

**THE IMPACT OF DIASPORA REMITTANCES ON AGRICULTURAL OUTPUT
GROWTH IN KENYA (1983-2015)**

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DECLARATION

I declare that this is my original work and has not been presented for the award of any degree in any university.

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X51/73135/2014

This paper has been submitted for the award of the degree of Masters of Arts in Economic Policy Management with my approval as University supervisor.

Signature: Date:

DR. ODHIAMBO SULE

DEDICATION

I dedicate this research work to my family and friends who have supported me and my dreams, but most importantly to my wife and children who had to bear with my absence from home as I did long hours of classes, private study and research, and to my Parents who always encouraged me, placed a big emphasis on education and instilled in me the importance of hard work.

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ACRONYMS AND ABBREVIATIONS

API:	Agricultural Price Index
CBK:	Central Bank of Kenya.
CPI:	Crop Price Index
DF:	Degrees of Freedom
EXP:	Expenditure
FEM:	Fixed Effects Model
GDP:	Gross Domestic Product
IMF:	International Monetary Fund
IOM:	International Organization for Migration
IPI:	Input Price Index
LDCs:	Less Developed Countries
MFAIT:	Ministry of Foreign Affairs and International Trade
NELM:	New Economies of Labor Migration
OLS:	Ordinary Least Square
REM:	Remittances
USD:	US Dollars
VIF:	Variance Inflation Factors

ABSTRACT

Rapid agricultural growth has put most developing countries on the path of a much broader transformation process. In Kenya, agricultural sector is one of the key sectors that can enhance and deliver the 10 per cent annual economic growth rate as envisioned under the economic pillar of vision 2030. Unfortunately budgetary allocations as well as loans advanced to this sector have been very low compared to other sectors, hampering expansion and technology adoption. Literature recently associates diaspora remittances to an alternative source of financing the agricultural sector. Based on this analogy, this study empirically establishes the impact of diaspora remittances on agricultural growth in Kenya. Specifically, the study was meant to first establish the causal link between diaspora remittances and agricultural sector; and secondly, examine the effect of diaspora remittances on agricultural output growth in Kenya. The study objectives were tested at 1% and 5% level of significance. The granger causality test was performed to investigate the causal link while Ordinary Least Square was conducted to estimate the econometric relationship between diaspora remittances and agricultural output growth. From empirical results, a unidirectional causality was found between diaspora remittances and agricultural output growth at 1% level of significance. The study results further revealed that diaspora remittances were significant at 1% level of significance in increasing agricultural output growth. On the other hand, their respective interactions through human capital and technological developments were not statistically significant in influencing agricultural output growth in Kenya. The study concludes that much effort need to be enhanced by the government to attract more diaspora remittances to boost domestic investment through agricultural sector and respective consumption. The study recommends for creation of ample environment by the government favoring agricultural sector as this may attract more diaspora remittances to be channeled to this sector in the long run. By investing in agricultural sector, remittances may be directed towards acquisition of machinery, irrigation, fertilizers among other fundamentals hence modernization of agriculture which would trigger improved agricultural output.

CHAPTER ONE

INTRODUCTION

1.1 Background

Agricultural sector is the backbone of Kenya's economy. Kenyan agricultural sector accounts for more than the current 65% of total exports. Actually, the growth of Kenya's economy is highly correlated to growth and development in agriculture (Alilo and Atieno, 2006; Republic of Kenya, 2010). According to Vision 2030, agriculture is one of the key sectors that can enhance and deliver the 10 per cent annual economic growth rate as envisioned under the economic pillar. Therefore, transforming smallholder agriculture from subsistence to an innovative, commercially oriented and modern agricultural sector is significant in realizing this growth.

Most importantly, the rapid growth of the sector witnessed immediately after independence was spurred by expansion because there was ample land and better use of technology (Odhiambo, Nyangito and Nzuma, 2004). Similarly, the national government established and supported several agricultural institutions such as farmer cooperatives and those for agricultural inputs, marketing, credit and agro processing coupled with better budgetary (Republic of Kenya, 2010). However, this growth was not sustained. Odhiambo, Nyangito and Nzuma, (2004) observed that whenever agricultural Gross Domestic Product (GDP) declines, overall GDP for the whole economy consistently drops and vice versa. The main reasons for this decline were associated with low investment in the sector, mismanagement, virtual collapse of agricultural institutions and, more importantly, negligence of agricultural extension and research (World Bank, 2013). The renewed efforts of increasing productivity and income growth for smallholders from the beginning of the new millennium saw emergence of agricultural policies in Kenya. The policies revolved around enhanced food security and equity, irrigation to introduce stability in agricultural output, commercialization and strengthening of production; appropriate and participatory policy design and environmental sustainability (Republic of Kenya, 2015).

An immediate growth challenge for Kenya is the constant overall poor economic performance like most of other developing countries. Increasing agricultural productivity

is the single change with the greatest direct benefit to the poor. Given that many of these households rely on agriculture for most of their income, there is a need to an understanding of what propels productivity and growth of agricultural sector in Kenya Chipeta et al., (2015).

Among the growth catalyst suggested by Akpan, Okon and Udoka (2014) for both micro and macroeconomic backgrounds, remittances was associated with crop production and external movement of labour effect. On the other hand, diaspora remittances encourage crop and possibly self-employment production in the rural areas (Taylor et al., 2003). Diaspora remittances sent back home by these migrants are thought to have enormous effect on the socio-economic conditions of households left in the country of origin.

According to Gonzalez-Velosa, (2011) there is increased optimism regarding potential development benefits in agricultural sector due to large increase in remittances from international migrants. Remittances are cross-border, private, voluntary monetary transmissions organized by diaspora migrants (McLean, 2008; Plaza, Navarrete & Rhata, 2012). Therefore, remittances are money or goods transferred to households back home by those who migrated outside their country of birth to work in other foreign countries. International Organization for Migrants indicates that over 140 million people in developing countries live outside their country of birth (IOM, 2015). The monies sent by this population back to their countries have become their major source of private capital inflows in dozens of developing countries. Skeldon (2008) concludes that remittances has always been and will always be an integral part of development.

On the other hand, Lowell and Gerova (2004) mainly associate remittances to promotion of communication system, transport system, employment, tourism and agricultural sectors. Collectively, diaspora remittances in the first decade of the new millennium indicates that migrants sent three times more than what was received by developing countries on official development aid and half of the amount received in form of foreign direct investment (Kapur, 2003). According to Ratha (2013) in most developing countries, diaspora remittances were approximately 20% of the total Gross Domestic Product (GDP). However, due to Global financial crisis, diaspora remittances were shown to decline.

1.1.1 Financing Agriculture Sector and Access to Credit

Rapid agricultural growth has put countries on the path of a much broader transformation process: rising farm incomes raising demand for industrial goods; lowering food prices, curbing inflation and inducing non-farm growth and creating an additional demand for workers. It is evident from countries (especially emerging economies like Kenya) that have achieved sustained agricultural growth have done so by adopting technology, which led to increased joint productivity of land, labour and total factor productivity through capital. Similarly, Odhiambo, Nyangito and Nzuma (2004) established that the Kenya's trade policy, climate and government finance (expenditure) on agriculture are important determinants of agricultural total factor productivity growth.

However, agricultural sector in Kenya and in the larger East African countries has been facing frequent constraints since independence (Salami, Kamara and Brixiova, 2010). Because of the lack of collateral or credit history, most farmers are bypassed not only by commercial and national development banks, but also by formal micro-credit institutions (World Bank, 2016). In this case, most farmers rely on incomes of friends and relatives, remittances and informal money lenders.

1.1.2 General Overview of Agricultural Growth and Remittances

Economic growth and improvement in agriculture according to Kibet (2011) are greatly correlated. Most Sub-Saharan African countries regard agriculture as a significant factor for sustainable development, food security improvement and poverty reduction (Ouma & Groote, 2011). According to Suro (2003) and Ratha (2013), approximately 80% of remittances received by countries over a decade ago have been consumed by the household. While land (agriculture), livestock as well as housing are termed as future assets of emigrants, they are also referred to as investments from diaspora remittances (Young, 2008). Remittances have also been established by the New Economies of Labor Migration (NELM) theory as a substitute for informal or formal credit that qualifies households with limited or no access to financial markets (Richter, 2008; Wouterse, 2010).

According to Lucas, (1987) agricultural production can be influenced by international remittances. For example as a result of Lesotho, Botswana and Malawi labor migrants

who migrated towards the mines of South African production of crop decreased in some small sectors in the short period, but with time transfers improved production. Also Lucas, (2005) argued that households receiving remittances are guaranteed of food security especially the rural poor households. These households use remittances to purchase agricultural inputs which are essential in producing more agricultural outputs. On the other hand, Lucas (2006) argued that remittances institute an efficient strategy to counter low agricultural productivity and instability of farming activities by acting as insurance through improved food security. Investing remittances in agriculture, leads to industrial decentralization and renewal of economies (Papademetriou, 1985).

Woodruff (2006) explained why the effect of diaspora remittances is different in various countries. For instance, diaspora remittances supported migrants to do investment in agricultural sector (i.e. land and cattle) while in others proceeds of diaspora remittances are invested in housing sector. Also, households receiving remittances are able to acquire new agricultural technology which increases agriculture productivity. Therefore, transfers are deeply associated with local income and output (Rozelle et al., 1999; Taylor et al., 2003; Quinn, 2009).

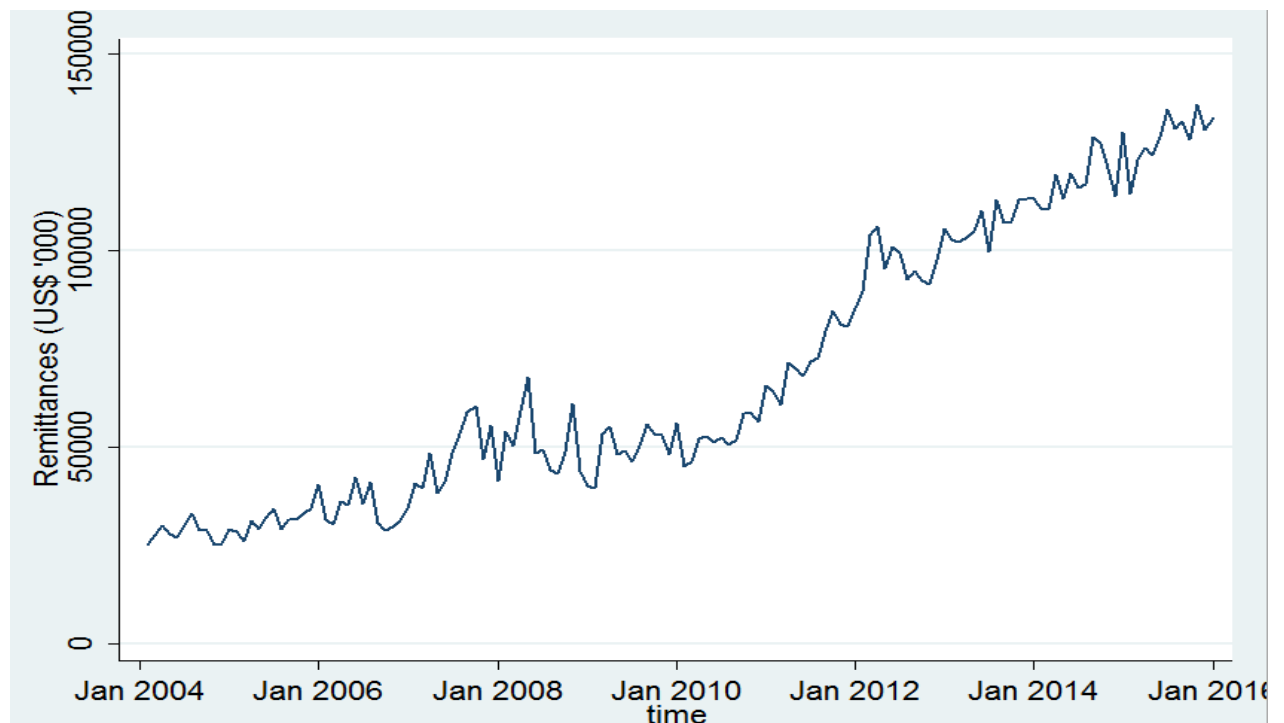
1.1.3 Role of Remittances in Kenya

Kenya is a significant home to both regular and irregular migrants as origin, destination and even passage country towards other countries (South Africa or North Africa), or countries in other continents such as Europe or Middle East (IOM, 2015). However, estimates and the spread of the Kenyan migrants differ. According to the MFAIT, (2014a), Kenyan migrants are projected about three million. This figure is expected to rise unceasingly. Similarly, there is debate on the magnitude of undocumented Kenyans in the diaspora. Based on the available information from visa admittances as well as the US registration department, it is estimated that over thirty thousand Kenyans reside irregularly in United States (Passel, 2013).

According to World Bank (2011), the United Kingdom (UK) was identified as the top destination for migrants from Kenyan, then the Republic of Tanzania and finally the US. Further, it is suggested that a conventional assessment of the Kenyan migrant populace oscillates at 5.8% of the African population residing in US. According to McCabe,

(2011), following Nigeria, Ethiopia, Egypt and Ghana, this makes Kenya the major African diaspora community at the fifth position. The ever increasing number of emigrants abroad translates to increased remittances at the receiving countries (Canuto & Ratha, 2011). Gonzalez-Velosa (2011) and Ratha, (2013) argues that the asymmetric impacts of diaspora remittances are associated to insurance and investment finance that fosters agricultural development which is envisioned to account for a good proportion of the export of a country. This consistently contributes to the total GDP of the Kenyan economy (Ngunjiri, 2006; Ngugi, 2015). Figure 1.1 shows trends of monthly remittance inflow to Kenya between January 2004 and January 2016.

Figure 1.1: A Graph showing Remittances inflow to Kenya (Jan 2004 – Jan 2016)



Source: Central Bank of Kenya (CBK, January 2016)

Figure 1.1, shows that diaspora remittance inflows to Kenya have been improving consistently over the years. Cumulatively, inflows in the whole of the year 2015 increased by 9.7% to USD 1,571 million from USD 1,432 million in 2014. As shown in Figure 1.1, the annual average inflows exhibit an upward tendency. In addition, these increases may be as a result of aggressive government efforts of attracting migrants to invest especially in securities back in the country. According to Cheron, (2013) diaspora

remittance inflows have complemented government efforts to develop the financial sector by creating innovative investment instruments.

1.2 Problem Statement

Agricultural sector for decades has been providing livelihood for majority of the population in Kenya with a significant contribution to GDP (Republic of Kenya, 2010). It generates considerable tax revenues and earnings from external sectors that help to support other part of economy (World Bank, 2008). In spite of the agricultural sector's enormous share of Kenya's employment and GDP, less than 1 per cent of commercial lending goes to agriculture (Odhiambo, Nyangito and Nzuma, 2004; World Bank, 2016). On the other hand, a loss in labour supply and a greater availability of capital encourages a transition to more capital-intensive sectors such as manufacturing. However, the share of commercial banks' loans to agriculture has been very low compared to manufacturing, trade, and other services sectors, hampering expansion and technology adoption (World Bank, 2016). According to Salami, Kamara and Brixiova (2010), the lack of capital and access to affordable credit in Kenya is indicated by investors as the main factor behind the low productivity in agriculture.

Access to formal credit in Kenya is mainly confined to large urban centres, where collateral requirements are high. On the other hand, high interest rates inhibit agricultural investments (World Bank, 2016). In modern economy, Gonzalez-Velosa, (2011) links remittances to other sectors of the economy especially correlation with the size of agriculture. UNDP (2015) associate diaspora remittances to alternative source of financing the agricultural sector.

Available studies indicate that diaspora remittance inflows can increase productive investments including investments in agricultural sector in the receiving communities (Dustmann and Kircham 2002, Woodruff and Zenteno 2006, Yang and Choi, 2007; Mendola, 2008; Yang, 2008 and Gonzalez-Velosa, 2011). Other studies (Rosenzweig & Stark, 1989; Morduch, 1995 and Rapoport & Docquier, 2005) indicate that diaspora remittances are mainly employed in leisure or current use/consumption with limited effects in investments in the long-run. Due to this inconclusiveness, this study thus tests

the hypothesis that there is a significant relationship between diaspora remittances and agricultural output growth in Kenya.

1.3 Research Questions

- i. What is the impact of diaspora remittances on agricultural output growth in Kenya?
- ii. What are the trends of diaspora remittances and agricultural productivity in Kenya?
- iii. What is the causal relationship between diaspora remittances and agricultural output growth in Kenya?

1.4 Research Objectives

1.4.1 General Objective

The main aim of this study is to determine the impact of diaspora remittances on agricultural output growth in Kenya (1983-2015).

1.4.2 Specific Objectives

The specific objectives of the study include;

- i. To explore trends of annual diaspora remittances and agricultural productivity in Kenya.
- ii. To determine the causal linkage between diaspora remittances and agricultural output growth in Kenya.
- iii. To draw conclusions and policy recommendations based on the study findings.

1.5 Scope of the Study

The study is limited to diaspora remittances and their link to the agricultural sector in Kenya. The study will be limited to thirty two years (period 1983-2015). Also, the study relies only on secondary data to establish relationship between diaspora remittances and agricultural output growth in Kenya.

1.6 Justification of the Study

Diaspora remittance inflows to Kenya have been increasing since independence. Remittances can have an important positive impact to the growth of Kenyan economy through agricultural sector. This could lead to increased support of the domestic

investment such as agricultural investment and consumption. It is therefore important to explore whether diaspora remittances have a role on the agricultural development in Kenya. This study contributes to the literature on the diaspora remittance and agricultural output growth nexus. The study findings also validate behavioral theories such as altruism theory verses the optimism and pessimists among other theories with regard to international cash transfers. Further, this study not only adds to the current literature on diaspora remittances, migration and agricultural development but will also inform through empirical interrogation on the relevant evidence based policies such as agricultural development policies, the Kenyan or labour migration policy and/or the country diaspora policy.

1.7 Organization of the Study

Subsequent to the introduction (chapter one), the other parts of the study are arranged as follows; Chapter two covers literature review whereby both theoretical, empirical and overview of the literatures shall be considered. Chapter three comprises the research methodology with theoretical framework, empirical model and model specification, estimation technique, variable definition and expected signs, diagnostic tests and data sources. Chapter four deals with analysis of data and its presentation, major interpretations and discussions are also done while chapter five presents the summary, key conclusions, appropriate recommendations and areas for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature Review

This chapter provides a review of the theories and past studies carried out on remittances, specifically their role and impact.

2.2 Theoretical Literature Review

2.2.1 Theory on Remittances

This theory gives the widest explanations of diaspora role on a particularly economy regarding to its growth. Orozco (2003) in explaining this theory associated development as a result of diaspora community funds to sectors of the economy such as communications, trade, transport and the exchange of financial remittances. On the other hand, diaspora systems/structures are further aligned to investment in business, remittances, instruments investment and transfer of knowledge in country of origin (Johnson and Sedaca, 2004). They specifically argued and focused on the charge of sending and organizing remittances on the use of monetary services as well as growth of enterprise. Thus diaspora community/system can play an important role in creating trade, in particular given their characteristics of high likelihood of catalyzing growth back home.

Johnson and Sedaca (2004) specify investment funds or sovereign diaspora bonds as the best financial instruments suitable to be used by highly skilled migrants to spur development. Further, it is claimed that association of trained diaspora individuals play vital part in encouragement of information transmission to their home countries to offer information pertaining various investment areas. However, according to Lowell and Gerova (2004) remittances are better placed to motivate investment through existing diaspora-home business links especially those associated with promotion of investment undertakings on private or government sector. Based on this theory, remittances can be extended and channeled to improve agricultural growth in Kenya.

2.2.2 Neo-Classical Migration Theory

The theory is associated with migration and optimum distribution of factors of production to the benefit of either sending or receiving countries. As a requisite for growth, the re-

distribution of labour from rural agricultural zones to urban areas and/or manufacturing sectors or across borders should be considered (de Haas,2010). This is also a basic component of the overall growth process (Todaro, 1969). These re-allocations eventually results in the likelihoodness of the rise in shortage of workforce. As this correlates with a higher marginal productivity of labour and increasing wage levels in remittance receiving countries, capital flows are anticipated to go in precisely the opposite direction (de Haas, 2010). However, once wage levels at both the remittance receiving and sending countries converge, the presumed practice of factor price equalization predicts cessation of migration (Massey et. al., 1998).

This theory however holds that the increased contribution of migration is totally recognized through factor price equalization despite ruling out the benefits accruing to the non-migrants (Djajic, 1986). According to Taylor, (1999) the theory has no place for monetary transfers rolling to origin nations, rather, the theory perceives migrants as not only atomistic but also utility maximizing individuals. Back in the 1950s and 1960s, the return migrants based on this theory were seen as proxies of transformation and novelty. This category of individuals was expected come along with money, business approaches, new ideas and knowledge. This made migrants to be thought of for a progressive role in progress as well as contribution of the fast-tracked continuous transmission of transformation in less developed nations. Also international transfers have been accredited a significant part in motivating economic development. Referring to the theory of development, given large-scale resource transfer for instance through remittances and aid, there would be rapid industrialization and economic development especially by poor countries (Adler, 1981; Penninx, 1982).

Therefore, diaspora remittances are seen as a tool of improving agricultural sector. Beyond what other accessible development methods could deliver, Keely and Tran, (1989) argue that we can achieve this through ensuring quality of life and revenue sharing. Beijer, (1970) adds that re-investments by labour migrants in businesses in origin countries could be possible after their generally wide predictable return. Large-scale emigration was widely thought that it can lead to fast growth in the country of origin

hence migrant workers will be perceived to represent optimism for both agricultural and industrial development of their home countries.

2.2.3 The Altruism Theory on Remittances

The proposition of altruism theory depicts that the choice to remit is based on the income needs of the relatives of the emigrant worker. This theory was proposed by Becker (1974) and it categorically states that a migrant will care about the well-being of others and thus derives pleasure from remitting. According to the model on pure altruism, the migrant enjoys sending back home and derives satisfaction from the utility of those left back home. The utility of the household also is assumed to be influenced by per capita consumption, (Kiriti and Tisdell, 2001; Cherono, 2013). Therefore, there is no prospect of giving in return on the part of the migrant worker. The basis of remitting money back by the migrant worker is grounded on his/her utility which is derived from that of his family members (Chami et al., 2003; Cherono, 2013). This implies that the migrant worker gets satisfaction from improved wellbeing of the family left back home. As economic constraints of his/her family rises, the motivation for the migrant worker to remit increases as well.

According to Cherono, (2013) remittances are a form of compensatory transfers which compensate households faced by economic disruptions thus enabling them smoothen their consumption. Indeed, how remittances are spent therefore rely also on the motives motivating the remittance flows. As such internal transfers tend to be countercyclical; increasing during times of economic declines and decreasing during periods of robust economic growth. Having considered the altruism theory and the fact that remittances are mainly utilized on consumption activities, they do not have a direct but rather an indirect positive relationship with agricultural investment and thus productivity. However, Stark (1991) argues that a migrant will send money back or resources to his household/family given the aspiration to own them later, sustain rural investments and the intents of coming back. This makes the migrant preserve attention in his home country outside altruism which correspond with our argument that some of those investment may go to agricultural sector.

2.2.4 Theory of Optimal Brain Drain and Economic Growth

According to the proponents of this theory, the scale of highly skilful people in Less Developed Countries (LDCs) can be substantial in the context of the relatively small numbers. Lowell and Gerova (2004) suggest that developed countries attract approximately five percent of the migrants from developing countries with secondary education and that the figures for the upper levels are yet higher. However, the estimates indicate that 30% to 50% of the persons with skills in science and technology from developing countries reside in the developed countries (Meyer and Brown, 1999; and Barré et al., 2004). Hypothetically, there is an ideal level of emigration that encourages growing build-up of human capital according to Beine et al., (1999). This may be ascribed to the fact that migrants from LDCs may be motivated to pursue education since they can expect higher earnings given opportunity to work abroad. While supporting this theory, Beine et al., (2003) suggests that these people belong in different economic sectors and that as long as not all of these persons emigrate, economic growth can be spurred through investment. On the other hand, Lowell and Gerova (2004) argue that the effect of diaspora remittances on growth is not automatic.

Global cities in both LDCs and developed countries succeed on maintaining higher levels of brain flow leading to aftermath loss of skill. Nevertheless, other studies emphasize on the significance of complimentary feedback effects i.e. return migration and diaspora effects like monetary and technology transfers as well as investment among others (Freinkman, 2002; Commander et al., 2002). Given this theory, there will be a likelihood of the brain drain being beneficial to the remittance receiving households in the home countries and in particular to the agricultural sector (Lowell & Gerova, 2004). In this case, complimentary feedbacks will trickle down to agricultural investment in the long run.

2.2.5 The Theory on Remittance and Structural Transformation

This theory attributes both economic and social consequences to structural transformation as a result of remittances. Glytsos (2002) associates shortage, economic well-being and resource distribution with outcome on intake patterns and reserves to expansion or growth through modifications in trade and investments. However, in countries with big

number of emigrants, remittance may have an insightful effect on varying the structure of the economies, improving living standards and creating favourable condition for local development such as improved agricultural productivity in case of developing economies. Despite the negative relationship to development as postulated through inflation created by induced rising demand and unresponsive supply (Looney, 1990), it is evident that wages may rise by increasing leisure on recipients through remittances hence reducing labour supply (Katseli & Glytsos., 1989).

This study considers agricultural sector as the most significant in developing countries. Its alteration contributes to main structural change and development. According to Papademetriou and Martin (1991) the migration of labour and subsequent increase in the wages of remaining ones prompts capital for labour replacement which is somehow dependent on migrant transfer's fast-tracking the progression agriculture capitalization. Further, Glytsos, (2002) suggests that productivity can be spurred by this process of capital for labour substitution. For developing countries, it is necessary to make an assumption for rationality of remittances receivers such that during investment, they will channel it to most productive investment activity.

2.3 Empirical Literature Review

Few empirical studies have been conducted relating remittances to agricultural sector. Existing studies have focused mostly on investment as a whole without distinguishing and if any, it's the relationship between remittances and financial sector or economic growth.

Akpan, Okon and Udoka (2014) explored the link between remittances and indicators of agricultural productivity in Nigeria. The authors estimated the impact of remittances using ordinary least square (OLS) technique. The study found indicators (agricultural to GDP; Agricultural Productivity Index (API); remittances and Crop Productivity Index- (CPI) have positive exponential growth rates. However, remittance was shown to increase at a high rate compared to others. Further, remittance was found to have a linear and symmetric relationship with agricultural productivity index as well as CPI. On the other hand, the Granger causality test (bilateral) indicated unidirectional association

between agricultural to GDP and inflow of remittance in the country. In addition, API and CPI in the long run demonstrated a significant relationship with remittance whereas agricultural to GDP and API showed significance relationship with remittances.

Udah (2011) employed Ordinary Least Squares (OLS) in estimating the impact of remittance on economic performance in Nigeria. Remittance was only found to impact economic performance upon interacting it with accumulation of human capital and diffusion of technology (interactions). Other control variable thought to be crucial in hastening the pace of economic growth and development was the capital expenditure by the government on economic and social services.

While exploring the effect of migration and remittances on adoption of the new farming technology in rural Senegal; Tshikala and Fonsah (2014) used a Three-Stage Least Squared (3SLS) model to analyze the data from the World Bank rural project. The study findings showed that both internal, diaspora migrations and diaspora remittances have significant and positive influence on the adoption of new farming technologies. However, the study further indicates that increase in migration may cause shortage of labor or the abandon of farming activities in many rural areas which may reduce agricultural production.

Kagochi and Chen (2013) conducted a study to explore whether diaspora remittances to Kenya could be explained by either altruistic and/or self-interest motive. The Autoregressive Distributed Lag model (ARDL) with co-integration using the World Bank annual data for the period between 1970 and 2010 was employed by the study. The study revealed that self-interest to invest motivated remittances but not altruism. Further, the financial status of migrants' country of destination was shown to be intensely connected to the quantity of remittances. Finally, the findings revealed that both exchange rates and housing construction demand compared to agriculture were the two resilient motivators of diaspora remittances in Kenya.

Woodruff and Zenteno (2004) explored the relationship existing between remittances and microenterprises in Mexico. The log-linear regression findings indicated that remittances led to entrepreneurial accomplishments. The authors however noted that this was only

possible if monetary limitations for small business were relaxed considering LDCs. Further, it was shown that both business throughout and employment were improved considering the positive influence of remittances on investment. The study concluded that there is also a robust prospective for remittances to contribute to community development through other sectors and increase Gross National Product (GNP). Other authors who support these results concur that international remittances function as a passage for expansion of financial market. This implies that remittance receiving household(s) will have a tendency of investing in healthcare and education (Roberts & Banaian, 2004).

Adams (2004) carried out a cross sectional survey focusing on the nexus between remittances and poverty in Guatemala. The study applied a binary probit regression model in estimation. Poverty gap, poverty head count and squared poverty were explored on Guatemalan households who received remittances from internal and/or international migrants. This was compared with household(s) who never received any remittance as income. The study results revealed that households who had either/both internal and international remittances had increased probability of minimizing poverty. Adams and Cuecuecha (2010) similarly, in their survey on the economic role of diaspora remittances on poverty and household consumption and investment in Indonesia revealed that remittances lowered poverty in Indonesia. The authors used panel data for the period 2000-2007 and Random Effects Model (REM) as an estimating technique. They concluded that remittances increases human and capital investments levels in the receiving economies.

A study was conducted by Griffith, et al., (2008) on impact of remittances on investment in Barbados from 1970-2002. The Dynamic Ordinary Least Squares model (DOLS) was employed. The study findings showed that remittances have extensive influence on investment in both the short- term and long run. The study also revealed that the housing sector has profited from diaspora remittances as wooden houses have been rehabilitated to concrete structures in Barbados. Further, the study reveals that bonds savings has improved since 1970 in Barbados signifying that remittances have been used to invest in bonds.

In Sub-Saharan Africa, Balde (2010) compared the impact of remittances and foreign aid on savings and investments. The study used ordinary least squares (OLS). The results revealed that the coefficients on remittances variable was 6 to 7 times higher than those on the foreign aid variable. The results also showed that remittances are more effective than foreign aid in increasing savings and investments in sub-Saharan Africa.

Taiwo and Odekunle (2013) undertook a study to establish the link between remittances and capital formation in Nigeria. The study used time series data between 1977 and 2010 together with dynamic ordinary least squares model. The results revealed a positive significance between remittances and physical investment. The study concludes that the Nigerian government should improve financial development so as to increase the influence of remittances on capital formation.

In Albania for example, rural remittance receiving households changed from crop production to livestock production. Regardless of decline in workforce, income from agriculture did not reduce because of higher investment in livestock production (Miluka, et al., 2007). Lack of agricultural investments such as arable land, sufficient irrigation water and good infrastructure made consumers of remittances withdraw from agricultural practices (de Haas, 2007). Inflow of remittances on the other hand was shown to influence land prices such that there was incredible increase in land prices as migrants invested in land back at home. This led to land inaccessibility of poorer households (Vargas-Lundius & Lanly, 2007).

Aitymbetov, (2006) used dynamic demand model to measure macroeconomic implications of remittances in Kyrgyzstan. About 10 percent of remittances were used as a form of investment in Kyrgyzstan hence a positive effect on the economy. The study results revealed that remittances are found to yield a multiplier effect for example a \$100 increase in income led to \$230 increase in income. The multiplier effect is defined by the proportion devoted to consumption and proportion devoted in investment. The study concluded that remittances positively affect the economy through its effect on the aggregate investment in the sectors of the economy.

In order to analyze the relationship between remittances on economic growth, Zieseimer (2006) developed an open economy model through two channels: human capital channel and physical capital channel. Data was combined from four countries that received remittance in the year 2003. The study findings indicated that remittances had a positive relationship with Gross Domestic Product. The author concluded that remittances would not only increase growth through investment but also through increased literacy levels.

Cherono (2013) investigated the impact of remittances on private investment in Kenya using the OLS regression. The results showed that remittances were positively significant to investment in Kenya. The results established that a percentage rise in remittances led to 15% growth in private investment in Kenya. This suggested that remittances contributed positively to private investment between 1980 and 2011.

Gonzalez-Velosa (2011) estimated the link between emigration and remittances on agriculture growth in Philippines. The study explore whether emigration and remittances led to a shift out of the agricultural sector or caused changes in farming practices. The study used Fixed Effects Model (FEM) and an instrumentation strategy. This was meant to take care of the macro-economic blows at the country of destination while identifying separately the causal effects of emigration and remittances. The findings revealed that remittances had no significant effect on agricultural growth through farmed area; number of farms and agricultural labour. However, it was shown that remittance had significant positive influence on farming practices. The study concluded that remittances increase the quantity of farms that yield high-value marketable crops, while lowering the portion of farms that involve in crop diversification and increase the adoption of automated technologies among farmers.

2.4 Overview of Literature Review

Several studies support diaspora remittances with its positive impact on developing economies. For example, theoretical literature reviewed and tested by Kagochi and Chen (2013) in their study found that self-interest to invest motivated remittances but not altruism. Some other reviewed empirical studies relating remittances and agricultural growth indicated mixed results. For example Akpan, Okon and Udoka (2014) remittances had a significant relationship with API and CPI while Gonzalez-Velosa (2011) found

remittances having no significant effect on agricultural growth through number of farms, farmed area and agricultural labour. Kagochi and Chen (2013) on the other part concludes that other sectors like housing sector was more related significantly to remittances compared to agricultural sector.

Similarly, more other studies such as Woodruff and Zenteno (2004), Adams 2004, Griffith et al 2008, UDAH 2011, and Taiwo and Odekunle (2013) despite relating remittances to investment in an economy, they are based in other developing countries with no studies conducted in Kenya except Kagochi and Chen (2013), and Cherono (2013). On the other hand, no studies reviewed have considered estimation concerns except a study by Gonzalez-Velosa (2011) who addressed endogeneity and heterogeneity in the study. This study will not only contribute to the inconclusive debate on diaspora remittances and agricultural growth in Kenya but will also address the methodological gap whereby the influence of remittances through critical drivers of agricultural sector will be established while addressing various estimation concerns to avoid spurious estimates.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the methodology that is used in conducting the study. The section examines the theoretical framework, model specification, variable definition, data sources and estimation issues.

3.2 Theoretical Framework

This study adopts a theoretical model of Gonzalez-Velosa (2011) who developed some intuition about how remittances can affect production decisions in local agricultural economies. Remittances are related to shocks that moderate the endowment of labour and working capital. From the logical reasoning of Banerjee and Duflo (2008) the effect on production through changes in input endowment will rely on the features of the credit and labor markets. The study will further consider the role of diaspora remittances as an insurance mechanism which may alter the risk taking behaviour of farmers. Diaspora remittances may impact agricultural production through alternative channels as suggested by Udah, (2011). This could include through different production approaches (Romer, 1990; Nelson & Phelps, 1966; Benhabib & Spiegel, 1994).

According to Gonzalez-Velosa (2011) in an economy where output prices are determined competitively, agricultural households will weigh the profits of two alternative production methods or goods: “Modern”, which is indexed by M and “Traditional”, which is indexed by T. Production technologies will be described by $Q_M = F_M(Z, K)$ and $Q_T = F_T(Z, L)$, where Z corresponds to a vector of fixed inputs and household characteristics, K corresponds to the physical capital while L corresponds to labour. According to the model, these two alternative technologies differ in use of either capital or labour.

However, the model proposed by Gonzalez-Velosa (2011) failed to account for an inflow of capital from diaspora remittances in an environment in which the household is bound by a credit market constraint which ambiguously have an impact on modern production technologies. This is because in the absence of credit constraints, diaspora remittances will only affect agricultural growth through modern production criterion if they reduce

the marginal cost of capital faced by the household and this will be subject to the flexibility of the supply of capital in the local market (Yang & Choi, 2007).

Considering diaspora remittances and production decisions, this study provides the effects of diaspora remittances due to human capital and new technological innovation in the agricultural sector. Note that the growth rate of total factor productivity is subject to the skilled content of human capital which has a direct effect on endogenous technological progress that ultimately influences agricultural growth (Romer, 1990). Further advanced level of human capital accumulation quickens up the adoption of imported technology (Barro & Salai-Martin, 1995).

3.3 Model Specification and Estimation Technique

In this study, total factor productivity is modelled based on human capital accumulation as described by Mankiw, Romer and Weil (1992); and Barro and Salai-Martin, (1995). Following Gonzalez-Velosa (2011 and Uдах (2011), given human capital, technological diffusion; their respective interactions with remittances are as shown the following equation;

$$\text{Log}y = \alpha_0 + \alpha_1(\text{log}Z*\text{log}REM) + \alpha_2(\text{log}T*\text{log}REMt) + \dots \quad (1)$$

Where $\text{Log}y$ is the total factor productivity; Z is the proportion of accumulation of human capital that affects total factor productivity and T is the proportion of technology that influence total factor productivity as described in theoretical model whereas REM is the total diaspora remittance which indirectly affect total factor productivity through human capital and technology adoption.

To estimate the effect of diaspora remittance on agricultural growth, our model is to be specified by including other control factors like Agricultural Price Index (API) and Input Price Index (IPI) as used by Akpan, Okon and Udoka (2014) and government expenditure (Exp) through budgetary allocation to represent physical capital as suggested by Ibitoye, (2012) in the following multiple regression model shown below;

$$\text{Log}Y_t = \beta_0 + \beta_1\text{log}REMt + \beta_2(\text{log}Z*\text{log}REMt) + \beta_3(\text{log}T*\text{log}REMt) + \beta_4\text{log}API + \beta_5\text{log}IPI + \beta_6\text{log}Exp + \epsilon_t \dots \quad (2)$$

Where $\text{Log } Y_t$ is the natural logarithm of the agricultural output growth at time t ; β_0 = intercept coefficient, and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$ and β_6 are the coefficients of the regression subject to estimation and ε_t = error term.

From equation 2, we expect a positive relationship between agricultural growth and remittances; the interaction of human capital with remittances; interaction of technological diffusion and remittances; agricultural price index, and government capital expenditure. The government capital expenditure on economic services (presumed to impact the level of human capital predicted to cause increases in total factor productivity) which in return Loening, (2002) asserts can accelerate the pace of agricultural growth. Also, a negative association is predicted between agricultural growth and input price index.

The model is estimated through Ordinary Least Squares (OLS) as an estimating technique. The Ordinary Least Square (OLS) method makes various assumptions on Normal distribution of the random error term, constant variance of error terms across observations, linearity, no serial autocorrelation of the error terms, no perfect correlation between any pair of independent variables and stationarity (Mukras, 1993). Therefore, diagnostic tests are undertaken so as to validate the estimates that OLS yields.

3.4. Data Source and Variables Description

3.4.1 Data Source

Secondary data employed in this study is to analyze the effect of remittances on agricultural output growth rate in Kenya. The time series data relating to expenditures on agriculture in Kenya from 1983 to 2015 was obtained. This type of data (human capital development, government) was obtained from government publications from economic surveys; 1983-2015 as well as publications of international organizations such as World Bank and International Monetary Fund for input and agricultural price indexes. Also data for technological diffusion was sourced from World Bank development indicators.

3.4.2 Variable Description

Agricultural output growth was obtained for the period 1983 to 2015 since this period indicate the era coupled with introduction of new government policies on agricultural

sector; despite being a period associated with many variations experienced in Kenya (Kosimbei, 2009). The study converted nominal average growth to real average growth since the nominal values fail to reflect the exact changes in agricultural growth and the changes in income as a result of inflation that causes prices to rise when the quantities fall.

Table 3.1: Variable Description, Measurement and Expected Sign

Variable	Description and measurement	Expected sign
Dependent variable		
Agricultural output growth	Total agricultural output was measured as the market value of final output of agricultural products which excludes the intermediate products.	
Independent variables		
Diaspora Remittance	This comprises the total amount of money sent back to Kenya from the international migrants (Kenyan nationals living abroad)	Positive
Human capital accumulation/development	This is measured by the rate of primary and secondary school enrolment.	Positive
Technological development	The development of manufacturing sector (total amount). This will be measured by the contribution of manufacturing sector to GDP given in percentages.	Positive
Government expenditure	Total amount of money allocated to agricultural sector and spent on purchases of physical as well as on economic and social services.	Positive
Agricultural Price Index (API)	This is agreed indices of the prices paid and/or received by Kenyan farmers for agricultural goods and services. This will be an annual measure. It will show the yearly price changes in agricultural outputs for the Kenya.	Positive
Input Price Index (IPI)	This is calculated on the basis of price changes in various cost modules of the product to be realized (in this case agricultural products). This index reflects the price farmers pay for goods and services. This is split into products under current consumption and products adding to investment.	Negative

3.5 Diagnostic Tests

3.5.1 Heteroscedasticity

Heteroscedasticity affects the minimum variance which later leads to invalid conclusions when testing hypothesis. The study applied the use of Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. If heteroscedasticity is present, as a remedy, robust standard errors are used to eliminate it (Mukras, 1993).

3.5.2 Autocorrelation

This refers to the association between random error terms of the subsequent time periods. If present, the bias leads to spurious estimates. To test for this, the study uses Breusch-Godfrey Lagrange Multiplier test for autocorrelation. The use of robust standard errors serves as a remedy for autocorrelation if found present (Mukras, 1993).

3.5.3 Multicollinearity

Multicollinearity makes the coefficient of regression to be indeterminate and standard errors become infinite. To check for the presence of Multicollinearity, Variance Inflation Factor (VIF) test is used as it measures how much variance of an estimated coefficient increases due to collinearity. In this study, correlation matrix was used to assess the relationship between various pairs of variables used in the study. As a remedy, one of the correlated variables will be dropped or retained if it is not highly correlated, (Mukras, 1993).

3.5.4 Normality Assumption of the Random Variable

The random error term need to be distributed normally with a mean of zero and a constant variance. This is among the classical assumptions of linear regression model. The error term is used to capture all other variables that influence agricultural growth rate but are not included in the model (Mukras, 1993). The study employed Shapiro Wilk test, to confirm whether the error term is normal or not. If found present, the study employ non-linear model.

3.5.5 Stationarity Test

The study conducts unit root tests to detect non stationarity in all the variables. If variables are non- stationary, there is a tendency of the estimates to change over time.

This characteristic leads to spurious estimates. The study applied the Augmented Dickey Fuller test (ADF). Therefore, if variables are found to be non-stationary, successful differencing is applied until the bias is eliminated. The null hypothesis states that the variable under consideration is non-stationary (Gujarati, 2004).

3.5.6 Cointegration

In reality, there is high likelihood that the long-run association between the economic variables changes. The reason for this might be as a result of technological progress, economic crises or changes in the people's preferences and behavior accordingly; policy alteration. There is a need therefore to have a long-run relationship between the agricultural growth rate and explanatory variables apart from non-stationarity. However, this is applied only if all variables under study are of the same order (from stationarity analysis). The Johansen test for Cointegration is employed to this effect. If it is found that there is Cointegration and all variables, non-stationary but upon first differencing they will be stationary, we shall conduct error correction model (Gujarati, 2004).

CHAPTER FOUR

STUDY FINDINGS AND DISCUSSIONS

4.1 Introduction

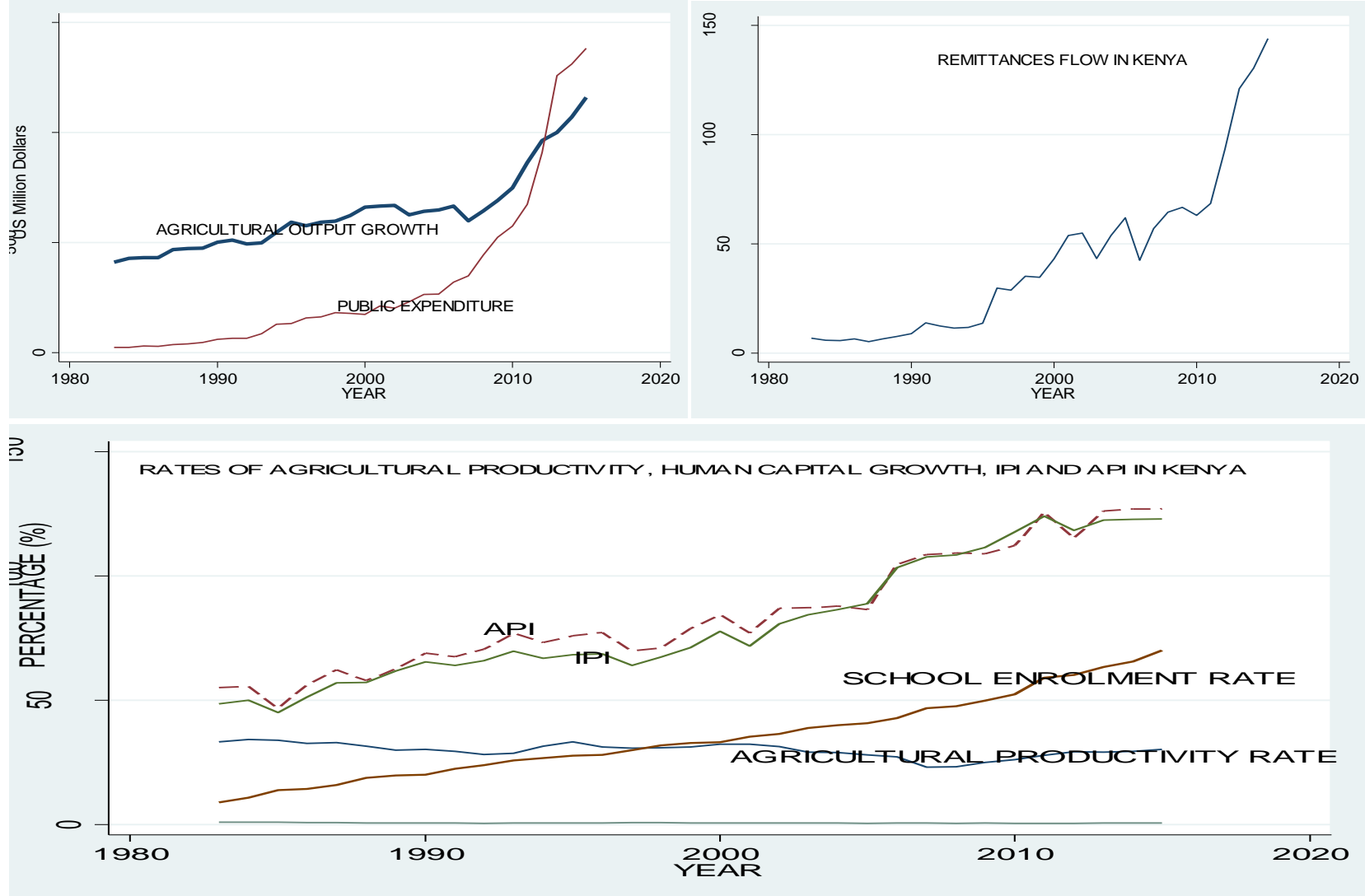
This section comprehensively analyses the relationship between diaspora remittances and agricultural growth in Kenya. The study objectively reveals how diaspora remittances contribute to agricultural growth using time series data collected for the period (1983 to 2015). The study employs OLS model in estimation. Lastly, the results are presented mainly descriptively in table forms, figures and structured as per the study objectives.

4.3 Trend Analysis of the study variables (1983-2015)

The study further conducted trend analysis for variables under study. As can be observed from the figure 1, agricultural output growth and public expenditure have both been increasing consistently over time. However, agricultural output growth was more than public expenditure until the year 2013 when public expenditure on agriculture surpassed it. This may be attributed to the entrant of the new government that spent more resources on infrastructural and other capital sectors.

As for diaspora remittances, there has been observed increase despite being non-systemic from the beginning of the study period to the year 2012 when a sudden consistent upsurge was observed. As for other variables like API and IPI had a common increase with fluctuating speed. Surprisingly, agricultural productivity over time showed a downward trend whereby it decreased with declining speed whereas human capital development took an opposite direction to that of agricultural productivity. This may be associated with the increase in diversification in the country and the trends of school enrolment may be as a result of announcement and implementation of free primary education in Kenya in the early 2000s. More details are as can be observed in the figure 4.1.

Figure 4.1: Trends on Agricultural Output Growth, Remittances and other Variables



During the same period, remittances were also increasing consistently. However, the rate of rise was shown to be higher between the year 2013 and 2015. This may be attributed to the perceived better investment opportunities back in Kenya as a result of the prevailing peace. Similarly, it can be observed that over the entire period of the study that both agricultural price index and input price index moved together with a closer rate which was higher compared to the agricultural productivity and technological development. The latter two have a symmetrical opposing trend whereby as one declines, the other increasing at lower rate. However, both of them were at equilibrium in the years between 1998 and 2000.

4.2 Descriptive Results

The study has used the mean, standard deviation, minimum and maximum values of the respective dependent and explanatory variables. The study findings (table 4.1) shows that agricultural growth was on average US million dollars 635.47 with the minimum being US million dollars 411.02 and maximum of US million dollars 1159.59. Remittance flows to Kenya was US million dollars 42.66 on average over the entire period of study.

The school enrolment rates for both primary and secondary were averagely 34.99% while technological development rates were 65.07% on average. The study also established that there was little variation in terms of agricultural price index (84.92%) and input price index (81.58%). Also, the government expenditure on agriculture was US million dollars 319.56 on average throughout the entire study period.

Table 4.1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Agricultural growth	33	635.4747	187.5097	411.0168	1,159.588	1.2663	4.0434
Remittances	33	42.66239	37.58488	5.214	144.0846	1.1252	3.6938
Agricultural price index	33	84.9179	23.7810	46.82	127.04	0.4483	2.0322
Input price index	33	81.5779	25.36438	45	124.04	0.4742	1.8406
Human capital	33	34.9879	16.7309	8.9	70.1	0.4389	2.2783
Public expenditure	33	319.5595	380.7667	23.070	1,383.388	1.7352	4.9571
Technology	33	0.6507	0.1248	0.5311	0.9979	1.5145	4.5475

Looking at the distribution of the parameters, the study revealed that all the variables are positively skewed meaning that they are skewed to the right. On kurtosis values it can be concluded that almost all variables have non – normal distribution given that its kurtosis values are as close to 3.0 except input price index.

4.4 Causality Analysis for Diaspora Remittances and Agricultural Output Growth

The first objective of this study was to determine the causal relationship between diaspora remittances and agricultural output growth in Kenya. The study investigated whether the causality was significant or not. In this case, we were interested to know whether one time series predicts another. From Table 4.2 below, it was established that diaspora remittances and the respective interactions including control variables are jointly significant in causing or determining the agricultural output growth at 5% level of significance. Diaspora remittances and its respective interactions however were not significant in causing agricultural output growth.

Table 4.2: Granger Causality/ Wald Tests by Independent Variable-Agricultural Output Growth

EQUATION	EXCLUDED	CHI2	DF	PROB > CHI2
Agricultural output growth	Remittances	2.4558	2	0.293
Agricultural output growth	Remittance and human capital- interactions (D2)	4.1362	2	0.126
Agricultural output growth	Remittance and technological development- interactions (D)	1.8521	2	0.396
Agricultural output growth	Agricultural price index (D)	1.0883	2	0.580
Agricultural output growth	Input price index (D)	1.71	2	0.425
Agricultural output growth	Public expenditure (D)	4.4521	2	0.108
Agricultural output growth	ALL**	21.717	12	0.041

**All of these variables combined significantly cause agricultural output growth.

The study further tests whether agricultural output growth causes diaspora remittances or its respective interactions. As shown in table 4.3, agricultural output growth and other variables employed significantly cause diaspora remittances. Specifically, agricultural

output growth causes diaspora remittances at 1% level of significance. This implies that there is a unidirectional causality. However, diaspora remittances cannot be caused by any of its respective interactions.

Table 4.3: Granger Causality Tests/Wald Test by Dependent Variable

EQUATION	EXCLUDED	CHI2	DF	PROB > CHI2
Diaspora Remittances	Agricultural output growth	23.456	2	0.000
Diaspora Remittances	Remittance and human capital-interactions (D2)	0.09611	2	0.953
Diaspora Remittances	Remittance and technological development-interactions (D)	0.78423	2	0.676
Diaspora Remittances	Agricultural price index (D)	0.84876	2	0.654
Diaspora Remittances	Input price index (D)	1.2824	2	0.527
Diaspora Remittances	Public expenditure (D)	2.5554	2	0.279
Diaspora Remittances	ALL	78.026	12	0.000

D represents first differences

4.5 Pre-Estimation Tests

4.5.1 Correlation Analysis

Biasness as a result of Multicollinearity arises when one or more pairs of independent variables are perfectly correlated to each other. Correlation matrices was explored as indicated in Table 4.4. There is a mix of positive and negative correlations among the variables. The correlation among the coefficients of the variables which was more than |0.6| was an indicative of presence of Multicollinearity. According to Murkras (1993), the presence of Multicollinearity inflates the variance of parameter estimates leading to provision of spurious estimates and signs, and thus incorrect conclusions. The study showed almost all pairs of variables had higher correlation coefficient (r^2). Instead of dropping one of the pairs, the study conducted first differences to eliminate it. The results are as indicated in the parenthesis.

Table 4.4: Summary of Correlation Matrix

Variables	Agricultural growth	Remittances	Agricultural price index	Input price index	Human capital	Public expenditure	Technology
Agricultural growth	1.0000						
Remittances	0.9657	1.0000					
Agricultural price index	0.8942 (0.0076)	0.9017 (-0.2055)	1.0000				
Input price index	0.8731 (-0.0975)	0.8886 (-0.2434)	0.9925 (0.9142)	1.0000			
Human capital	0.9424 (0.2553)	0.9480 (0.1333)	0.9763 (0.1196)	0.9725 (0.0347)	1.0000		
Public expenditure	0.9634 (0.4433)	0.9567 (0.1636)	0.8783 (0.0370)	0.8638 (-0.1045)	0.9077 (0.2854)	1.0000	
Technology	-0.4973 (0.1419)	-0.4696 (0.1002)	-0.6546 (0.0402)	-0.6630 (-0.0036)	-0.6496 (0.0826)	-0.4065 (0.2979)	1.0000

The values in parentheses were obtained after addressing Multicollinearity through first differencing. The study further conducted a confirmatory test using the Variance Inflation Factor (VIF) tests whereby on average, VIF was more than the recommended threshold of 10. After differencing the API, IPI, human capital, public expenditure and technology, the overall mean was less than 10 implying absence of Multicollinearity. The results are as indicated in Table 4.5.

Table 4.5: VIF Test

Variable	VIF	VIF
Agricultural price index	81.20	7.27*
Input price index	76.02	7.26*
Human capital	67.65	1.25*
Remittances	29.13	2.19
Public expenditure	13.30	1.95*
Technology	2.93	1.33
Mean VIF	45.04	3.54

*The * represents VIF results after first differences*

4.5.2 Unit Root Tests

If variables are non- stationary, there is a tendency of the estimates to change over time. Unit root tests are used to detect non-stationarity in all the variables. This characteristic and thus presence leads to spurious estimates. Therefore, if variables were found to be non-stationary, successful differencing was applied until the bias is eliminated. The null

hypothesis in this case is that the variable under consideration is non-stationary or has got unit root. Augmented Dickey Fuller test showed that out of all study variables, only three (API, IPI and Human capital growth) variables are found to be non-stationary since their test statistic was less than critical value at 5% level of significance. However, upon conducting the first differences, they became stationary. The results are as indicated in table 4.6.

Table 4.6: Testing for Stationarity

Variables	Test Statistic without differencing (Critical level of 5%)	Test statistic with first differences (Critical level of 5%)
Agricultural output growth	-3.038 (-2.980)	-
Remittances	-4.595 (-2.983)	-
Agricultural Price Index*	-0.214 (-2.980)	-7.948 (-2.983)
Input Price Index*	0.056 (-2.980)	-6.293 (-2.983)
Human Capital*	2.350 (-2.980)	-5.089 (-2.983)
Public Expenditure	4.097 (-2.980)	-
Technological Development	-3.264 (-2.980)	-

*These variables have a unit root. H_0 : Variable is non-stationary¹.

Since the unit root test revealed that the variables under consideration were integrated of different orders, the study will not establish the existing relationship that is whether there is a long run or short run relationship between the dependent variable and explanatory variables. This means that there is no need for conducting Cointegration test.

4.6 Regression Results

The second objective of this study is to establish the extent to which diaspora remittances influence agricultural output growth in Kenya. The study sequentially checked for unit root and possibility of Cointegration and goodness of fit of the model² estimated. Non-

¹Condition: If the test statistic is less than critical value, reject the null hypothesis.

² The study established goodness of the model fitness by checking the presence or absence of Multicollinearity, autocorrelation, and normality of the residuals thus the model is desirable.

stationarity behavior and high persistence are part of characteristics of most economic variables. That is why series for pre-test is necessary in order to determine the appropriate transformation that renders the data stationary. Considering table 4.7, the results for the estimated model are as shown.

Table 4.7: Log Linear Model for Agricultural Output Growth and Diaspora Remittances

Linear regression		Number of obs = 31 F(6, 24) = 116.16 Prob > F = 0.0000 R-squared = 0.9300 Root MSE = 0.07615				
Robust						
Natural logarithm of agricultural output growth	Coefficients	Std. Err.	t	P>t	[95% Conf. Interval]	
Diaspora Remittances	0.000668**	0.0000404	16.54	0.000	0.0005846	0.0007513
Diaspora Remittance and human capital- interactions						
D2.	2.03e-06	3.83e-06	0.53	0.602	-5.88e-06	9.94e-06
Diaspora Remittance and technological development- interactions						
D1.	-0.0005908	0.0004275	-1.38	0.180	-0.0014731	0.0002915
Agricultural Price Index						
D1.	0.0060663	0.0058327	1.04	0.309	-0.0059719	0.0181045
Input price index						
D1.	-0.0093995	0.0083939	-1.12	0.274	-0.0267237	0.0079246
Public expenditure						
D1.	2.72e-07	2.98e-07	0.91	0.371	-3.44e-07	8.88e-07
Constant	13.05975	0.0248718	525.08	0.000	13.00842	13.11109

*D1 represents the first differences and **Significant at 5% significance level.

As can be further be observed from Table 4.7, all variables are jointly significant in determining agricultural output growth. This is because of the overall significance (Prob > F= 0.0000) which has a p-values of less than 5% level. Approximately, 93% of the total variations in agricultural output growth have been explained by diaspora remittances, respective interactions and the control variables considered in this study while the rest of the variations are accounted to other factors not included in the model.

4.7 Post Estimation Tests

4.7.1 Normality of the Residuals

We use Shapiro Wilk and Jarque-Bera tests for normal distribution of the random error terms. The null hypothesis in this case is that the error terms are normally distributed. From table 4.8, the p value of 0.00180 is less than the significant level of 0.05, we reject the null hypothesis of normality of residuals. This implies that error term is not normally distributed. The study employed non-linear model.

Table 4.8: Shapiro-Wilk Test for Normal Data

Variable	Obs	W	V	z	Prob>z
Residuals	31	0.87483	4.077	2.912	0.00180

H₀: Residuals are Normally Distributed

The transformed model implies that there is no need of conducting linearity test.

4.7.2 Test for Autocorrelation

Correlation between the stochastic random error terms of the succeeding time periods is anticipated in time series studies. Its presence associated with biasness leads to spurious estimates. From table 4.9 the Breusch-Godfrey LM test, autocorrelation is confirmed to be present given the p value of 1.41% which is less than 5% level of significance. In that case, the study applied robust in the estimation.

Table 4.9: Breusch Godfrey Langrage Multiplier Test for Autocorrelation

LM test for Autocorrelation			
lags(p)	chi2	df	Prob > chi2
1	6.030	1	0.0141

H₀: No serial correlation

4.7.3 Heteroscedasticity test

This is a test for variance of the error terms across all the observations. To check whether variance is constant, the study applied Breusch pagan test or the Cook-Weisberg test for heteroscedasticity. From the result in table 4.10, it was shown that the p value of 17.61% is more than 5%. The findings indicate absence of heteroscedasticity.

Table 4.10: Breusch-Pagan / Cook-Weisberg Test for Heteroscedasticity

Ho: Constant variance
Variables: Fitted values of Natural logarithm agricultural output growth
Chi2(1) = 1.83
Prob > chi2 = 0.1761

4.8 Discussion of the Study Findings

Literature links diaspora remittances to agricultural output growth through substitution (i.e. informal or formal credit) that qualifies households with limited or no access to financial markets. This study however, unearthed the causality between the diaspora remittances and agricultural output growth. From the findings, a unilateral relationship was revealed since diaspora remittances and its respective interactions however were not significant in causing agricultural output growth. On the other hand, agricultural output growth was found to cause diaspora remittances at 1% level of significance; however, diaspora remittances cannot be caused by any of its respective interactions. These findings are similar to the study results of Akpan, Okon and Udoka (2014) in Nigeria who showed a unidirectional relationship between agricultural to GDP and inflow of remittance through the Granger causality test.

Since all the control variables were insignificant as well as the interactions, the study focuses on the significant relationship established between diaspora remittances and agricultural output growth in Kenya. This is in tandem with the findings of Gonzalez-Velosa (2011) who found that remittances had no any significant effect on agricultural growth through capital accumulation (number of farms, farmed area) and agricultural labour (what is represented through interactions). However, it was contrary to the findings obtained by Udah (2011) who showed remittance as having significance effect on economic performance through its interactions with accumulation of human capital and technological diffusion.

Specifically, at 1% level of significance, diaspora remittances were found to increase agricultural output growth by 0.0668% holding other factors constant. The study associates this relationship to improved farming practices. The study concurred with the results of Gonzalez-Velosa (2011) who demonstrated that remittance had significant

positive influence on farming practices. Similarly, Tshikala and Fonsah (2014) in their analysis indicated that diaspora remittances have significant and positive influence on the adoption of new farming technologies which translated to increased agricultural output growth. Further, diaspora remittances increase the proportion of farms that yield high-value marketable crops as depicted in the literature while lowering the portion of farms that involve in crop diversification and increase the adoption of automated technologies by both small scale and large scale farmers in Kenya. This ultimately leads to increase in crop yields and thus output which spurs agricultural growth.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the study in relation to the objectives, literature review and key variables in our study. It later makes comprehensive conclusions based on the established relationship between diaspora remittances and agricultural output growth in Kenya upon which recommendations are drawn. Suggestions for further areas of study are conducted thereafter.

5.2 Summary of the Study

Agricultural sector for decades has been contributing considerable revenues and earnings from external sectors in Kenya which help to support other part of economy. Unfortunately budgetary allocations as well as loans advanced by commercial banks to agriculture sector has been very low compared to manufacturing, trade, and other services sectors, hampering expansion and technology adoption. This has led to low output from this and other related sectors. Literature recently associated diaspora remittances as an alternative source of financing the agricultural sector.

Due to increased correlation of diaspora remittance to growth of agricultural sector, the main objective of the study was thus to explore the existing empirical relationship between the two. Specifically, the study was meant to first establish the causal link between diaspora remittance and agricultural sector; and secondly, examine the effect of diaspora remittances on agricultural output growth in Kenya. The study objectives were tested at 1% and 5% level of significance. The granger causality test was performed to investigate the causal link while Ordinary Least Square was conducted to estimate the econometric relationship between diaspora remittances and agricultural output growth. From empirical results, a unidirectional causality was found between diaspora remittances and agricultural output growth at 1% level of significance. The study results further revealed that diaspora remittances were significant at 1% level of significance in increasing agricultural output growth. Surprisingly, its respective interactions through human capital and technological developments) were not statistically significant in influencing agricultural output growth in Kenya.

5.3 Conclusions on the Study Findings

Scarcity, economic well-being and resource distribution which later influence intake patterns and reserves relates with expansion or growth through modifications in trade and sectoral investments (which includes in the agricultural sector). Since independence diaspora remittances to most of developing nations and particularly Kenya have been consistently increasing.

It is thus evident that remittances have direct importance to growth of agricultural sector and consequent the Kenyan economy. The study concludes that much effort need to be enhanced by the government to attract more diaspora remittances to boost domestic investment through agricultural sector and respective consumption. This is based on the result which showed that diaspora remittances were attracted by growth of agricultural sector and the fact that diaspora remittances significantly improved agricultural output growth.

5.4 Recommendations of the Study Result

Since independence, agricultural sector in Kenya has been facing frequent financial constraints. There is lack of collateral or credit history required by most local banks, investors (small and large scale farmers) in the agricultural sector are left at the crossroads even by formal micro-credit institutions in the country. Theories reviewed conclude that international transfers have been attributed to a significant part in motivating economic development. Referring to the theory of development, given large-scale resource transfer for instance through remittances and aid, there would be rapid industrialization and economic development especially by poor countries. Also, altruism theory specifically, depicts that the choice to remit basing on the income needs of households left behind (or origin country). This could be the needs associated with consumption or investment.

Based on the study results that are the positive and significant relationship between diaspora remittances and agricultural output growth, the study recommends the government to create ample environment favoring agricultural sector as this may attract more diaspora remittances to be channeled to this sector in the long run. This is in tandem

with theory on remittance and structural transformation reviewed in this study. Investing in agricultural sector, remittances may be directed towards acquisition of machinery, irrigation, fertilizers among other fundamentals hence modernization of agriculture triggering improved output. As a matter of fact, Kenya is among the developing countries with big number of emigrants, implying that diaspora remittance may have an insightful effect on varying the structure of the economy. This supports the study argument of improving living standards and creating favorable condition for local development, thus increased agricultural productivity which translates to improved agricultural output growth.

5.5 Areas for Further Study

The study has mainly concentrated in exploring the existing empirical relationship between diaspora remittances and agricultural output growth upon interrogating various theoretical expositions. The study actually explored its indirect effect through human capital accumulation and technological development. Other control variables such as public expenditure, API and IPI were used to moderate the model. The study suggest similar inter country study focusing in diaspora remittances in agricultural growth in economic blocks within Africa such as East Africa Community countries. Further, sub categories contributing to the agricultural output growth need to be explored to establish how diaspora remittance influences them. Finally, the study recommends an intra country study that is the effect of diaspora remittances on county developments or growth. Other sectors also need to be explored to determine the contribution in specific sectors for comparative purposes.

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APPENDIX

Data used in the study

YEAR	AGRICULTURAL OUTPUTGROWTH	REMITTANCES (US\$. MILLIONS)	HUMAN CAPITAL (%)	TECHNOLOGICAL DEVELOPMENT (%)	API (%)	IPI (%)
1983	411016.8	67.98	8.9	99.79175	55.16	48.58
1984	428264	58.08	10.9	99.52701	55.61	49.96
1985	431952	56.76	13.8	88.40968	46.82	45
1986	431324.7	66	14.4	79.27942	56.26	51.32
1987	467792.4	52.14	15.9	81.93536	62.23	57.02
1988	472575.6	66	18.8	69.23302	57.93	57.13
1989	475024.1	76.56	19.7	64.48538	62.66	61.86
1990	501563.2	89.1	20.1	61.29608	68.9	65.49
1991	510759.4	139.26	22.4	58.80191	67.6	64.04
1992	493436.9	124.08	23.9	53.11491	70.53	65.87
1993	498487.7	114.84	25.8	55.9269	77.06	69.76
1994	546265.4	118.14	26.8	58.30267	73.27	66.83
1995	592030	137.28	27.7	62.16455	75.97	68.38
1996	576871	298.32	28.1	67.49947	77.26	68.58
1997	592417.1	288.42	29.9	72.80625	69.93	64.09
1998	596930.5	351.78	31.8	76.80485	70.97	67.3
1999	623320.2	347.82	32.8	68.43751	78.88	71.19
2000	661875.6	431.64	33.2	66.81306	84.47	77.73
2001	665433.4	537.9	35.4	64.52649	77.03	71.9
2002	669806.3	550	36.5	60.60677	87.04	80.72
2003	625782.4	433	38.9	59.23887	87.22	84.45
2004	641990.3	538	39.9	55.27405	87.91	86.46
2005	648914.2	620	40.8	54.96074	86.57	88.95
2006	665044.2	424.9911	42.9	55.20726	104.72	103.32

2007	599360.6	570.4593	46.9	58.35323	108.71	107.74
2008	643486	645.2079	47.7	53.3463	109.2	108.43
2009	690856.6	667.3173	49.8	59.70868	109	111.53
2010	748680.8	631.4609	52.4	54.48648	112.32	117.69
2011	863991.7	685.7573	59.1	54.33315	125.74	124.04
2012	964414.5	934.1492	60.2	54.9484	115.17	118.39
2013	1001004	1211.021	63.4	58.84041	126.12	122.42
2014	1070406	1304.277	65.7	58.73008	126.99	122.89
2015	1159588	1440.846	70.1	60.23593	127.04	123.01