The Impact of Key Macroeconomic Variables on Agricultural Infrastructure Investment and Output in Kenya (2005 to 2016)

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Abstract

Agriculture is the heart of Kenya's economic development and will continue to play a significant role for many years to come. The government of Kenya, has been implementing key macroeconomic policies every succeeding year to improve the performance of the economy through agricultural productivity. The identified macroeconomic policies used, have included, fiscal, monetary and, trade policies. Fiscal policy involves the use of public expenditure, taxation and borrowings, while monetary policy is the control of money supply and credit by use of monetary instruments to regulate interest rates in the economy. Trade policies relates to how, our local products competes with other agricultural products globally, thus impacting on the current account balance and thus aggregate demand. Given the fact that international trade in agri-food products is characterized by oligopolistic competition, the competitiveness of local agri-food produce has often had mixed results, leading to a negative current account position. This study attempts to explore the contribution of key macroeconomic policies to the growth of the agricultural output using time series data from 2005 to 2016 obtained from the Central Bank of Kenya and the Economic Surveys, various issues. The empirical perspective of the paper applied Ordinary Least Squares regression using Statistical Package for Social Scientists Software Version 21. It relied on the theoretical support posited by new Keynesians, taking into account the importance of the monetary policy transmitted through the banking sector.It was found that, the variables, current account balance, national income, total commercial bank credit to agriculture, government total expenditure, and real interest rates had a joint statistical significance to agricultural output, and all conformed with a priori- expectations.

Keywords: Macroeconomic policies, Agricultural Infrastructure Investment, Agricultural Productivity, Trade policies, economic growth and poverty reduction

1. Introduction

The Comprehensive African Agriculture Development Programme (CAADP) is the Continent's context for agricultural sector transformation. Agra (2016), posits that CAADP embodies the preference of African governments for an agriculture-led growth and poverty reduction policy. It aims at increasing funding for the sector and enhancing policy practices to accelerate growth. Its main philosophies comprise; African ownership and leadership, inclusivity, evidence based planning and mutual accountability. It compels African nations to pursue systematic planning and implementation phases to attain key CAADP targets, which are, a 6 percent agricultural growth rate at the national level and 10 percent budgetary allocation to CAADP goals and objectives.

Agricultural output is affected by an array of institutional incentives, chief among them, the macroeconomic policies. Muftaudeen and Abdullahi (2014) states that, macroeconomic policies are public policy instruments through which the government of an economy tries to regulate economic activities to achieve a high level of economic growth for developing countries and stabilization for developed countries. Macroeconomic policies consists of fiscal, monetary, exchange rate regimes and trade policies that influence production output in the real and agricultural sectors. Monetary policy is the control of credit and money supply in the economy using monetary instruments to manipulate interest rates for attaining, economic growth, stability in rate of inflation and exchange rate, low and stable real interest rate and employment creation. Wrightsman, D. (1976). Monetary policy can either be expansionary or contractionary. Contractionary if it is targeted towards reducing the size of money supply or increasing interest rates, whilst its expansionary, for vice versa. Fiscal policy includes the use of government expenditure, taxation, borrowings and subsidies in terms of relief to advance economic growth. Fiscal policy instruments are classified into two groups: Automatic stabilizers and discretionary fiscal policy. Automatic stabilizers relate to government expenditure or reduction in taxation which is not influenced by deliberate government actions, but important in regulating oscillations in the economy, whilst discretionary fiscal policy entails conscious government intervention to obtain specific macroeconomic objectives.   Johnson, R, B. (2009),

According to Johnson and Kilby, 1975, Lipton, 2005, Mellor, 1976 and Vollrath, 2007 in Agra (2016),   many African Countries have shown positive correlation between agricultural productivity growth and poverty reduction. Only Kenya, Benin and Madagascar had a negative relationship. Economic theory postulates that agricultural productivity growth contributes in poverty reduction in areas that the workforce is predominantly engaged in

agriculture. This situation is predisposed by various variables, including, the initial distribution of productive assets, that influences the level to which agricultural productivity expansion is inclusive and that subsequently regulates the power of successive income and employment multipliers. The non-conformance of the three countries, may have been caused by different factors. These includes, data discrepancies, agricultural productivity is not broadly based where a large proportion of smallholder farmers are generating increased incomes and spending. Agra (2016), posits that the robustness of the agricultural growth-poverty nexus also depends on the agricultural sub-sector which provides productivity growth. An illustration is the export-crop stimulated growth may involve nominal number of smallholder farmers and thus have varying outcomes on poverty reduction than staple crop-led growth engaging numerous rural smallholder farmers.

Filmer and Fox (2014), Tschirley et al (2015), Yeboah and Jayne (2016) opines that agri-food systems will continue to employ a large proportion of developing countries population until 2030 and beyond even with lasting economic transformation. Filmer and Fox (2014), extrapolates that approximately 40 percent of all Africans entering the labour force over the next ten years will be principally involved in agriculture. Consequently, enhanced attention on supporting agricultural productivity on smallholders will be significant for diminishing rurdal poverty and producing the income and employment multipliers required for rapid and sustainable economic transformation. Ishola,S. A et al (2013), argues that technological innovations, enterprise development and industry capacity is the fastest trajectory through which a nation can achieve sustainable growth and development. This assertion is corroborated by the meteoric expansion of the Dutch agri-food systems, to be one of the leading in the World and second to the United States of America. The Dutch have invested heavily in human capital formation, producing highly skilled workforce undertaking premium research and innovation through the Golden Triangle Concept.

In the Kenyan experience, extreme and prolonged drought, sharp decline in exchange rate, unprecedented expansionary fiscal policy, and corruption have adversely affected economic growth and development as manifested in escalating high food prices, low agricultural, real sector and industry productivity, leading to severe food shortages and rising unemployment. Other problems bedeviling the Kenyan economy currently, include, high dependency on imports for consumption and capital goods leading to deteriorating current account balances, dysfunctional social and economic institutions, poor absorption of development budgets, low agricultural productivity, and neglect of smallholder agricultural sector. These have cumulatively resulted in declining incomes, food availability and soaring poverty among Kenyans. Albeit the government of Kenya initiating various forms of interventions since, independence, including macroeconomics policy reforms to revamp agriculture and rural development, no tangible improvement has taken place, to ensure sustainable food security and poverty reduction. Kenya is among three countries in Africa where economic growth has an inverse relationship with food security and poverty reduction.

Despite the country recording increase in GDP, agricultural productivity remains low, and poverty rates continues to increase. Economic theory posits that a nations' increase in GDP will result in more available resources, which are invested in productive sectors, to yield more production and incomes. In view of this, the question is does macroeconomic policies have impact on agricultural sector output and food security. This paper is the second objective of the broad research being undertaken to address "Smallholder Accelerated Market Access for Inclusive Growth, Food Security and Poverty Reduction in Kenya; Institutional and Macroeconomic Perspective". This paper examines whether, there is a significant relationship between current account balances, government expenditure, agriculture sector credit, real interest rates, economic growth and agricultural sector growth.it aims at providing stakeholders with the analytical basis for designing institutional, macroeconomic and agricultural policy strategy that contributes to unlocking constraints encountered by smallholders in the commercialization and investment in the Kenyan agricultural sector for sustained economic growth, enhanced food and nutrition security, and poverty reduction.

1.2 Statement of the Problem

Empirical evidence has shown that mega stand alone, public sector agricultural investment has failed to increase the productivity of the smallholder farmers, with little impact on economic growth and poverty reduction in developing countries. This situation is replicated in Kenya, where over the years despite massive investments in dams and irrigation by the public sector, no tangible benefits have been realized. The most recent such investment, is the Multi-Billion Galana Kulalu project at the Coast of Kenya. Despite massive Public investment, the pilot project has achieved mixed results, underscoring the notion of inefficient public sector in project implementation, and that through appropriate form of Public Private Partnership these resources can be used to transform the rural economy contributing to economic growth and poverty reduction. Further empirical evidence reveals, that out of the 3 million irrigation potential in Kenya, only a paltry 13 percent has been developed providing a growth rate of 0.5 percent. This is exacerbated by lack of a national policy, legal and institutional framework and the low investment in irrigation infrastructure and water storage occasioned by inadequate Public Private Sector participation in the sector.

Agriculture is the heart of kenya's gross domestic product (GDP) growth, but why does agriculture lag behind in inclusive infrastructure investment and sustainable macroeconomic and trade policy implementation-? The policy framework for investment in agriculture (PFIA) aims to support countries in evaluating and designing policies to mobilize private investment in agriculture for steady economic growth and sustainable development. Attracting private investment in agriculture requires a wide set of policies that go beyond agricultural policy, including macroeconomic and sectoral policies. In developing countries like Kenya, where Monetary policy alone is ineffective due to existence of underdeveloped money and capital markets, fiscal policy can be used as an important adjunct to monetary policy in accelerating the rate of capital formation by diverting resources from less productive channels into productive channels. The incremental saving ratio can be raised by government expenditure in creating social and economic overheads and in expenditures that create an enabling matrix for the private sector to flourish. Despite ratifying the Maputo protocol of 2003, of increased annual investment in agriculture by African Countries to at least 10 percent of the annual budgetary resources, Kenya's investment remains a paltry 4 percent with no significant documentation of the net private sector participation or investment in the traditional economy to support smallholder farmers.

The return of economic development to Sub-Saharan African countries and an array of new internal and external dynamics have significant implications for opportunities for African agriculture as a fulcrum of inclusive and sustainable growth. Numerous variables have influenced this increased economic performance, chiefly, macroeconomic reforms and impeccable institutions, new technologies such as mobile phones, and innovative information communication technologies and higher product prices. In addition, over the past ten years, more African economies including Kenya, have gone through salient transitions, majorly propelled by a more interrelated dynamics of complex global ecosystem and other domestic changes, such as increased urbanization and soaring urban incomes and middle class and the related higher demand for food. A glimpse into the future, renewed interest in agriculture from classical donors and new actors such as Brazil, Russia, India, China and South Africa, (BRICS) nations, private investors, burgeoning youth populations, land scarcity, environmental degradation, rising poverty and inequality and climate change all provide new obstacles and opportunities for the rural economies and agricultural sector in Africa and Kenya in particular in the years ahead. Managing the nexus between agriculture infrastructure development, financing and increased agricultural productivity through optimization of institutional incentives and sound macroeconomic policies is fundamental to a country's economic growth and development.

1.3 Justification of the study

The significance of the agricultural sector in the Kenyan economy cannot be gainsaid. The agricultural sector contributes 30 per cent to the National Gross Domestic Product and accounts for 60 per cent of export earnings , 18 per cent of formal employment and approximately 60 per cent of informal employment. As an adjunct, the sector contributes about 75 per cent of the raw materials used in the manufacturing and 65 per cent of rural household incomes in the country. Kenya is also a signatory to the Maputo protocol that commits member states to allocate at least 10 per cent of annual budgetary resources to agriculture development. Grow Africa partnership (2013), estimates that over 300 international businesses have made commitments of over ten billion US dollars investment across 12 African countries. World Bank (2015), states that the value of Africa's total agricultural output today is estimated at US $ 280 billion and could triple to around US $ 800 billion by 2030 due to rising local and international demand for food. In addition, World Bank posits that urban food markets will increase four times and overall Africa's demand for food is predicted to triple by 2050, increasing by 178 per cent, juxtaposed to 89 per cent in India and 31 per cent in China for similar period.

During the just concluded Global Entrepreneurship Summit (GES, 2015), held in Kenya, President of the United States, announced over US dollars 100 billion in new financial commitments for youth and women entrepreneurs across the globe, with investors from East Africa and especially women and youth set out as major beneficiaries. The financial commitments is to be sourced from banks, foundations, philanthropists and the US Government. Broad and sustained economic growth has led to significant increase in public and private investment. Local small and medium enterprises (SMEs) have been sprouting and developing in Kenya around agriculture and agribusiness segments significantly enhancing prospects for smallholder farmers. This paradigm shift is occasioned by the fact that, governments, development partners and the private sector have recognized that agriculture is not just about food security, but it is also at the fulcrum of rural pro-poor economic transformation. Investments in agriculture are regarded as more valuable than investments in any other market sector, because of their capacity of a higher multiplier in poverty reduction and wealth creation and economic growth that is broadly inclusive.

1.4 Significance of the study.

According to the World Bank World Development Report, Development and Climate Change (2010), states that meeting climate change and development goals requires significantly stepping up international efforts to diffuse

existing technologies and develop new ones. Public and Private investment- now in the tens of billions of dollars per year –need to be steeply ramped up to several hundreds of billions of dollars annually. 'Technology –Push' policies based on increasing public investments in research and development will not be sufficient. They need to be marched with 'market-pull' policies that create public and private sector incentives for entrepreneurship, for collaboration and to find innovative solutions in unlikely places. This study will build into the body of literature, by identifying key macroeconomic variables that can lead to inclusive increased investments in agricultural infrastructure development by, investors, the financial sector and government through appropriate form of Public Private Partnerships to spur smallholder agricultural productivity and enhance local agribusiness enterprises in the rural economy.This initiative, will scale up the transformation of rural development through rural entrepreneurship, leverage the private sector to invest more in agribusiness, ensure inclusive growth through women and youth empowerment as the bulk of agricultural activities are consummated by women and youth. Through optimization of both financial and agricultural value chain approaches, there will be increased food, nutrition and income security, further leading to economic growth and poverty reduction.

Objectives of the study includes:
1) To determine the impact of key macroeconomic variables on agricultural infrastructure investment and output in kenya
2) Provide recommendations on macroeconomic policy reforms that can be used to accelerate inclusive integration of smallholder farmers to modern agri-food value chains to bolster food security, rural incomes, economic growth and reduce poverty.

1.6 Research Questions
1) What is the impact of key macroeconomic variables on agricultural infrastructure investment and output in Kenya?
2) What are the general and policy recommendations that can enhance optimization of institutional incentives and macroeconomic policy to accelerate smallholder farmers agricultural investment and integration into modern agri-food value chains?

Literature Review
Young, R.A and Haveman R.H, (1985), posits that macroeconomic policies and sectoral policies that are aimed specifically at the agricultural sector can have a strategic impact on resource allocation and aggregate demand in economy. A country's overall growth and use of macroeconomic policies- fiscal, monetary and trade policies directly and indirectly affect demand and investment in agriculture related activities. The most obvious example is government expenditures (fiscal policies) on irrigation, flood controls and dams. A less apparent example is trade and exchange rate policy aimed at promoting exports and earning more foreign exchange , for example as a result of currency depreciation , exports of high value water consuming crops may increase. If additional policy changes reduce export taxes, farmers are provided with an even greater incentive to invest in export crops as well as in necessary irrigation. This therefore buttresses the assertion that investment in agriculture infrastructure has a higher multiplier in rural income creation and poverty reduction

Aroriode et al.,(2014), in their study of the Nigeria agricultural sector, found that Government uses macroeconomic policies to accelerate economic performance through an array of policies, such as manipulating the level of taxation, government spending, exchange rates, interest rates, borrowings, and the money supply in the economy. Varying macroeconomic policies affects GDP, prices, interest rates, and exchange rates, all of which affects agricultural output.

Felloni et al., (2001) states that, the extraordinary importance of infrastructure in development has been recognized by many western models of thought, to great merit. Infrastructure provides better access to both input and output markets, promoting the access of remoter areas to monetized exchange systems; the consequent reduction of production costs, shifts the production possibility frontier outwards , eventually leading to a more efficient allocation of scarce resources.

Food and agricultural Organization (FAO, 2009), states that, special category of infrastructure subsidy is what in the United Kingdom is called Private Finance Initiatives (PFIs). In the PFI model of PPPs the public sector is transformed from the owner and operator of public services to purchasers of services. Applying the concepts of PFIs to high risk rural and agricultural infrastructure in developing countries could carry some advantages. These include spreading the cost of capital investment in public infrastructure over time (with government effectively taking out a repayment mortgage with the private sector) and shifting the risks of capital cost overruns and operational revenue deficits from poor maintenance to the private sector". World Bank Report (2007), "improving efficiency by bringing in a third party service provider through public private partnerships", provides practical realities of countries that have successfully implemented such partnerships.

Oxfam (2014), posits that, Government's in Africa are turning to large scale partnerships with donors and multinational companies to stimulate investments in agriculture. However, so called-mega agricultural public private partnerships are by and large unproven and risky, and are likely to skew the benefits of investments towards

the privileged and more powerful, while the risks fall on the most vulnerable. There are more effective, tried and tested approaches for donors and public investment that are more likely to reach those who need it".

US Department of Federal Highway Administration (2010)," Public-Private Partnerships, or PPPs, involve a contract, between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risks in the project. It combines the efficiency of private firms with the trustworthiness related to a public enterprise"

FAO(2009), further states " Five percent of arable land in sub-Saharan Africa is irrigated, compared with 38 percent in South and East Asia and 10 percent in Latin America. The United Kingdom Commission on Africa report recommends irrigation coverage should be doubled by 2015, with an emphasis on small scale and micro-irrigation, bringing an additional 5 to 7 million hectares under irrigation at a cost of US dollars 2 billion. In Tanzania for, instance this type of investment is estimated to raise yields by an average of 5 percent, crop prices by 7 percent and put up irrigated land rentals by 40 percent per annum".

World Bank Group Agricultural Action Plan (March,19th 2014), states that agriculture accounts for one third of gross domestic product (GDP) and three quarters of employment in Sub-Saharan Africa. Agricultural development is an especially, pro-poor source of economic growth-about two to four times more effective in raising incomes among the very poor than growth in other sectors.

In his speech at the IFAD (International Food and Agricultural Development) Conference in April 2008, Joachim von Braun, Director-General of IFPRI (International Food Policy Research Institute) stated that in Kenya, a 1.0 percent increase in irrigation investment decreases poverty by 3.9 percent, while, a 1.0 percent increase in rural road investment decreases poverty by 2.4 percent. In Mauritania, the Nakhlet small scale irrigation scheme has achieved an internal rate of return of 103 percent.

According to the Organization for Economic Cooperation and Development (OECD 2013), states succinctly in its Policy Framework for Investment in Agriculture (PFIA), that private investment is significant if agriculture is to realize its noble objective of contributing to economic growth, poverty reduction and food security. OECD (2013), further posits that, agricultural production should expand by a minimum of sixty per cent over the next forty years to meet the increasing demand for food emanating from World population growth, higher income levels and lifestyle changes. Due to scarcity of land as a factor of production and the maxim of production possibility frontier, agricultural growth will depend mainly on enhanced productivity leveraged in particular by private investment. Agricultural investment can suppress upward pressure on food prices, in the milieu of increasing land and water scarcity, thereby enhancing world food security.

Njagi et al (2014), argues that, the agricultural sector in Kenya contributes 24 per cent to the national Gross Domestic Product (GDP), accounts for 60 per cent of export earnings, 18 per cent of formal employment and approximately 60 per cent of informal employment. In addition, the sector contributes about 75 per cent of the raw materials used in the manufacturing sector, and on average accounts for 65 per cent of total households income in the counties, with the exception of Nairobi county. Njagi et al (2014). Further argues, that despite Kenya being a signatory to the 2003 Maputo protocol, where nations committed to financing agricultural sector by at least 10 percent of the national budget annually, it is regrettable that the share of Kenya remains a paltry 4 per cent.

1.7 Theoretical Framework

This study will be based on the Keynesian theory of economics. Keynesian economics derives its name, theories and principles from British Economists, John Mynard Keynes (1883-1946) who is regarded as the founder of modern macroeconomics. Keynes is considered the intellectual founding father of the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development, (IBRD or World Bank) in 1944 to ensure stability of the international financial system and facilitate the rebuilding of nations devastated by World War II. According to Sarwat J. (2014), the main principle of Keynesian school of thought, is that government intervention can stabilize the economy and lead to increased growth in output and employment.

The key framework of Keynes theory, is the affirmation that, aggregate demand measured as the sum of spending by households, businesses and the government is the most significant driver in an economy. Keynesians believe that free markets have no self- balancing mechanisms that lead to full employment. Keynesian economists, support government intervention through public policies that aim to achieve full employment and price stability. In addition Keynesian theory postulates that, aggregate demand is influenced by diverse economic decisions, both public and private. Private sector decisions can sometimes lead to negative macroeconomic results, that is, decline in consumer expenditure, during recession. These market failures, necessitates the government to formulate active policies, such as a fiscal stimulus package.

Sarwat, J (2014), further asserts that Keynesian economists supports a mixed economic system guided by the private sector, but partially operated by the government. The theory states, that changes in aggregate demand, have their greatest short-run effect on real output and employment and not prices. Keynesian believe that, because prices are rigid and sticky fluctuations in any component of spending, consumption, investment of government expenditure cause output to change. If government spending increases for instance, and all other spending

components ceteris paribus, then output will increase. Keynesian models of economic activity also include a multiplier effect: that is, output changes by some multiple of the increase or decrease in spending that caused the change. If the fiscal multiplier is greater than one, then one shilling increase in government spending would result in an increase in output greater than one shilling. The main departure of Keynesians from other economists is their belief in activist policies to reduce the amplitude of the business cycle, which they rank among the most significant of all economic problems. In addition, rather than seeing unbalanced government budgets as wrong, Keynes advocated countercyclical fiscal policies that act against the trajectory of the business cycle. For example, Keynesian Economists would advocate deficit financing or spending on labour intensive infrastructure projects to stimulate employment, and stabilize wages during economic downturns. They would raise taxes to cool the economy and prevent inflation when there is abundant demand-side growth. Keynesians also believed that monetary policy could be used to stimulate the economy, for instance by reducing interest rates to encourage investment. The exception occurs during a liquidity trap, when increases in the money stock does not lower interest rates thereby not boosting output and employment.

Keynesian economics dominated economic theory and policy after World War II, until after the 1970s , when numerous developed economies experienced both inflation and slow growth , a phenomenon called stagflation. Keynesian theory's popularity waned then because it had no appropriate policy response for stagflation. Monetarist economists were skeptical about the ability of governments to regulate the business cycle with fiscal policy and argued that judicious application of monetary policy (essentially, controlling the supply of money to affect interest rates) could alleviate the crisis. Keynesians argued that governments should solve problems in the short run, because in the long run we are "dead". Monetarists also maintained that money can have an effect on output in the short run but believed that in the long-run expansionary monetary policy leads to inflation only. Keynesian economist largely adopted these critiques, adding to the original theory a better integration of the short and the long run and an understanding of the long run neutrality of money, that is, the idea that a change in the stock of money affects only nominal variables in the economy (prices, wages) and has no effect on real variables (employment and output).

However, both Keynesians and monetarists came under scrutiny with the rise of the new classical school during the mid 1970s. The new classical school asserted that policy makers are ineffective because individual market participants can anticipate the changes from a policy band, act in advance to counteract them. Conversely, a new generation of Keynesians that arose in the 1970s and 1980s argued that even though individuals can anticipate precisely, aggregate markets may not clear instantaneously, therefore fiscal policy can still be effective in the short-run. On the other hand, the world financial turmoil of the 2007-2008 instigated a renaissance in Keynesian thought. It was the theoretical foundation of economic policies in response to the turmoil by various nations, including the United States and the United Kingdom. Towards the end of 2008, during the aforementioned global recession, Havard Professor, N. Gregory Mankiw wrote in the New York times on November 28th 2008 and stated, "*If you were going to turn to only one economist to understand the problems facing the economy, there is little doubt that the economist would be John Maynard Keynes*".

The 2007-2008 global financial melt-down, showed that Keynesian theory had to better include the role of the financial system. Keynesian economists are rectifying that omission by integrating the real and financial sectors of the economy. It is against this backdrop, that this study, seeks to incorporate the role of the banking industry in Kenya, as a key player in Public Private Partnership towards enhancing inclusive agricultural investment through sound macroeconomic policies. While many large scale public agricultural undertakings have failed in many developing countries, including Kenya, for example through the recently launched mega multi-billion Galana Kulalu project, there is urgent need for the paradigm shift, by incorporating the more efficient private sector, through Public Private Partnership. As an advancement of the Keynesian school of thought, the Financial sector, and especially the banking industry has been used as a proxy for the private sector in this study. It is envisioned that the Government (Public) will spearhead policy formulation whilst the private sector (banks, donors) undertakes the actual policy implementation by playing the role of the meso economy.

1.8 Conceptual Framework:

Macroeconomic Policies, Financial Sector, Agricultural productivity, Economic Growth and Poverty Reduction
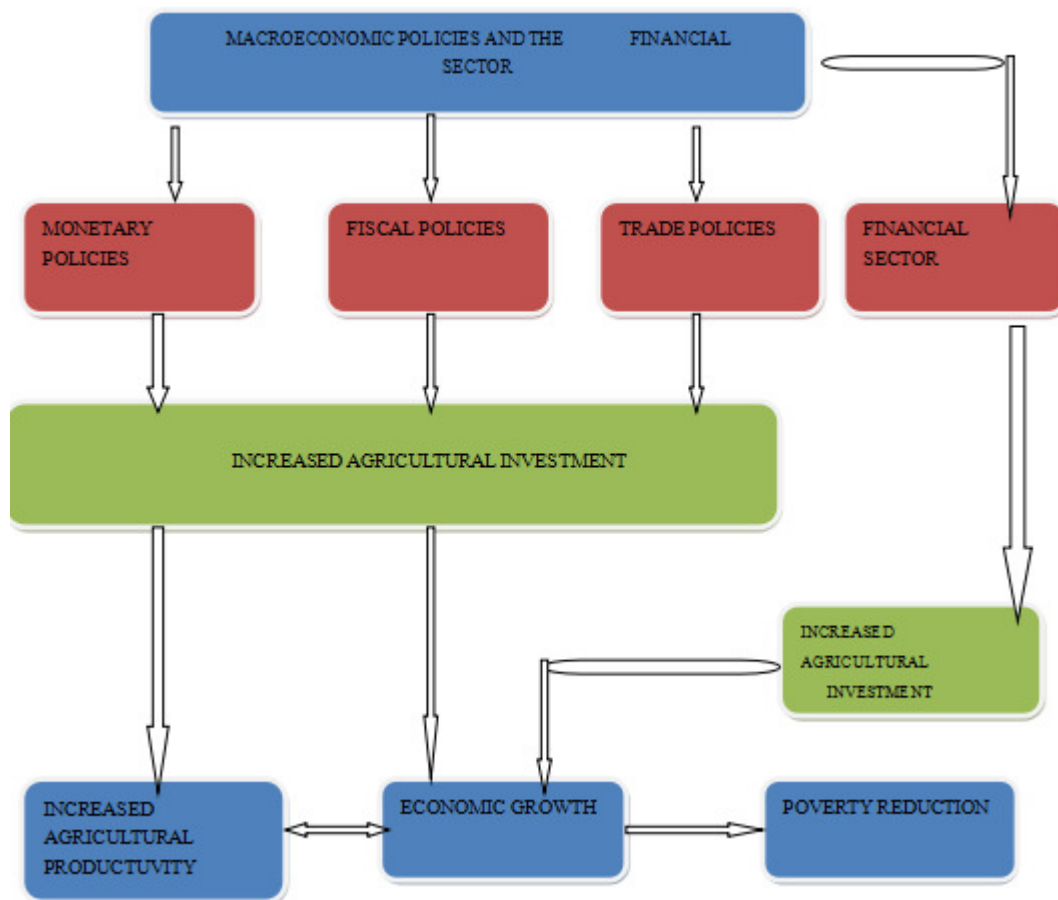
Figure 1: Conceptual framework Developed by Author.

1.9 Empirical Model Formulation.

The Keynesian product and money market (IS-LM) Function will be the platform upon which the empirical model will be formulated, as provided below: As discussed in the Keynesian theoretical literature above, the model takes into account the effects of the financial sector as propounded by modern economic thinkers and proponents of the new Keynesian school of thought. The banking sector, component will be represented by the variable (CRA), which is total credit by commercial banks to agriculture sector infrastructure investment. The identified key macroeconomic variables to spur agricultural sector productivity and growth are, national output, current account balance. Real interest rates, government expenditure general , credit to agricultural sector. The model is specified in terms of ordinary least squares and is in the form of:

$$AgriGDP = \alpha_0 + \alpha_1 \, BoP + \alpha_2 \, RINT + \alpha_3 \, GEXP + \alpha_4 \, CRA + \alpha_5 \, GDP + \xi_t$$

A priori expectations are established by the principles of economic theory and refer to sign and size of the parameters of economic association: Then, $\delta AgriGDP/ \delta$ money supply (M_2) > 0, $\delta AgriGDP/ \delta$ real interest rates (RINT)< 0; , $\delta \, AgriGDP/ \delta$ Inflation < 0;, $\delta \, AgriGDP / \delta$ exchange rate (ER) < 0; , $\delta \, AgriGDP / \delta$ agriculture sector credit (CRA); , $\delta AgriGDP/ \delta$ gross domestic product (GDP), $\delta AgriGDP/ \delta$ government total expenditure (GEXP) and $\delta \, AgriGDP/ \delta$ current account balance (BoP) > 0;

Where,

BoP = Current account balances

RINT = Real interest rates

GEXP = Government total expenditure

CRA = Domestic total credit to agriculture by the local banking sector

GDP = National Gross Domestic Product

ER = Exchange rate

ξ_t = Error term

α_0, α_1, α_2, α_3, α_4 and α_5 parameters to be estimated.

This study has not used money supply, while inflation has been used in the computation of real interest from the prevailing annual interest rates. Statistical Package for Social Scientists Software Version. 21 is used for the regression analysis, to obtain the parameters and model estimate.

Results and Discussion of Findings

The results obtained from the equation estimated shows that the explanatory variables explain about 99.7 percent of the variations in agricultural output which is the endogenous variable and the proxy for agricultural productivity. This is corroborated by the value of the Co-efficient of determination R-Squared, and further adjusted R-square at 99.5 percent considering the level of freedom and the inclusion and exclusion of avariable. (Table 1)

Further, the results denotes lack of serial auto-correlation problem as reflected in the value of the Durbin – Watson Statistics of 1.924.

which lies between 1.5-2.5 i.e $1.5 < d < 2.5$ and $d = 1.924$ (table 1), thus this depicts the presence of positive auto-correlation which will permit to reject the null-hypothesis.

Table 1: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.999[a]	.997	.995	45323.69719	.997	419.294	5	6	.000	1.924

a. Predictors: (Constant), BoP, RINT, GEXP, CRA, GDP

b. Dependent Variable: AgriGDP

The ANOVA F statistic confirms that the independent variables are jointly statistically significant. Individually, it can be shown that GDP and Current account balance are statistically significant. GDP= 0.001 <0.05=p-value and BoP = 0.009<0.05=p-value.

Table 2: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4306646955467.766	5	861329391093.553	419.294	.000[b]
	Residual	12325425161.902	6	2054237526.984		
	Total	4318972380629.667	11			

a. Dependent Variable: AgriGDP

b. Predictors: (Constant), BoP, RINT, GEXP, CRA, GDP

Table 3: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-394052.405	55796.229		-7.062	.000	-530580.858	-257523.951
	GDP	.339	.060	.977	5.644	.001	.192	.486
	GEXP	.023	.139	.025	.168	.872	-.316	.362
	RINT	-3601.072	4693.240	-.026	-.767	.472	-15085.017	7882.873
	CRA	5.547	2.636	.189	2.104	.080	-.904	11.997
	BoP	.724	.192	.200	3.775	.009	.255	1.194

a. Dependent Variable: agrGDP

The estimated model from the table of coefficients becomes

AgriGDP = -394,052 + 0.724BoP – 3,601RINT + 0.023GEXP + 5.547CRA + 0.0339GDP.

This indicates that, the current account balance, government expenditure, credit to agricultural sector and national output all have a positive direct correlation with agricultural productivity. A one per cent improvement in current account balances will increase agricultural output by 0.724. Also, a one percent increase in total government expenditure will increase agricultural output by 0.023 and a one percent increase in total credit to agricultural sector improves agricultural output by 5.547, whilst a one percent increase in the Country's Gross Domestic Product increases agricultural output by 0.0339. Conversely, real interest rates and the constant have an inverse relationship with the level of agricultural output. A one percent change in real interest rates, will negatively change agricultural output by 3,601. The results further shows that, the expected parameter signs or signs of the computed estimates agree with the expected a-priori. Gross Domestic Product (GDP); Government Total

Expenditure (GEXP), Current Account Balance (BoP) and Total Agriculture Credit (CRA) all have positive coefficients, while real interest rates has a negative co-efficient(Table 3).

Recommendation, Summary and conclusion
In the light of the deduced empirical results, it is recommended that for a nation to record expansion in agricultural output, sound macroeconomic policies must be pursued. In terms of fiscal policies, the government must increase proportion of budgetary allocation in expenditures that promote, agriculture investment by both the private and smallholder farmers. Thus agricultural infrastructure investment, such as construction of water storage facilities (dams, canals) for irrigation, expenditures in research and development, analogous to the golden triangle in the Dutch transformation, extension services, roads, electricity, ports and airports, will increase agricultural productivity. This massive infrastructure development for agricultural transformation, will provide millions of jobs and opportunities to the youth and women in the rural areas.

Further, a stable and low real interest rate regime will ensure more availability and accessibility of finance by the both private and smallholder farmers. This will foster rural agribusiness entrepreneurship leading to increased food security, incomes and poverty reduction. A low and stable real interest rate regime can be achieved through sound macroeconomic policies, such as, reduced public borrowings, prudent public expenditure and good governance, and policies that attract private sector investment in agri-food development to provide employment and reduce inflation (food inflation).

Appropriate trade policies should be formulated, that will allow increased investment in local value addition, and market access in foreign countries of the country's agricultural output. Through appropriate form of agri-public private partnerships, local producer or farmer organizations, can enter into partnerships with established foreign firms (Bertrands-price setters) and (Cournots-quantity leaders) to increase local productivity and access to better markets globally. This will enhance, current account balance and hence foster economic growth, employment creation, and rural poverty reduction.

Through enhancement of judicial processes, with regard to property rights, such as (land rights, water rights) and providing clear mechanisms of expeditious settlement of business disputes, will attract more investments in agribusiness and allow commercial banks and private sector to supply more credit to smallholder farmers. The formation of farmer associations, will automatically optimize value chain financing to this rural sector, with the consequence of increased productivity.

Summary and Conclusion
This study has empirically investigated, the significance of macroeconomic policies in the expansion of the agricultural sector in Kenya. The study used ordinary least squares to obtain parameter estimates in evaluating the significance of current account balance, national growth, real interest rates and commercial bank credit to agriculture sector in agricultural output. The results indicates that there exists a positive relationship between current account balance, gross domestic product, government expenditure and commercial bank credit to agriculture. The question is why agricultural productivity, food security and poverty levels non-responsive? This could partly be explained by the fact that, increased government expenditure over the years has not been directed towards agricultural sector infrastructure investment, and indeed only 4 percent of the national budget goes to agricultural sector. This is a far cry from the Maputo declaration that requires at least 10 percent of the budgetary allocation to agriculture. Domestic and global insecurity could also have precipitated the country to allocate more resources in security and public administration. It is also clear that the proportion of bank credit to agricultural sector is relative small compared to other non-productive sectors, due to high risk perception of the smallholder farming by the banks. Thus it is recommended that the government should increase budgetary allocation and expenditure towards agricultural infrastructure investment in the rural areas, to encourage smallholder productivity, food security, poverty reduction and economic growth.

Acknowledgement

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