------3.2

Where;

ECG= economic growth

α_0 = constant

ITR=interest rate

AGP=agricultural production

ECR=exchange rate

IFR=inflation rate

t = The subscript used to represent the time component in the model summarizing the year when the data was collected.$\beta_0\beta_1\beta_2\beta_3$ These regression coefficients representing the causal relationships between the dependent variables and each of the independent variables in the model.

ε =The error term also called the stochastic error term is assumed to be serialy uncorrelated and homoscedastic.

Table 3.1: Description of the Variables used for the study

Variable	Acronym	Description
Gross Domestic Product	GDP	GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. The GDP is the proxy for economic growth. It is The dependent variable.
Exchange rate	EXC	The *price* of a nation's currency in terms of another currency. An *exchange rate* thus has two components, the domestic currency and a foreign currency, and can be quoted either directly or indirectly. ... Also known as a currency quotation, the foreign *exchange rate* or forex *rate* Bodnar, G. M., & Gentry, W. M. (1993) the economic indicators used to forecast an exchange rate are the same ones used to determine the overall economic health of a country. The gross domestic product (GDP), consumer price index (CPI), producer price index (PPI), and interest rates are all key determining factors of a country's foreign exchange rates.
Inflation	INF	Measuring number of goods that are representative of the economy are put together into what is referred to as a "market basket." The cost of this basket is then compared over time. This results in a price index, which is the cost of the market basket today as a percentage of the cost of that identical basket in the starting year.

		Using Consumer Price Index (CPI) and Producer Price Indexes (PPI).
Agricultural Production;	AGP	Refers to the practice of cultivating the soil, producing crops, raising livestock and marketing of the resulting products.
Interest rate	IR	Interest rate is the amount charged, expressed as a percentage of principal, by a lender to a borrower for the use of assets. Interest rates are typically noted on an annual basis, known as the annual percentage rate (APR)

Source: Authors computation

3.4 Data analysis

a) The descriptive statistics

The descriptive statistics reveal variability of the data of the study variables within the country, justifying the inclusion of these variables in the econometric analysis. It consists of Mean, Standard deviation, minimum and maximum.

b) Testing for Stationarity

The assumptions of the Classical regression model necessitate that both the dependent and independent variables be stationary and the errors have a zero mean and finite variance. Non stationary variables results in spurious regression and as Granger and Newbold (1974), argued they are characterized by a high R^2 and a low Durbin-Watson (*dw*) statistic, t-and F-statistics that appear to be significant, but the results derive no any economic sense (Verbeek, 2000). The results "looks good" because the least-squares estimates are not consistent and the customary test of statistical inference do not hold (Enders, 1995).

The series were also tested for stationarity using the Augmented Dickey Fuller test. The reason for this test is the fact that macroeconomic variables are desired when they are stationary and

on the contrary, regression on the series yields spurious results. The ADF statistic is computed using formula below;

$$\Delta y_t = \alpha_0 + \lambda_t + \delta Y_{t-1} + \sum_{=1} \phi_i \Delta y_{t-1} + \varepsilon_t \ldots\ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots \ldots \quad .3$$

Where

l, is the lag length

The ADF statistic tests the null hypothesis that the series are non stationary against the alternative that the series are stationary. Where the absolute value of the computed ADF statistic is greater than the tabulated one, the null hypothesis is rejected and an inference drawn that the series is stationary at a given level of significance. The series which were found to be non stationary were differenced to make them stationary.

c) Granger Causality

Granger Causality test examines whether lagged values of one variable helps to predict another variable. Granger causality means that if one variable for example in our study, agriculture granger causes, economic growth, then agriculture is a useful predictor of economic growth whereas past values of economic growth do not help to predict agriculture when controlling for past values of economic growth. Therefore, in the VAR model we can identify whether Inflation predicts economic growth using Granger Causality test. Granger is specified accordin6g to emenike (2015) as follows.

$$Y_t = 0 + 1Y_{t-1} + \ldots\ldots iY_{t-i} + 1X_{t-1} + \ldots\ldots iX_{t-i} + \mu \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.4$$

$$X_t = 0 + 1X_{t-1} + \ldots\ldots iX_{t-i} + 1Y_{t-1} + \ldots\ldots iY_{t-i} + \mu$$

Where, the subscripts *t* and *t-1* denote time periods and μ is a white noise error. The constant parameter *0* represents the constant growth rate of *Y* in the equation (7) and *X* in the equation (8). Granger (1969) shows that X Granger-causes *Y* if *Y* can be forecast better using past *Y* and past *X* than just past *Y*. Sample *F*-test is applied to examine causality in the variables. A significant *F*-statistic implies that lagged changes in a variable *Y* Granger cause changes in variable *X*. Unidirectional causality will occur between two variables if either null hypothesis of equation (7) or (8) is rejected. Bidirectional causality exists if both null hypotheses are rejected and no causality exists if neither null hypothesis of equation (7) nor (8) is rejected (Duasa, 2007).

3.5 Diagnostic test

3.5.1 Serial Correlation Test

Serial Correlation is a correlation among members of the series of error terms ordered in time. It is mainly caused by incorrect functional forms, auto regressions, manipulation of data, data transformation and non-stationarity of the data (Wooldridge 2009: 274).

The problem of serial correlation can be detected using the graphical method, Geary test, Durbin - Watson d test and Breusch–Godfrey (BG) test. In this study, the BG test that is based on the Lagrange Multiplier principle is chosen since other tests have drawbacks that made the BG test to be favored.

The test statistic is computed by an auxiliary regression as follows. First, suppose you have estimated the regression;

$$Y_t = X_t\beta + \varepsilon \ldots\ldots \ldots\ldots \ldots\ldots \ldots\ldots 3.5$$

where β are the estimated coefficients and ε are the errors. The test statistic for lag order p is based on the auxiliary regression for the residuals $\varepsilon = y - X\beta$:

3.5.2 Normality Test

In the literature, there are several tests for normality such as a histogram of residuals normal probability plot (NPP), Anderson–Darling and Jarque–Bera tests. The Jarque–Bera test for normality is employed in this research. The Jarque - Bera test is a test based on OLS residuals mainly used in a large sample test. First, it requires calculating the Skewness and Kurtosis and then measures the OLS residuals as. In this case, we use the JB test to determine whether the residuals are normally distributed or not. The null hypothesis and the alternative hypothesis are given as

H0: Residuals are normally distributed

H1: Residuals are not normally distributed

Under the null hypotheses where the residuals are normally distributed, if the p-value of the statistics is sufficiently low or lower or equal to the level of significance, then it will be rejected. But if the p-value is found to be reasonably higher, then the normality assumption will not be rejected. In other words, the normality assumption is not rejected mostly when the value of the statistic is close to zero. The Jarque–Bera test statistic follows the chi-square distribution with two degrees of freedom (Jarque and Bera).

3.5.3 Multicollinearity tests

Multicollinearity is said to exist in a situation where the independent variables are highly and strongly related to each other in a given model. Given the fact that this research involves the use of more than one independent variable, there may exist a problem of Multicollinearity. Although the regression coefficients obtained in instances of Multicollinearity may be close to the true value, they cannot be used for making forecast and estimates and conclusions as they result into very large confidence intervals leading to very poor interpretations. To detect the problem of Multicollinearity, this study will use a statistical test of correlation matrix such that if the correlation coefficient between two variables is 0.5 or more then there is a problem of

multicollinearity which requires one of the two to be dropped. The variables used to test multicollinearity included all the independent variables of agricultural production, interest rates and inflation as well as exchange rate.

3.5.4 Heteroscedasticity Test

One of the ordinary least squares and Regression Model assumptions is that the variance of disturbance terms should be constant. As pointed out by Engle (1982). When the data is not homoscedastic, although coefficients obtained from the regression analysis would hold, the confidence intervals obtained from them would be extraordinarily large and as a result, would affect further inference to be made about the data. In this study, Breusch Pagan Cook-Weisberg test for heteroscedasticity was used to test if the residuals from the regression model are homoscedastic or not.

CHAPTER FOUR

ANALYSIS AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter includes; descriptive statistics, diagnostic tests like heteroscedasticity test, normality test, autocorrelation test and stationarity test prior to a Vector Autogression of GDP on Agricultural production, interest rate, exchange rate and inflation rate .

4.1. Preliminary Analysis

Table 4.1.1 Descriptive of the data

The descriptive statistics reveal variability of the data of the study variables within the country, justifying the inclusion of these variables in the econometric analysis. Table 4.1; present a summary of descriptive statistic for the variables considered for analysis namely agricultural production and econ6omic growth. It describes the distribution of each variable with respect to mean, standard deviation, minimum and maximum values for the 30 observations

Table 4.1: Descriptive statistics of the major variables in the model

	GDP	AGRICPROD	INTEREST_RATE	EXCHANGE_RATE	INFLATION_RATE
Mean	2.753548	159.6365	11.80284	34.86503	20.19419
Median	2.580000	120.1400	9.500000	7.143000	9.400000
Maximum	6.220000	312.4500	34.47500	490.6750	115.4670
Minimum	0.310000	16.92000	4.725000	6.282000	-0.026000
Std. Dev.	1.873771	101.0067	6.765220	91.61019	28.87390
Skewness	0.406712	0.336417	1.674511	4.277635	2.065184
Kurtosis	1.826374	1.636050	5.425732	21.29497	6.435347
Jarque-Bera	2.633780	2.987710	22.08766	526.8691	37.27951

Probability	0.267967	0.224505	0.000016	0.000000	0.000000
Sum	85.36000	4948.730	365.8880	1080.816	626.0200
Sum Sq. Dev.	105.3305	306070.4	1373.046	251772.8	25011.06
Observations	31	31	31	31	31

Source: researcher analysis 2018

The mean GDP growth rate in the study period was 2.754 percent, Maximum registered growth was 6.22 percent and the lowest was 0.31 percent. The standard deviation of growth rate from the mean was 1.874 percent. The growth of Agricultural production was 159.637 million dollars on average with the highest recorded being 312.45 and the least 16.92 million dollars. The standard deviation from the mean of agricultural production growth was 101.007 million dollars. The mean interest rate in the study period was 11.803 percent with the highest estimate at 34.475 percent and the least at 4.725 percent. The average exchange rate in the period of study was 34.865 with the highest level being 490.675 and least 6.282. The standard deviation from the mean exchange rate in the period was 91.610. The mean inflation rate was 20.194 with the highest being 115.4670 and lowest -0.026000. The standard deviation from the mean inflation rate was 28.87390.

The Jarque-bera statistic shows that with exception of GDP growth rate and Agricultural production growth, the other variables are not normal at 5 % level of significance. The skewness statistics of all the variables are much higher than zero and this implies that the variables are not normal. The kurtosis values for all the variables don't tend to 3 in absolute terms which is the condition for normality of any series.

Where: GDP is gross domestic product in billions of US dollars; AGRICPROD is agricultural production growth in millions of US dollars; INTEREST RATE is interest rate on treasury bills; EXRT is exchange rate of Somali Shillings to the USD; INFLAT is the annual inflation rate.

4.2 Correlation Matrix of the study variables

Table 4.1.1: Showing correlation matrix among and multicollinearity results among the variables understudy

	gdp	agricprod	interest rate	exchange rate	inflation
gdp	1				
agricprod	0.9610	1			
interest rate	-0.2592	-0.3413	1		
exchange rate	0.5390	0.4702	-0.2163	1	
inflation	-0.6243	-0.6177	-0.2599	-0.1783	1

Decision Rule coefficient >0. 5 there's a problem of multicollinearity

The table above presents the correlation among independent variables but confirms no problem of multicollinearity as all values are less than 0.5. Since none of the coefficient had a value which is greater than 0.5, this study concludes that there is no multicollinearity among the independent variables under study. Hence our independent variables are free from the problem of multicollinearity.

Table 4.2.2 Unit root test results

VARIABLES	Levels critical value at 5% level of significance		Integrated (1) critical value at 5% level of significance		Decision
	ADF	PHILLIP PERRON	ADF	PHILLIP PERRON	
GDP	-3.346	-3.427*	-7.557**	-7.544**	Stationary at first

					difference
AGRICPROD	-4.975**	-4.509**	-2.547**	-2.396**	Stationary at level
INTEREST RATE	-2.907	-2.848	-7.987**	-9.169**	Stationary at first difference
EXCHANGE RATE	10.611	12.541	-41.307**	-30.235**	Stationary at first difference
INFLATION RATE	-2.033	-2.349	-3.745*	-3.639**	Stationary at first difference

" *" 5% significance, "**" 1% significance

5%(*) -4.45687

1%(**) -5.24424

Notes: Values marked with * represent a stationary variable at 5% significance level and Values marked with ** represent a stationary variable at 1% significance level The null hypothesis is that the variable has unit root or the variable is not stationary. Decision rule; reject the null hypothesis if the test statistic is greater than the 5% critical value. Using the ADF test, the findings revealed that all the variables are found to be nonstationary in their level forms except for agricultural production which is stationary at level. According Dickey and fuller, if the time series is not found to be stationary at levels, there is a possibility that its first difference becomes stationary. Following dickey fuller assumption, the variable for gdp, interest rate, exchange rate and inflation rate were differenced once to make it stationary. On taking first difference gdp, interest rate, exchange rate and inflation rate that exhibited unit roots at level became stationary.

4.3 Lag selection criterion

If the lags are not clearly selected, it may lead to presence of a serial correlation in the residual and results will be spurious therefore the researcher selected the proper number of lags (4) to be used in the model using Schwartz Information Criterion (SIC)

because it has a higher penalty on the degrees of freedom than the other criterion and small sample size.

Table 4.3.1: Results for the lag selection criterion

Lag	FPE --	AIC	HQ	SC
0	.227178	1.35153	1.42289	1.5915
1	.152985	.952922	1.03855	1.24089
2	.143534*	.884583*	.984481*	1.22054
3	.144094	.882271	.99644	1.26622
4	.135048	.80927	.937711	1.24122*

4.4 The effect of agricultural production on economic growth of Somalia

The first objective of the study was to assess the effect of agricultural production on economic growth in Somalia. Regression analysis was employed as a way of examining how the study variables impact economic growth in Somalia.

4.4.1 Regression Analysis of the variables under study

Table 4.5: Showing the Regression results of the variables under study

No of observation	=	31		
Prob>F-Statistic	=	0.0001		
R-squared	=	0.9711		
Adj. R-Squared	=	0.8616		
GDP	Coef.	Std. Err.	t	P>|t|
Agricultural production	0.005981	0.01176	-0.50	0.026
Interest rate	0.023262	0.01626	1.43	0.360
Exchange rate	0.626158	0.33460	1.87	0.457
Inflation	0.000327	0.00666	0.05	0.160
_cons	-0.018438	0.31500	-0.06	0.019

Source: Researcher 2018.

The findings from the above table indicate that agricultural production is statistically significant at 5% level. I.e. the p-values of 0.026 are less than 0.05. Other independent variables like interest rate, exchange rate and inflation are all insignificant that is; the p-values of 0.360, 0.457, 0.160 are all greater than 0.05.

This study therefore concludes that agricultural production positively contributes to the growth of Somalia's economy. However, Exchange rates, inflation and interest rate are positively affects growth though not significant.

GDP=-0.01844+0.0059agriprod+0.0232intrst+0.6261exchange+0.00032inflation

The interpretation of the above equation is that a 1% increase in agricultural production increases GDP growth rate by 0.59% and that a one million 1% increase in interest rate increases GDP growth rate by 2.3%. Thus the findings indicate that a 1% increase in exchange rate in Somalia's increases GDP growth rate by 6.2% while a 1% increase in inflation increases GDP growth rate by 0.03%.

The findings also indicate that the p-value for the entire model (p=0.0001) is less than 0.05 implying that the model is statistically significant at 5% level. Furthermore, the R-squared value shows that a combination of all the independent variables accounts for 97.11% changes in GDP growth rate in Somalia.

4.5 Granger Causality Tests

The second objective of the study was the to examine the causality between agriculture production and economic growth, variables (in their logarithmic form) in the VAR model are tested for Granger causality to find out whether there exist any relationships among them. The results are presented in Table below.

Table 4.5.1: Granger-causality Tests

Variable	GDP growth rate	Agricultural growth	Interest rate	Exchange rate	Inflation rate
GDP growth rate	-	0.8417	0.8353	0.8571	0.7203
Agricultural growth	0.1690	-	0.6441	0.2010	0.1558
Interest rate	0.9541	0.6417	-	0.9744	0.3716
Exchange rate	0.7828	0.4830	0.9769	-	0.8159
Inflation rate	0.5340	0.4215	0.5912	0.9976	-

The figures in the table are the p-values of F-distribution at 0.05 level of significance. Granger-causality runs from row variables to column variables.

The results presented in the Table 4.7 above show that there is no unidirectional causality running from Agricultural production to GDP as the null hypothesis of no causality is accepted at 0.05 level of significance. GDP growth does not Granger-cause Agricultural production since we fail to reject the null hypothesis even at 10 percent level of significance. Therefore, there is no causation running from Agricultural production to GDP growth implying that Agricultural production does not affect GDP growth.

Interest rate does not Granger- causes GDP growth at even 10 percent level of significance. GDP growth does not Granger cause interest rate as well. This means there is no significant relationship between interest rate and GDP.

There is no unilateral causation running from exchange rate to GDP as the null hypothesis is accepted at 0.05 level of significance. This is similar to case to the case of inflation and GDP where the null hypothesis is also accepted at 0.05 level of significance. So neither exchange rate nor inflation rate Granger-cause GDP.

There is no causation between Agricultural production, interest rates, exchange rates and inflation rate. Therefore there is no complementary effect of these variables on GDP growth.

4.6 Diagnostic Tests

Diagnostic tests determine the goodness of the model. Thus, the regression model was preceded by diagnostic tests presented. The diagnostic tests included: Jarque-Bera test for Normal data, white test result for heteroscedasticity and Breusch-Godfrey Lagrange Multiplier test for autocorrelation.

Table 4.6.1: Heteroscedasticity test using White test results

VAR Residual Heteroscedasticity Tests: No Cross Terms (only levels and squares)

Included observations: 28

Joint test:

Chi-sq	Df	Prob.
294.2335	300	0.5830

The null hypothesis of the no heteroscedasticity is tested against the alternative of heteroscedasticty at 0.05 level of significance. The results in the table 4.6.2 above shows that there is no heteroscedasticity since the p-value are greater that significance level, we fail to reject the null hypothesis implying that the residuals have constant variance.

4.6.2 Test for Serial correlation

Table 4.6.3: Breusch-Godfrey LM test for Serial correlation results

Breusch-Godfrey Lagrange Multiplier test for serial correlation			
lags(p)	chi2	Df	Prob>chi2
1	0.2243	1	0.6357
2	0.1795	1	0.6717
H0: No serial correlation			

From table above, the p-value of the chi2 of the lags are greater than the p-value of 0.05 level of significance therefore, we fail to reject the null hypothesis and conclude that there is no serial correlation in the model which is desirable of our model.

CHAPTER FIVE

DISCUSSIONS, CONCLUSSIONS AND RECOMMENDATION

5.0 Introduction

This chapter presents a discussion of findings, conclusion and recommendation of the research.

5.1 DISCUSSIONS OF THE RESULTS

The aim of this study was to examine the impact of private sector investment on economic growth in Uganda for the period from 1986 to 2016; The study examined the time series property of the data using Augmented Dickey- Fuller (ADF) and Phillip Perron tests were as well employed to confirm the findings of the ADF stationarity tests. Correlations were used to establish causal relationships among the variables under study. Finally, regression analysis was used to establish the impact of agricultural production on economic growth in Somalia.

5.1.1 Granger causality between agricultural production and GDP growth in Somalia

Granger causality was the method that was employed to examine short run relationship between agricultural production on economic growth in Somalia. The results as indicated in chapter four showed that agricultural production has no short run relationship with GDP growth. As indicated by the p-values of 0.169 that was found to be greater than 0.05 making the study fail to reject the null hypothesis which stated that there is no short run relationship between agricultural production and GDP growth. These findings of non-causality between agricultural production and GDP growth are consistent with the findings of (Chimobi, 2013) who using the VAR Granger Causality Test established that there is no causality between agricultural production and economic growth in Nigeria. The study findings also conform to the findings of Kigume (2011) who findings while studying the causality between GDP growth and agricultural production in Kenya from 1973 to 2003 revealed that there is no short run relationship between agricultural production and GDP growth.

5.1.3 The effect of agricultural production on economic growth in Somalia

Multiple linear Regression analysis was used to examine how agricultural production impacts economic growth in Somalia. The findings of the regression analysis indicated that there is a positive significant impact of agricultural production on economic growth in Somalia as the model showed that a 1% increase in agricultural production increases GDP growth rate by 0.59%. Further findings from the model also showed that inflation, interest rate as well as exchange rate also impacts the growth of economy positively though insignificant. These findings align well with the findings of Le and Suruga (2013) that while exploring the impact of agricultural production and exchange rate on economic growth, using panel data of 105 of developed and developing countries over the period 1970-2009 showed that both agricultural production have a positive significant relationship with economic growth.

Empirical studies addressing the impact of agricultural production on economic growth in developing countries started to appear in economic literature following the 1980s and 1990s structural adjustment program. Mankiw et al (2009) using the augmented Solow model, which includes accumulation of human as well as physical capital in the growth regression found that 80% of the cross country growth variation in the model is explained by these variables. He found out that agricultural production has statistically significant effect on growth through where the causality runs directly from agricultural production to economic growth. This result is consistent with the study findings though the difference is in the methodology used where the casual correlation method is a weak on compared to the Vector Autocorrelation Regression used in this study.

A similar study, which tried to show the role of the agricultural production in economic growth, is that of Ghura (1997) for Cameroon using modern econometric tools of time series to avoid any spurious correlation. The analysis established a significant robust causal linkage between agricultural production and economic growth implying that increases in agricultural production ratio boost economic growth. His results are consistent with the study which also found that agricultural production plays a crucial role in output expansion and is dependent upon the previous economic growth rate of one year.

Coutinho and Gallo (2011), Serven and Solimano (2014) came to a similar conclusion, although they have used a relatively small sample size and limited time period. Ram (2009) extended Khan and Reinhart's (2010) work by estimating their growth models to cover a considerably larger cross sectional sample and by including data for the 1970's and 1980's.

Ghali (1998) also attempted to address this issue in the neoclassical growth framework where he employed a Co-Integrated Vector Autoregressive model to account for potential endogeneity and non-stationarity problems and the findings suggest that agricultural production stimulated economic growth in Tunisia over the period from 1963-93. Although the methodology differs from this study, the results suggest that agricultural production growth stimulates Economic growth even through the one year lag period.

Badawi (2009) by using the same methodology as Ghali (1998) for Sudan found a positive contribution of agricultural production to economic growth. Khan and Kumar (2010) using pooled time series cross section data came up with similar positive contribution of agricultural production to economic growth though the study focused on time series data.

Ramirez and Nazmi (2003) also suggested that agricultural production positively contribute to economic growth for nine major Latin American countries. Ashipala and Haimbodi (2003) observed that agricultural production plays a crucial role in long-term stabilization policies in South African countries.

Paterson (2003) used data from 1981 to 2000 to analyse the relationship between growth in real GDP and agricultural production in a simple Harrod-Domar growth model found a positive connection between production and GDP growth rate in Ethiopia consistent with the study findings

5.2 Conclusion

This study examined the impact of agricultural production on economic growth in Somalia and found that it has a positive impact on economic growth. Exchange rate, interest rate and inflation rate equally had positive non-significant impact on GDP growth. The R-squared value was 0.971 implying that a combination of all the study independent variables in this study account for 97.1 % changes in GDP growth in Uganda. Also the p-value of the entire model (p=0.0001) showed that the model is statistically significant. Therefore, we can comprehend agricultural production as a means by which government interested in fostering a new division of labor in order to increase the effectiveness and contribution to the development.

Based on the objective one the findings of regression analysis showed that the agricultural production explain that there is a significant effects agricultural production on economic growth in Somalia, regression output were used to identify their interaction. In this research, the study compared the findings of both Trace and Maximum Eigenvalue results to examine if there is a significant effect of agricultural production on economic growth in Somalia as revealed in table 4.5. The Unrestricted regression trace rank test showed that there are positive effects between agricultural production and economic growth; we conclude the null hypothesis of non-existence of an effect between agricultural production on economic growth in Somalia was rejected, and we fail to accepted alternative hypothesis. And the objective two findings are, to examine whether Granger causality exist between agricultural productions on economic growth in Somalia. The aim is used this Granger causality is to establish whether these two are helpful to forecast one another and The result of a Granger causality test table 4.5.1 shows that agricultural production does not cause economic growth at 5% significance level.in a sense that the p-value of agricultural production on economic growth is great than 0.05 implying that agricultural production does not causes on economic growth. As well as the p-value (0.169) of economic growth does not causing agricultural production which is also great than 0.05 implying that we fail to reject the null hypothesis for both variables.

5.3 Recommendation

It is widely accepted that the expansion of agricultural production should be the main impetus for economic growth, allowing other production resources gradually to focus on social areas including alleviation of poverty and the upgrading of social capital and services (Chiber and Dailami, 1990). Notably Somalia's economy consists of both traditional and modern production, with a gradual shift in favor of modern industrial techniques taking root. Its agriculture accounted for 65% of GDP (Gross Domestic Product) in 2006. Therefore the government should address the country's challenges currently facing the country namely; building up its infrastructure; provisions of agriculture extension services and development of its labor force. Through increased productivity of Agricultural Sector as a whole, economic growth rate consequently increases as suggested by the study and other researchers.

As pointed earlier there is literature gap in the study of the relationship between agricultural production growth and economic growth, the study recommends the use of other methodologies to establish the significance of agricultural production and other factors that affect the sectors and their contributions to the economy.

5.4 Areas for Further Research

During this study we have learnt that no single study is exhaustive enough to show the impact of agricultural production on economic growth. Therefore; further research can be done on the impact of agricultural production on economic growth while including other variables like FDI, provite investment among other that easily impact economic growth.

REFERENCES

Abdallah, A. Y., and Egesa, A. K. (2005) Trade and growth in agriculture: a case study of Somalia's export potential with in the evolving Multilateral trading regime, Bank of Somalia Staff Working Paper, January 2005

Ahmad Reza Khorami, D. S. (2013). The Role of Agriculture in Iran's Economic Development, Research Journal of Applied Sciences, Engineering and Technology.

Akiyama, T., Baffes, J., Larson, F. D. and Varangis, P (2003) Commodity Market Reform in Africa: Some recent experiences, World Bank Policy Research Working Paper 2995, March 2003,

Aladejana, O. A. (2016). Agricultural Credit and Economic Growth Nexus. Evidence from Nigeria. International Journal of Academic Research in Accounting, Finance and Management Sciences.

Alberto, G and David, V (2005). Long Black: Surviving the Agriculture crisis, Division on International Trade in Goods and Services, and Commodities, UNCTAD, Geneva, 49th AARES Annual Conference, Coffs HarBOSr, New South Wales, 9-11 February 2005

Alemayeha, F. (2017) Transaction Costs Analysis: Final Report. Prepared for the Plan for the Modernization of Agriculture. The Natural Resources Institute and the International Institute of Tropical Agriculture.

Aremu, Y. (2014). Role of Agriculture in economic growth & development in Africa.

Anderson, B. E. (2007) "*Monetary policy and economic performance of West African Monetary Zone Countries*" University of Lagos, Nigeria.

Badawi, O. (2018) Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia. In Geographic Perspectives on Soviet Central Asia, pp.132180

Baffes, J (2001). Policy Reforms Experience in Agriculture Markets. In Commodity Market Reforms: Lessons from Two Decades.

Baffes, J, (2006). Restructuring Somalia's Agriculture Industry: Why going back to basics matters, World Bank Policy Research Working Paper 4020, October 2006, Washington, D.C.

Baffes, John (2006). Restructuring Somalia's Agriculture Industry: Why Going Back to the Basics Matters. Development Policy Review, 24(4):413-36.

Bercal & Tom. (2012). *Determinants of economics*, AERC Research Paper, 100, Nairobi: African Economic Research Consortium.

BOS (2005) Annual Report 2004/05 Bank of Somalia.

BOS (2006) Annual Report 2005/06 Bank of Somalia.

Brown, O. and Gibson, (2006). Boom or Bust: Developing countries' rough ride on the commodity rollercoaster, International Institute for Sustainable Development (IISD), October, 2006.

Calamitsis, P. (2016) Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia. In Geographic Perspectives on Soviet Central Asia, pp.132180

Claire, C (2006). Gender and Economic Growth in Somalia: Unleashing the Power of Women. Directions in Development.

Chiber w. and Dailami, K. M.-D. (2017). Indian Agriculture- Status, Importance and role in Indian Economy. International Journal For Agriculture and Food Science Technology.

Coutinho R. and gallo, k. (2018) agricultural productivity and economic growth in nigeria. 2000-200: panel data evidence develomen6t policy review 32 (2) cc 483-508.

Craumer, P (1992). Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia. In Geographic Perspectives on Soviet Central Asia, pp.132180

Crawford, M. D. C. (1999). The Heritage of Agriculture: The Fibre of Two Worlds and Many Ages. New York: Grosset & Dunlap Publishers.

Deininger, K., and Okidi, J (2003) Growth and poverty reduction in Somalia. 1992–2000: Panel data evidence Development Policy Review 21 (4) pp 481–509.

Dennis, B (2006). International Trade and Poverty: Can Trade Policy, Market

Easterly, W. and S. Rebelo (2009). "*Fiscal Policy and Economic Growth*: An Empirical Investigation", Journal of Monetary Economics, 32, 417-458

Edwards, M (2007). Cotlook's GM Agriculture Survey. Agriculture Outlook, Special Edition, pp. 64-67. Cotiook Limited, Liverpool.

Emenike O.K. (2015). Response of foreign private investment to public dept in Nigeria. The Romanian Economic Journal, 18(56), 65-86.

Falck-Zepeda, Jose, Daniela Horna, and Melinda Smale (2007). The Economic Impact and the Distribution of Benefits and Risk from the Adoption of Insect Resistant (Bt) Agriculture in West Africa|| Discussion Paper 718. International Food Policy Research Institute. Washington, DC.

FAO (2004). State of Agricultural Commodity Markets, United Nations Food and Agricultural Organization

FAO, Food and Agriculture Organization (2004). The State of Food and Agriculture Agricultural Biotechnology: Meeting the Needs of the Poor? Rome.

FOODNET (2002). Transaction Costs Analysis: Final Report. Prepared for the Plan for the Modernization of Agriculture. The Natural Resources Institute and the International Institute of Tropical Agriculture.

Gerdien, P. R. (2007). The Role of Agriculture in Economic Development. markets, China and Sustainable Development Strategy and Policy Paper, no.5 Stichting. Wagening:

Ghali, T. (2017) Agricultural Change, Labor Supply, and Rural Out-Migration in Soviet Central Asia. In Geographic Perspectives on Soviet Central Asia, pp.132180

Ghulam, N. & Toniolo, G. (2010) *Economic Growth in Europe* since 1945. Cambridge: Cambridge University Press

Ghura, R. (2016) Impact of agricultural export on economic growth in Cameroon. Case study of Banana, Agriculture and Cocoa. International journal of Business and management review.

Gibbon, P. (2006) An overview of the certified organic export sector in Somalia, Danish Institute for International Studies (DIIS) Working Paper No. 2006/13, Strandgade 56 1401 Copenhagen, Denmark,

Gibbon, P., and Bolwig, S. (2007). The economics of certified organic farming in tropical Africa: A preliminary Assessment, (Danish Institute for International Studies) DIIS Working Paper no. 2007/3, Sub-series on Standards and Agro-Food Exports (SAFE) No. 7.

GOU–MFPED/ EC (2002) Somalia. European Community: Country Strategy Paper and National Indicative Programme for the period 2002-2007 Government of Somalia Ministry of Finance, Planning and Economic Development, and the European Commission.

Government of Somalia (2013). Report on the Review of Producer Price Policy for Export Crops, 1992-2013. Volume I: Main Report. Agricultural Secretariat, Agricultural Policy Committee. Mogadishu.

Gustavo K. S. (2007). Rural Development and Poverty Reduction: Is agriculture still the key? Electronic Journal of agricultural and Development economics.

Hezell, P. (2009). The Role of Agriculture In Africa Development.

Isabelle B. G. (2007). Agriculture In Economic Development: Primary Engine Of Growth Or Chicken And Egg?Amer. J. Agr. Econ., 1-7.

Jose, D. N. (2013). Impact of agricultural export on economic growth in Cameroon. Case study of Banana, Agriculture and Cocoa. International journal of Business and management review.

Kasozi A. (2006) Institutions and commodities of Agriculture in Somalia. A paper presented at the Workshop on Commodity Dependence and Development in Africa, Centre for Research in Institutional Economics, University of Hertfordshire.

Keizire (2004) Policy Research – Implications of Liberalization of Fish Trade for Developing Countries: A Case Study for Somalia, DFR (MAAIF) for the Food and Agriculture Organization (FAO) of the United Nations, Rome, July 2004.

Kelly and Steiner, (2013). Economic Growth.|| New York: McGraw Hill.

Khan, D. (2016) Impact of agricultural export on economic growth in Cameroon. Case study of Banana, Agriculture and Cocoa. International journal of Business and management review

Lewin, B., Giovannucci, D., and Varangis, P. (2004) Agriculture markets: New paradigms in Global Supply and Demand, Agricultural and Rural Development Discussion paper. Washington D.C.: World Bank.

Lewis Ivey, M. L, Miller, S, A., Hakiza, G., and Geiser, D. M., (2003) Characterization of Agriculture Wild Pathogen in Somalia, Ohio State University, Agriculture Research Institute Mukono-Kituza, and Pennsylvania State University.

Lundbaek, J. (2003) Privatisation of the Agriculture sub-sector in Somalia: Market failures and institutional mechanisms to overcome these, Masters Thesis the Royal Veterinary and Agricultural University, Department of Economics and Natural Resources, Copenhagen, Demark, June 2003.

Lukia, E. (2016) Restructuring Somalia's Agriculture Industry: Why going back to basics matters, World Bank Policy Research Working Paper 4020, October 2006, Washington, D.C.

Mccagreth, N. A. (2009). Economic policy and planning , united Nations economy sector

Omorogbe O, J. Z. (2014). The Role Of Agriculture Of In The Economic Development Of Nigeria. European Scientific Journal.

Okidi, O. a.-A. (2014). Agricultural Production and Economic Growth in Nigeria: Implication For Rural Poverty Alleviation.

Oshea, j. (2006) An overview of the certified organic export sector in Somalia, Danish Institute for International Studies (DIIS) Working Paper No. 2006/13, Strandgade 56 1401 Copenhagen, Denmark,

Peterson, R. (2018) Economic policy and planning , united Nations economy sector

Ramirez, O. (2017) Policy Research – Implications of Liberalization of Fish Trade for Developing Countries: A Case Study for Somalia, DFR (MAAIF) for the Food and Agriculture Organization (FAO) of the United Nations, Rome, July 2004.

Romer, and Lucas (1962). *Economic Growth in Europe* since 1945. Ohio: Ohio University Press.

Serven, w. and solimano, c.m. (2017) agricultural economics, Ohio University, 6edition,

shakir, J (2002). Privatization of Agriculture in Somalia: Market Mechanisms and Institutional Mechanisms to Overcome These. The Royal Veterinary and

Agricultural University, Department of Economics and Natural Resources, Denmark. 2012.

World Bank. (2014). "Somalia, Moving beyond Recovery: *agricultural and Behavior Change for Growth.*" Country Economic Memorandum Volume II: Overview, Report 39221-SO, Africa Region, Poverty Reduction and Economic Management Unit, Washington, DCWPS 559, December, world bank.WWW. UN DATA. COM

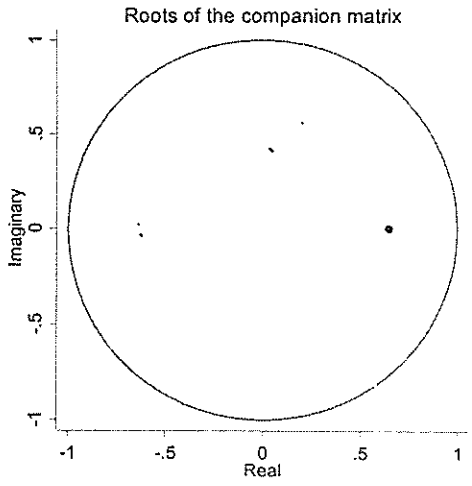
APPENDICES

Appendix A1(Data set)

YEAR	AGRICPROD	GDP	INTEREST RATE	EXCHANGE RATE	INFLATION RATE	ESTGDP	ERROR
2016	312.45	6.22	8.115	490.675	4.148	7.015983	-0.79598
2015	312.23	5.79	4.725	170.453	2.148	5.173113	0.616887
2014	305.13	5.88	6.408	105.177	5.105	4.421322	1.458678
2013	309.14	5.32	5.892	72	2.399	4.352768	0.967232
2012	304.89	5.14	8.542	39.487	4.194	3.786709	1.353291
2011	289.32	5.59	9.517	20.019	5.098	3.5151	2.0749
2010	281.78	4.33	10.175	15.788	3.953	3.469276	0.860724
2009	279.16	4.47	10.425	10.75	-0.026	3.578265	0.891735
2008	265.21	3.91	7.09	6.295	11.371	3.389937	0.520063
2007	237.14	3.31	6.551	6.295	4.929	3.716652	-0.40665
2006	197.28	3.59	9.216	6.295	13.532	3.089322	0.500679
2005	185.69	3.22	10.325	6.295	3.121	3.422885	-0.20289
2004	166.67	3.09	11.189	6.295	3.132	3.337573	-0.24757
2003	150.49	3.44	11.51	6.295	1.968	3.355521	0.084479
2002	120.14	3.12	21.95	6.295	0.633	2.38705	0.73295
2001	115.48	2.58	23.325	6.295	1.76	2.204128	0.375872
2000	112.36	2.22	23.408	6.282	9.4	1.871185	0.348815
1999	109.45	2.01	20.242	6.98	2.018	2.500749	-0.49075
1998	94.32	1.43	20.267	7.129	15.205	1.938899	-0.5089
1997	86.14	1.26	13.083	7.143	10.52	2.843579	-1.58358
1996	71.29	1.14	34.475	7.143	13.513	0.615682	0.524318
1995	76.18	1.33	13.208	7.143	16.886	2.560749	-1.23075
1994	68.78	1.05	7.667	7.143	18.5	3.03628	-1.98628
1993	62.99	0.81	7.5	7.143	24.4	2.80193	-1.99193
1992	50.32	0.78	13	7.143	33.4	1.87933	-1.09933
1991	41.75	0.59	7	7.143	65.8	1.09153	-0.50153
1990	16.92	0.55	6	7.143	115.467	-0.92112	1.471118
1989	17.13	0.31	7	7.143	97.417	-0.25219	0.562193
1988	61.78	0.79	9.5	7.143	69.847	0.674032	0.115968
1987	109.21	0.94	9.5	7.143	32.655	2.254692	-1.31469
1986	137.91	1.15	9.083	7.143	33.527	2.258581	-1.10858

Source: Un data and World Bank, 2016

Appendix A2(VAR stability tests)



Eigenvalue stability condition

Eigenvalue	Modulus
.6499678	.649968

All the eigenvalues lie inside the unit circle.

VAR satisfies stability condition.

Appendix A3(Casuality tests)

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
-	ALL	979.25	5	0.000

Appendix A4 (Autocorrelation tests)

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	2.6706	1	0.10222
2	0.0030	1	0.95654

H0: no autocorrelation at lag order

Appendix A5 (Normality test)

Jarque-Bera test

Equation	chi2	df	Prob > chi2
gdp	0.961	2	0.61858
ALL	0.961	2	0.61858

Appendix A6(Granger causality test)

Pairwise Granger Causality Tests
Date: 04/18/18 Time: 11:04
Sample: 1986 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
AGRIC does not Granger Cause GDP_1	28	1.92298	0.1690
GDP_1 does not Granger Cause AGRIC		0.17363	0.8417
INTERE_1 does not Granger Cause GDP_1	28	0.04707	0.9541
GDP_1 does not Granger Cause INTERE_1		0.18144	0.8353
EXCHAN_1 does not Granger Cause GDP_1	28	0.24757	0.7828
GDP_1 does not Granger Cause EXCHAN_1		0.15525	0.8571
INFLAT_1 does not Granger Cause GDP_1	28	0.64477	0.5340
GDP_1 does not Granger Cause INFLAT_1		0.33288	0.7203
INTERE_1 does not Granger Cause AGRIC	28	0.45231	0.6417
AGRIC does not Granger Cause INTERE_1		0.44849	0.6441
EXCHAN_1 does not Granger Cause AGRIC	28	0.75129	0.4830
AGRIC does not Granger Cause EXCHAN_1		1.72201	0.2010
INFLAT_1 does not Granger Cause AGRIC	28	0.89718	0.4215
AGRIC does not Granger Cause INFLAT_1		2.01828	0.1558
EXCHAN_1 does not Granger Cause INTERE_1	28	0.02336	0.9769
INTERE_1 does not Granger Cause EXCHAN_1		0.02600	0.9744
INFLAT_1 does not Granger Cause INTERE_1	28	0.53779	0.5912
INTERE_1 does not Granger Cause INFLAT_1		1.03389	0.3716
INFLAT_1 does not Granger Cause EXCHAN_1	28	0.00243	0.9976
EXCHAN_1 does not Granger Cause INFLAT_1		0.20533	0.8159

Appendix A7(VAR model)

Vector Autoregression Estimates
Date: 05/28/18 Time: 19:44
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	AGRIC	INTERE_1	EXCHAN_1	INFLAT_1	GDP_1
AGRIC(-1)	1.184582	-0.007253	-0.109799	0.351530	-0.009561
	(0.59918)	(0.43132)	(0.39037)	(0.28534)	(0.01511)
	[1.97700]	[-0.01681]	[-0.28127]	[1.23199]	[-0.63262]
AGRIC(-2)	-0.370784	0.074328	0.080199	-0.425057	0.007385
	(0.91982)	(0.66213)	(0.59927)	(0.43803)	(0.02320)
	[-0.40310]	[0.11225]	[0.13383]	[-0.97039]	[0.31828]
AGRIC(-3)	0.136423	-0.050981	0.243448	0.671856	0.012322
	(0.78860)	(0.56767)	(0.51377)	(0.37554)	(0.01989)
	[0.17300]	[-0.08981]	[0.47384]	[1.78905]	[0.61947]
AGRIC(-4)	0.162140	-0.037435	-0.214322	-0.649185	0.005981
	(0.46633)	(0.33569)	(0.30381)	(0.22207)	(0.01176)
	[0.34769]	[-0.11152]	[-0.70544]	[-2.92334]	[-0.50850]
INTERE_1(-1)	0.018087	-0.642141	-0.171148	0.091047	-0.004796
	(0.77701)	(0.55933)	(0.50623)	(0.37002)	(0.01960)
	[0.02328]	[-1.14805]	[-0.33809]	[0.24606]	[-0.24469]
INTERE_1(-2)	-0.202858	-0.306540	-0.207844	0.201868	-0.002359
	(0.79518)	(0.57241)	(0.51806)	(0.37867)	(0.02006)
	[-0.25511]	[-0.53552]	[-0.40119]	[0.53309]	[-0.11761]
INTERE_1(-3)	0.005416	-0.157325	0.165771	0.245580	0.021719
	(0.69320)	(0.49900)	(0.45162)	(0.33011)	(0.01749)
	[0.00781]	[-0.31528]	[0.36706]	[0.74394]	[1.24212]
INTERE_1(-4)	-0.069109	-0.044669	-0.148563	0.222302	0.023262
	(0.64450)	(0.46394)	(0.41989)	(0.30692)	(0.01626)
	[-0.10723]	[-0.09628]	[-0.35381]	[0.72431]	[1.43087]
EXCHAN_1(-1)	-4.509973	0.724993	-2.796411	-0.435000	-0.206170
	(4.26558)	(3.07058)	(2.77904)	(2.03131)	(0.10760)
	[-1.05729]	[0.23611]	[-1.00625]	[-0.21415]	[-1.91615]
EXCHAN_1(-2)	3.636554	-0.573269	0.304472	0.919208	0.205563
	(4.45101)	(3.20406)	(2.89984)	(2.11961)	(0.11227)
	[0.81702]	[-0.17892]	[0.10500]	[0.43367]	[1.83092]
EXCHAN_1(-3)	-2.969053	0.585434	4.052401	-0.774088	-0.194045
	(4.66508)	(3.35816)	(3.03931)	(2.22156)	(0.11767)
	[-0.63644]	[0.17433]	[1.33333]	[-0.34844]	[-1.64902]
EXCHAN_1(-4)	12.05800	-2.117786	18.05361	2.405156	0.626158

	(13.2649)	(9.54872)	(8.64209)	(6.31685)	(0.33460)
	[0.90902]	[-0.22179]	[2.08903]	[0.38075]	[1.87139]
INFLAT_1(-1)	0.094591	-0.115904	-0.048585	-0.202063	-0.009711
	(0.43409)	(0.31248)	(0.28281)	(0.20672)	(0.01095)
	[0.21790]	[-0.37091]	[-0.17179]	[-0.97748]	[-0.88690]
INFLAT_1(-2)	-0.162376	0.065132	0.159407	0.054465	-0.002146
	(0.36023)	(0.25931)	(0.23469)	(0.17154)	(0.00909)
	[-0.45076]	[0.25117]	[0.67923]	[0.31750]	[-0.23622]
INFLAT_1(-3)	-0.000262	0.003479	0.036453	0.183372	0.004873
	(0.35170)	(0.25317)	(0.22913)	(0.16748)	(0.00887)
	[-0.00075]	[0.01374]	[0.15909]	[1.09487]	[0.54929]
INFLAT_1(-4)	0.070462	-0.200728	0.090004	-0.145447	0.000327
	(0.26422)	(0.19020)	(0.17214)	(0.12583)	(0.00666)
	[0.26668]	[-1.05535]	[0.52285]	[-1.15595]	[0.04908]
GDP_1(-1)	-3.631963	4.246393	10.73311	1.336694	-0.465279
	(12.7197)	(9.15629)	(8.28692)	(6.05725)	(0.32084)
	[-0.28554]	[0.46377]	[1.29519]	[0.22068]	[-1.45017]
GDP_1(-2)	-0.644561	-2.878809	3.021656	7.976515	0.124915
	(13.9501)	(10.0420)	(9.08856)	(6.64319)	(0.35188)
	[-0.04620]	[-0.28668]	[0.33247]	[1.20071]	[0.35499]
GDP_1(-3)	-8.882206	-4.247904	6.385857	13.40214	-0.076746
	(13.2038)	(9.50478)	(8.60233)	(6.28779)	(0.33306)
	[-0.67270]	[-0.44692]	[0.74234]	[2.13145]	[-0.23043]
GDP_1(-4)	6.644975	-7.284725	-10.47160	10.62596	-0.035681
	(15.3723)	(11.0658)	(10.0151)	(7.32045)	(0.38775)
	[0.43227]	[-0.65831]	[-1.04558]	[1.45154]	[-0.09202]
C	4.343009	2.047850	0.442221	-13.22201	-0.018438
	(12.4880)	(8.98949)	(8.13597)	(5.94691)	(0.31500)
	[0.34777]	[0.22780]	[0.05435]	[-2.22334]	[-0.05853]
R-squared	0.971132	0.495339	0.994961	0.930457	0.752192
Adj. R-squared	0.861658	-1.523304	0.974807	0.652284	-0.239042
Sum sq. resids	1191.950	617.6495	505.9294	270.3048	0.758389
S.E. equation	15.43988	11.11440	10.05912	7.352616	0.389458
F-statistic	51.10137	0.245382	49.36715	3.344892	0.758844
Log likelihood	-86.62064	-78.07412	-75.48031	-67.33130	9.058113
Akaike AIC	8.278511	7.621086	7.421562	6.794715	0.918607
Schwarz SC	9.294666	8.637241	8.437717	7.810870	1.934762
Mean dependent	177.1454	0.081346	18.59738	-4.281500	0.219231
S.D. dependent	98.96120	6.996829	63.37542	12.46895	0.349879

Determinant resid covariance (dof adj.)	24332.31
Determinant resid covariance	6.399804
Log likelihood	-208.5935
Akaike information criterion	24.12258
Schwarz criterion	29.20335

APPENDIX 08 HETEROSKEDASTICITY TEST

VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 04/18/18 Time: 13:43
Sample: 1986 2016
Included observations: 28

Joint test:

Chi-sq	df	Prob.
294.2335	300	0.5830

Individual components:

Dependent	R-squared	F(20,7)	Prob.	Chi-sq(20)	Prob.
res1*res1	0.770064	1.172162	0.4418	21.56179	0.3648
res2*res2	0.742610	1.009802	0.5340	20.79307	0.4094
res3*res3	0.325584	0.168967	0.9992	9.116344	0.9815
res4*res4	0.988068	28.98378	0.0001	27.66591	0.1175
res5*res5	0.835493	1.777564	0.2228	23.39379	0.2699
res2*res1	0.508434	0.362010	0.9649	14.23614	0.8183
res3*res1	0.485955	0.330875	0.9755	13.60675	0.8499
res3*res2	0.367114	0.203022	0.9977	10.27918	0.9628
res4*res1	0.806232	1.456280	0.3179	22.57448	0.3102
res4*res2	0.695269	0.798553	0.6779	19.46753	0.4916
res4*res3	0.302005	0.151436	0.9996	8.456130	0.9884
res5*res1	0.814791	1.539755	0.2893	22.81414	0.2980
res5*res2	0.618411	0.567218	0.8489	17.31552	0.6324
res5*res3	0.600251	0.525550	0.8774	16.80703	0.6655
res5*res4	0.833345	1.750144	0.2295	23.33365	0.2727

APPENDIX VECTOR AUTO-REGRESSION RESULTS

Vector autoregression

Sample: 1988 - 2016		No. of obs	= 29
Log likelihood = -5.149726	(lutstats)	AIC	= -2.344793
FPE = .1471463		HQIC	= -2.31526
Det(Sigma_ml) = .0835155		SBIC	= -2.250496

Equation	Parms	RMSE	R-sq	chi2	P>chi2
gdp	8	.339604	0.9756	1157.218	0.0000

gdp	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
gdp						
gdp						
L1.	.3128015	.1941247	1.61	0.107	-.0676759	.6932788
L2.	.3667971	.1837877	2.00	0.046	.0065798	.7270143
agricprod	.0061274	.002756	2.22	0.026	.0007258	.011529
interestrate	.0101195	.0110541	0.92	0.360	-.0115462	.0317852
exchangerate	.0005746	.0007732	0.74	0.457	-.0009409	.00209
inflationrate	-.0037918	.0033675	-1.13	0.260	-.0103919	.0028083
error	.0474223	.0735005	0.65	0.519	-.0966361	.1914807
_cons	.0396199	.3091202	0.13	0.898	-.5662446	.6454844