



The impact of the agricultural sector on economic growth and development in South Africa

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DEDICATION

I dedicate this dissertation to my grandson, Musawakhe Nkanyezi. This work is my love made visible to you, Musa. I want you to know that everything seems impossible until it is done. The sky is not the limit!

DECLARATION

I, Duduzile Mirriam Kabini, declare that the dissertation titled:

**THE IMPACT OF THE AGRICULTURAL SECTOR ON ECONOMIC GROWTH AND
DEVELOPMENT IN SOUTH AFRICA**

is my own work, except where otherwise declared as a fact and acknowledged. It is submitted for the Master of Commerce degree in Economics at the North West University, Vandebijlpark. This dissertation has not, either in whole or to some extent, been submitted to earn a degree or diploma to any other university.

Duduzile Mirriam Kabini

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ABSTRACT

Economically, countries are funded by three economic sector structures nobably primary, secondary and tertiary economic sectors. The economy of South Africa also depends on these three sector performances for its growth and development. Economies of most developing countries are mostly reliant on the agricultural sector for industrialisation,for which there is evidence that even the current industrialised economies transformed through the agricultural sector. However, South Africa depended on the agricultural, mining and manufacturing sectors for transformation because ofthe consistent low performance of the agricultural sector. Though these sectors are still playing a significant role in economic growth and development in South Africa, the country facesa highunemployment rate, stagnating growth and low living standards. Growth in the primary sectors is impacted negatively by domestic and global constraints. Besidethe highunemployment rate, the said constraints include but are unlimited to global competition, limited supply of energy, volatile exchange rate, output reduction, deteriorating terms of trade, the impact of the 2008 global financial crisis, imbalance imports and exports, which all have adverse effects on the South African economy. However, since the early 2000s, the Presidency (2001) lamented that successful development in South Africa is dependent upon an agriculture-led growth strategy and direct policies at agricultural growth facilitation. Nonetheless, all strategies employed to induce agricultural productivity in South Africa proved futile.

Consequently, this study was commissioned to analyse the impact of the agricultural sector on economic growth and development in South Africa. The following empirical objectives were set to support the primary objectives of the study: (i) to determine the long-run impact of the agricultural employment, agricultural exports and agricultural output (GVA) on economic growth and development in South Africa; (ii) to determine the short-run impact of agricultural employment, agricultural exports and agricultural output (GVA) on economic growth and development in South Africa; (iii) to analyse the causal effects between agricultural employment, agricultural exports agricultural output (GVA) and economic growth and development in South Africa; (iv) to formulate recommendations for improved growth and development pertaining to the agricultural sector, economic growth and development in South Africa. Secondary annual time-series from 1994 to 2019 data used in the study were acquired from the South African Reserve Bank (SARB), the World Bank's world development indicators (WDI) and Quantec Easy Data. The data wereanalysed using different statistical and econometric approaches comprising descriptive statistics, Pearson correlation, unit root and stationarity tests using the autoregressive distributed lag (ARDL) model, error correction model (ECM) and the Toda-Yamamoto causality tests.

The study findings suggest the existence of a long-run relationship between dependent and independent variables. In order words, economic growth and development will respond positively to improvement in agricultural performance in South Africa. Improving agricultural productivity and agricultural GVA will improve both the contribution of agricultural employment and agricultural exports towards economic

growth and economic development as well as enhance the living standards in South Africa. Agricultural exports were found to be contributing less to economic growth in South Africa. Due to the low agricultural productivity and thus failure by the agricultural sector to satisfy domestic consumption, large quantities of food imports into South Africa reduce agricultural export objective to the attainment of positive trade balance only. Should the government improve agricultural policies and adopt export-oriented policies, increased exports will impact positively not to economic growth and development only, but on agricultural employment too. In addition, the long-run negative impact of agricultural employment on per capita GDP as indicated by empirical results of the study requires the adoption of productivity-enhancing technologies, which when coupled with agricultural employment, will increase agricultural productivity and contribute to employment creation in the sector. The impact of agricultural performance in the short-run is limited since changes that occur in the South African agricultural sector in the short-run do not have an impact on economic growth. However, short-run changes in chosen variables do have a positive impact on economic development. This means that inclusive and sustainable agricultural policies together with effective strategies are required to support the sector and induce economic growth and development in the short-run.

Keywords: Agricultural sector; agriculture; economic development; economic growth; ARDL model; South Africa's agricultural sector; South Africa

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CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Agriculture is a foundation of growth for national economies, a poverty reduction tool, a unique source of livelihoods and a development instrument (World Bank, 2007:2). Increased agricultural sector's output provided the initial industrial surge in some European Union countries, Canada, the United States of America and Japan and (USA) during the Industrial revolution (Rostow, 1990:7). Consequently, the agricultural revolution led to the industrial revolution, which started in England during the 18th century to Japan during the 19th century (Clark, 2002:42). The agricultural sector is not only significant in developed countries. In Africa, the agricultural sector is the backbone of economies and approximately 70 percent of the rural populace for poverty alleviation, food security, economic growth and development are dependent on the agricultural sector (Omorogiuwa, Zivkovic & Ademoh, 2014:134). Additionally, the agricultural sector contributes 32 percent to economic growth, provides 65 percent agricultural employment and remains the source of rural livelihood (Musvoto, Nortje, De Wet, Mahumani & Nahman, 2015:1).

However, for some scholars, the agricultural sector is linked to poverty, inequality and low standards of living (Castañeda, Doan, Newhouse, Nguyen, Uematsu, & Azevedo, 2018:1; Abubakar, Abubakar, Ibrahim & Kolo, 2018:63). Similarly, the study carried out by Mphuka, Kaonga and Tembo (2017:35) in Zambia, confirmed that most of the individuals employed in the agricultural sector live below \$1.90 a day. Accordingly, the study carried out by Diao, Dorosh, Kedir Jemal, Kennedy and Thurlow (2019:38) revealed that a services-led transformation delivers a modest economic growth rate as compared to the agricultural sector-led transformation. These debates are further fuelled by the proponents of the economic growth theory who advocate for increased agricultural productivity (Schultz 1978; Lewis 1954). In the economic growth theory, Lewis (1954:139) demonstrated how productivity increase will cause the outflow of labour from low productive areas into the highly productive non-agricultural sector without impacting negatively on the agricultural sector. This process, according to Rostow (1960:8), is a kick-start of the take-off stage towards rapid industrialisation.

The agricultural sector in South Africa is one of the biggest sectors of the economy (Greyling (2012:7). Despite its insignificant and declining contribution to national GDP at 2.4 percent during 2015/16, the agricultural sector remains significant for its contribution to employment (5.5% during 2015/16), food security and capacity to absorb the expanding unskilled and semi-skilled workforce (Greyling, 2012:12; Sihlobo & Nel, 2016:68). Venter (2017:6) asserts that rather than it being the leader, the agricultural sector has always played the balancing role in the country's trade balance. In addition, the agricultural sector is a key natural resources management stakeholder of 80 percent land surface and approximately 63 percent freshwater used for irrigation (Venter, 2017:6). Furthermore, the contribution made to the local economies

is significantly higher as evidenced by the 25 percent contributed to the Greater Sekhukhune district in the Limpopo Province during 2012 (Musvoto *et al.*, 2015:1).

Nonetheless, Samans, Blanke, Corrigan and Drzeniek Hanouz (2017:1) observed the complexities of modern economies as accompanied by declining global growth, trade and the reversing relationships between global trade growth and GDP from post-war trends of faster growth rates. Furthermore, Samans *et al.*, (2017:2) agree with economic growth theorists that labour productivity growth, technological advancement, human capital investments and growth-oriented macroeconomic policies, are essential for sustainable economic growth and development. Therefore, in its quest for economic growth and development, the South African government adopted the green economic growth principles citing the potential of the agricultural sector to create employment and safeguard the environment as guaranteed, provided the land reform process succeeds (Musvoto *et al.*, 2015:2).

Based on these debates and contestations, this research is commissioned to analyse the impact of the agricultural sector on economic growth and development in South Africa to identify policy gaps and better understand the relationship between the sector and its overall developmental impact. The outcome of the study will not only add to the body of knowledge but will possibly enhance the comprehension of future policymakers and also contribute to available literature with regards to the matter under discussion.

1.2 PROBLEM STATEMENT

Little did the South African populace know that the newly attained democracy in 1994 was the dawn of unending economic and social transformation struggle (Luiz, 2007:8). The objective of achieving a better life for all culminated in poverty, widening the inequality gap, low levels of economic growth and development (World Bank, 2018:112). According to Chipeta (2016:1), world economies including South Africa, are confronted with the challenge to create sustainable and effective solutions to reducing social inequality, eradicating poverty, employment creation and improving the standards of living. According to Feldman (2016:17) and Lane (1994:221), for democratic governments the ultimate benchmark of economic development are higher quality of life and prosperity. While economic development is a vehicle to realise the high quality of life and prosperity, it is also an obvious strategy to address the microeconomic challenges towards improved standards of living (Walsh & Van Rooyen, 2015:134).

Stiglitz (2016:3) puts forward that 35 percent of the wealth in the USA is in the hands of one percent of Americans. While Lechman (2014:2) opines that approximately 20 percent of the world's population enjoys a standard of living considered acceptable. This needs government intervention with regards to macroeconomic policies essential in the maintenance of full employment and economic stability since individuals who are in the middle or the end of the income distribution channel are hard hit by severe unemployment (Stiglitz, 2016:13). South Africa encountered years of slow economic progress between 2010 and 2014 where the economy grew by 2.4 percent on average compared with 3.6 per cent growth rate

enjoyed between 1989 and 2009 while there was a further decline of 1.3 percent during 2015 (Sihlobo & 2016:66). During 2015, agricultural productivity recorded a worse decline in two decades, valued at 8.4 percent (World Bank, 2017:4).

Since South Africa is plagued by high inequality and thus, weak aggregate demand, higher technology, education and infrastructure investment in the agriculture sector may be needed to stimulate demand, reduce the inequality gap and resuscitate economic development and growth (Stiglitz, 2016:13). For South Africa, in particular, the agricultural sector may be holding special relevance as the country is embattled with high poverty, unemployment and inequality, therefore, lack of economic development and growth. It is based on these debates and contestations that the study seeks to analyse the impact of the agricultural sector on economic growth and development within the context of South Africa to add to a somewhat limited body of knowledge on the significance of the agricultural sector in the contemporary economic environment.

1.3 RESEARCH OBJECTIVES

The following objectives were formulated for the study:

1.3.1 Primary objective

The primary objective of this study is to analyse the impact of the agricultural sector on economic growth and development in South Africa.

1.3.2 Theoretical objectives

For the study to achieve its primary objective, various theoretical objectives are pursued to:

- Provide definitions of key concepts relating to economic growth and economic development;
- Review agricultural, economic growth and development theories and theoretical relationships among variables;
- Analyse global, regional and local agricultural trends and performance;
- Review agricultural performance policies in South Africa.

1.3.3 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives are formulated to:

- Determine the long-run impact of agricultural employment, agricultural exports and agricultural output (GVA) on economic growth and development in South Africa;
- Determine the short-run impact of agricultural employment, agricultural exports and agricultural (GVA) on economic growth and development in South Africa;

- Analyse the causal effects between agricultural employment, agricultural exports agricultural (GVA) and economic growth and development in South Africa;
- Formulate recommendations for improved growth and development pertaining to the agricultural sector, economic growth and development in South Africa.

1.4 RESEARCH DESIGN AND METHODOLOGY

The functionalist paradigm which follows a quantitative research approach is the methodology this study will follow. It will include both literature and an empirical study.

1.4.1 Literature review

The theoretical background of the study will focus on the agricultural sector and economic development. Secondary sources which are journals, government reports, academic articles, books, internet sources and documents including thesis will be used as an anchor for the study. Moreover, a variety of local and international studies, together with various public policies, will also be used to determine the theoretical base of the study.

1.4.2 Empirical study

The empirical portion of this study comprised the following methodological dimensions:

1.4.2.1 Data sources

The study follows a quantitative approach based on a dataset of 25 annual observations starting from 1994 to 2019. The variables under consideration include agricultural employment, agricultural GVA, agricultural exports, GDP per capita (all estimated at constant prices) and a composite economic development index. The data is derived from the South African Reserve Bank (SARB) and the Quantec database. Only data post-1994 will be considered. This is done to avoid any distortions or variability in the data set that might be because of economic embargos that were placed on the country during the apartheid regime.

1.4.2.2 Econometric methods of analysis

The study will be based on secondary time series data. An econometric analysis will be conducted involving the use of descriptive statistics of the set variables, correlations analysis as well as the long-run relationships by employing the autoregressive distributed lag (ARDL) bounds test to co-integration. Besides this, the error correction model will be employed to estimate the short-run relationships. Finally, to test the causal effects, the Toda-Yamamoto Granger non-causality test will be used.

1.4.2.3 Models of the study indicating all variables

Based on the aforementioned and to achieve the empirical objectives of the study, the following models will be utilised:

$$\text{LPGDP} = f(\text{LAGEMP}, \text{LAGVA}, \text{LAGEXP}, \text{LCPI}) \dots \dots \dots (1.1)$$

$$\text{LEDI} = f(\text{LAGEMP}, \text{LAGVA}, \text{LAGEXP}, \text{CPI}) \dots \dots \dots (1.2)$$

Where: LPGDP is the natural logarithm of the real per capita income, the LAGEMP is the natural logarithm of the level of agricultural employment; LAGVA is the natural logarithm of agricultural gross value added (output); LAGEXP is the natural logarithm of agricultural exports. The LEDI refers to the natural logarithm of the economic development index, which was adapted from Meyer, de Jongh and Meyer (2016:101) and Meyer and de Jongh (2018:98). The index consists of three constituent variables that include the human development index (HDI), percentage of the population above the upper bound poverty line and the employment rate. All variables are equally weighted, with the index score ranging from 0 (low development) to 100 (high development).

1.5 ETHICAL CONSIDERATIONS

The study is quantitative and uses econometrics to analyse data. However, any confidentiality of the information accessed as a result of the study shall be protected. To ensure objectivity and the integrity of the study as well as adhering to the prescripts towards society, professionalism, the particular field of the subject and the environment, ethical standards of academic research as required by the North West University will be strictly complied with. Even though the information used is in the public domain, ethical clearance was obtained from the North West University by the Economic and Management Sciences research ethics committee (EMS-REC) with an ethical clearance number: NWU-0106-19A4 confirming that the proposed study is of minimal risk.

1.6 THE SIGNIFICANCE OF THE STUDY

South Africa is both an open economy and a developing country. Whilst it has the potential to be amongst the leading emerging economies in the world, the last decade has seen the country confronted with stagnating growth, a low standard of living and various structural problems that have contributed to large scale inequality and unemployment. Therefore, it is critical to continuously acquire knowledge on how best to address these challenges towards improving the quality of life of the country's population. This study specifically focuses on the agricultural sector and its underlining potential to act as a catalyst in addressing poverty and stimulating job creation (Mustafa-Topxhiu & Xhelili-Krasniqi, 2016:18). Whilst these sectors, throughout history, have proven to be pivotal in providing stable economic and social conditions, much of their relevance in a connected and globalised society has more recently come to be questioned. In fact,

over the last decade, contemporary foci have been ushered towards the creation of tertiary skills and the establishment of innovative services sectors that can consequently facilitate the transition into the fourth industrial revolution. Notwithstanding the importance of these contributions, the emphasis on these measures and their associated responses have spurred various theoretical debates. This has specifically surrounded the importance and position of primary, secondary and tertiary sectors in a modernised global economy and how these activities should be proliferated when the unique intricacies of countries and their respective development needs are taken into account.

Based on the aforementioned, the study seeks to analyse the link between the performance in the agricultural sector and economic growth and development in South Africa. In doing so, it aims to add to the underlining knowledge on the relevance of agricultural activity, especially within a globalised developing context. The importance of the findings and their potential to influence various strategies on both national and regional levels henceforth, cannot be ignored. Based on the holistic nature of the inquiry as well as the added policy recommendations that will be made, the study will possibly act as a reference point that can contribute towards assisting economic authorities, policymakers and key stakeholders in directing the needed support to better position the agricultural sector in addressing the scourge of poverty, inequality and low living standards in the country.

1.7 CHAPTER CLASSIFICATION

Chapter 1: Introduction and background

This chapter will provide a brief outline of what the study entails with the inclusion of the objectives the study seeks to achieve, namely; problem statement, contribution and scope of the study.

Chapter 2: Review of theory and empirical literature

This chapter will review the theory and literature relevant in addressing the concerns of the study. It details and analyses theoretic prepositions on the impact, relationship and empirical findings of the agricultural sector on economic growth development in South Africa.

Chapter 3: Empirical review of variable trends and performance

This chapter will conduct a trend, historic performance and policy analysis interrelated to the agricultural sector, economic growth and development from a global, regional (Sub-Saharan Africa) and local (South Africa) perspective as per set objectives. In analysing the impact of the agricultural sector, agricultural employment, agricultural export and output (GVA) variables were estimated to present a measure of the country's agricultural sector.

Chapter 4: Research design and methodology

This chapter will explain the sample period, data collection and different models used in the study to achieve the empirical objectives of the study. The unit root test is the first step to test and analyse the data and its results are obtained by employing the Augmented Dicky Fuller approach.

Chapter 5: Results and findings

This chapter will present the analysis and interpretation of results. More specifically, it will show the results relating to the models, which will be employed in achieving the study's empirical objectives.

Chapter 6: Conclusion and recommendation

This chapter will provide a summary of the study, conclusions on the findings and list all the recommendations for policy improvement and contribution to the body of knowledge, ideas and proposals for future research.

CHAPTER 2

THEORETICAL LITERATURE REVIEW

2.1 INTRODUCTION

The Nobel Prize Laureate, Theodore W. Schultz (1979), in his opening speech, lamented that researchers, economists and policymakers would realise that the mastery of the economics of being poor is the mastery of the economics of agriculture where poverty and agriculture are amongst the variables that matter most to the economy (Schultz, 1980:639). He further paired agriculture and food as key languages in every community since food is a symbol of a basic need while agriculture is the source of food (Schultz, 1978:12). Similarly, Gaur (2018:9), Walsh and Van Rooyen (2015:134) and Timmer (2014:11) paired agriculture with economic development as obvious and critical strategies to address poverty, inequality and unemployment towards improved standards of living. In contrast, Mphuka, Kaonga and Tembo (2017:35) put forward that most households engaged in agriculture are the poorest, much contrary to those individuals who participate in the mining, manufacturing and construction sectors.

The reality is that democratic governments in the world are faced with a critical challenge of delivering sustainable and effective solutions to address catastrophic microeconomic challenges such as poor medical care, poverty, food insecurity, income and unemployment (Chipeta, 2015:1). Most emerging economies in southern Asia, Latin America, China and sub-Saharan Africa are poor due to low levels of life expectancy (Gill & Karakulah, 2019:10). Fortunately, agricultural growth and development economists have long been preoccupied with how best the agricultural sector can contribute to inclusive economic growth, development, and industrialisation (Pingali, 2007:1). This interest was sparked by unequal levels of development and different quality of life across the globe where only 20 percent of the world's population live a standard of life they view as acceptable (Lechman, 2014:2). While, in South Africa, 55.5 percent of the population live below R992 per month (Sulla & Zikhali, 2018:7), a phenomenon Izvorski, Coulibaly and Doumbia (2018:1) blame on lack of economic growth and development.

Amid the debates concerning the contribution of the agricultural sector in economic growth and development, there are significant qualifications that prove that the agricultural sector impacts positively on both rural non-farm and wider economic growth through its forward and backwards linkages with other sectors (Meijerink & Roza, 2007:21). According to Chikwama (2014:5), the impact varies depending on the resource endowment, geography and the level of economic development of a country. Through increased agricultural sector productivity, increased demand for goods and services is stimulated in the transport and oil sectors, which backwardly link to the agricultural sector (Subramaniam, 2010:30). Similarly, the agricultural sector is forwardly linked to the food processing sector in such a way that an increase in the agricultural GVA stimulates growth in the downstream industries and also stimulates their growth by surpassing the supply constraints to those sectors (Chikwama, 2014:8).

The agricultural backward linkages are the strongest for economic growth (Vogel, 1994:144). When structural transformation of the agricultural sector takes place, reallocation of resources and activities is initiated across the manufacturing, services and agricultural sectors, resulting in economic growth and modernisation (Chikwama, 2014:19). The value-added shares of employment in the total workforce and of consumption expenditure measure the impact of the transformation process, hence, both the agricultural value added and the agricultural employment shares decrease with GDP per capita increase (Herrendorf, Rogerson&Valentinyi, 2014:7).

The agricultural sector has a higher poverty reduction effect than any other sector when the poor are allowed to participate through the inclusive development policies that in turn, improve human capital and employment opportunities (Christiaensen, Demery& Kuhl, 2006:30; Škare& Družeta, 2016:157). However, the GDP per capita increase has similar effects on poverty as it has on consumption expenditure and employment shares in that the more the economy grows and countries develop, the weaker the industrial links become and the less effective the poverty-reducing effect of the agricultural sector becomes (Subramaniam, 2010:30). At this stage, the science-based technology adoption is necessary to rapidly transform traditional agriculture into the modern agricultural sector (Herrendorf, Rogerson& Valentinyi, 2014:7).

This study aims to analyse the impact of the agricultural sector on economic growth and development in South Africa. In particular, this chapter reviews theories and literature specific to the concerns of the study. It responds to the first two objectives of the study, which are:

- To provide definitions and concepts relating to agricultural employment, agricultural output (GVA) agricultural exports and economic growth and development;
- To discuss economic theories relating to the relationships between the agricultural sector and economic growth and development.

The rest of the chapter is divided as follows: Section 2.1 introduces the background and the concepts of the study and Section 2.2 provides definitions of agriculture and economic growth and development concepts. Section 2.3 reviews theories of agriculture and economic growth and development. Thereafter, the empirical relationships between agriculture, economic growth and development are reviewed in Section 2.4 while Section 2.5 summarises the entire chapter.

2.2 CONCEPT DEFINITIONS

2.2.1 Economic growth and economic development

The growth theory is echoed in both economic growth and economic development concepts (Costanza, Hart, Talberth& Posner, 2009:18; Nübler, 1995:172) hence, the complexity of defining economic development without referring to economic growth (Haller, 2012:69). Since the Smithian era, the focus of

economists and policymakers has been on the gap in living standards between the developed and the developing economies (Pingali, 2007:1) which is a result of unequal distribution of income and wealth between countries and socio-economic groups (Škare & Družeta, 2016:157). While, GDP represents the total value of goods and services produced in the country at specified time parameters of a quarter or a year (Costanza *et al.*, 2009:3), economic development broadens the populations' choices in terms of creative, long and healthy lives and ensures that the environment they are in is enabling (Raheja, 2015:638). Again, GDP is concerned with quantities, changes in results and size that are the quantitative side of economic activity while well-being is about development and qualitative transformation of the economy and the society, which is a higher step of macro-economic evolution, qualitatively (Haller, 2012:68).

Most economists concur that the GDP is flawed as a measure of welfare because of its failure to cover all significant factors affecting the living standards (Jones & Klenow, 2016:2426). Soil degradation and deforestation are as a result of GDP centric policies, which increase GDP but harm the environments in which the society lives (Chartres & Noble 2015:139) as opposed to increasing welfare (Everett, Ishwaran, Ansaloni & Rubin, 2010:13). Similarly, increased crime statistics raise the GDP due to increased spending on the security systems but cannot raise the living standards (Costanza, Kubiszewski, Giovannini, Lovins, McGlade, Pickett, Ragnarsdóttir, Roberts, De Vogli & Wilkinson, 2014:284).

The GDP assesses economic prosperity and performance instead of the income distribution, quality of life, education, health or personal safety, because of which, the global well-being continues to fall short of targeted levels (Alston *et al.*, 2014:143). The GDP treats several economic activities and natural resources as free thereby, understating the true costs of economic activity (Islam & Clarke, 2002: 208). As a result, many developing countries are poorer than their GDP per capita incomes because of a combination of extreme inequality and shorter lives (Jones & Klenow, 2010:3). Economic development, on the other hand, is inclusive of economic growth and its distribution mechanism (Lucas, 1988:13). It is progress towards poverty reduction, employment provision, inequality reduction and the human rights guarantee (Abuiyada, 2018:120). Hence, Omvedt (1994:169) defines economic development as rising in the living standards caused by the transformation from agricultural to an industrial society where the agricultural sector provides consumer goods, capital equipment and raw materials needed.

It is the quantitative and the qualitative aspects of economic growth that are the key focus of economic development (Aliyu, 2019:105). At its best, economic development is about increasing incomes, delivering better health care, education, protection, food, shelter and increasing, improving, distributing and also extending all the socio-economic choices accessible to populations (Amin, 2010:2). In a nutshell, economic growth is more of a percentage increase in real GDP than in per capita terms (International Monetary Fund (IMF), 2012:20). Economic development is a multidimensional process concerned with the improvement of the quality of lives and the capabilities of the populations through the raising of the living standards, self-esteem and freedom (Dutta, 2018). Notwithstanding all the debates and criticism, GDP remains a critical

indicator and a significant prosperity measure across the globe (Coyle, 2015:557) since it enables policymakers to analyse, compare and link GDP per capita ratios of various countries for lack of an alternative measure (Bos, 1995:6; Kiogora, 2014:8).

2.2.2 The agricultural sector

The agricultural sector is an enterprise through which natural ecosystems are processed into fibre, food and fuel production (Learner, 2017:1). In broad terms, agriculture is the science and art of soil cultivation, farming, life stock rearing, gathering of crops, husbandry, tillage and a landscape-scale food production process (Harris& Fuller, 2014:105). In terms of what it does, agriculture supplies food for survival, growth and health for both humans and animals (Spielmaker& Leising, 2013:6). Besides the agricultural sector being the mainstay of many economies, it is a factor and very fundamental to the development process (Ahmed, 1993:2). It contributes indirectly to economic growth through the provision of better caloric nutrient intake by the poor, food price stability, food availability and poverty reduction (Timmer, 1995:469). The agricultural sector operates in the agriculture-based, transforming and urbanised worlds where different agriculture-for-development agendas are set in pursuit of sustainable growth and poverty reduction (World Bank, 2007:1).

2.2.2.1 The agricultural sector and its sub-sectors

The agricultural sector is a sub-sector of the infrastructure, social and productive sectors that are the three key sectors of the economy (Post Disaster Needs Assessments (PDNA), 2014:8). Farmers practise either subsistence, semi-subsistence (semi-commercial) or commercial agriculture (Abele& Frohberg, 2004:108). Subsistence farming is a farming activity whereby less than 50 percent of output is sold (Fredriksson, Davidova& Gorton, 2010:4) and is about crop production and livestock rearing mainly for personal consumption (Todaro, 1997:722).

On the other hand, the commercial or industrial agricultural sector is expressed as both an increase in marketable surplus and profit maximisation (Pingali, 1997:628). It is dominant in developing countries due to its direct links to development where farming households use the derived income for leisure, health and education (Truong, 2009:31). In contrast, environmental harm through land degradation, pesticides and over usage of fertiliser is blamed on commercial farming due to its intensive use of machines and breeds, which are high-yielding varieties (Pretty, 2018:1). Anything between commercial and subsistence agriculture is either semi-subsistence or semi-commercial (PDNA, 2014:8). The agricultural sector's structures are highly complex since they are further divided into sub-sectors as listed and defined in Table 2.1.

Table 2.1: Agricultural sector's prime sub-sectors

Agricultural sub-sectors	Definitions	Classification	Links to other economic sectors and sub-sectors
Farming	Raising livestock and growing crops (PDNA, 2014:84).	Primary sector with complex structures (PDNA, 2014:118).	Livestock is a source of proteins for human diets, income, foreign exchange, organic fertilizer for crop production and transport means (Upton, 2004:ii).
Fisheries and Aquaculture (including capture fisheries)	Farming of aquatic organisms such as molluscs, crustaceans, fish and aquatic plants (White, O'Neill, & Tzankova, 2004:5).	Primary and secondary sectors (FAO, 2018).	Coastal and marine tourism, mining, shipping, energy (Lahsen, & Cheryl, 2015:1).
Forestry	Management and use of the forest products (Holmgren, 2007:2)..	Primary and secondary sectors (Cheboiwo, Mutta, Kiprop, & Gattama, 2018:52).	Manufacturing, tourism and recreation, reindeer husbandry, agroforestry, printing and reproduction (Mauser, 2018:52).
Agro-Industry	Significant connection between the agricultural and the manufacturing sectors (PDNA, 2014:8).	Secondary sector (PDNA, 2014:118).	Beverages, food processing, horticulture, aquaculture, medicinal, aromatics and flavourants (PDNA, 2014:118).

Source: Own compilation

The prime sub-sectors are operated through the farming systems with examples as listed below:

- *Specialised farming*

It is a type of farming where few farming enterprises are run using acquired special knowledge and over 50 percent of its income is generated from a single enterprise (Czyżewski & Smędzik-Ambroży, 2015). It is mostly linked to commercial farming and the impact it has on the environment in terms of its contribution to biodiversity loss, climate change, soil erosion, air and water pollution (Killebrew & Wolff, 2010:7; Soussana & Lemaire, 2014:6).

- *Mixed crop-livestock farming*

Mixed crop-livestock farming is a system where both crops and livestock activities are practised (Havet, Coquil, Fiorelli, Gibon, Martel, Roche, Ryschawy, Schaller & Dedieu, 2014:120; Ryschawy, Joannon & Gibon, 2014:346). This type is mainly linked to subsistence farming and associated with traditional farming systems, which sustain year-round yields where agrochemicals are not used and biodiversity is promoted (Altieri, Nicholls & Montalba, 2017:1). The innovation process advances ecologisation of agriculture towards sustainable farming (Audouin, Bergez & Therond, 2019:3). Mixed crop-livestock farming divides into four farming systems as listed in Table 2.2.

Table 2.2: Mixed crop-livestock farming systems

Mixed crop-livestock farming (agro pastoralism)			
Pastoralism	Horticulture	Arboriculture	Vegeculture
Animals are raised as a pack and riding animals, providing food, fertiliser, hides bones and other products.	The structural and floristic diversity of the plant, enhancing its capacity to provide different edible, medicinal, fibres, dyes, flowers, containers and other construction materials	Focuses on the cultivation of fruit, nuts, seed and shrub trees. Also on leaves, thatch, fibre and construction wood.	Starch-rich root, tuber, rhizomes and corms crop production. Reproduction mainly from stems or sprout cutting rather than from seeds.

Source: Own compilation from Harris and Fuller (2014:111)

2.2.3 Agricultural performance

Agricultural productivity and agricultural efficiency are measures used to measure agricultural performance (Aye, Gupta, & Wanke, 2018:7). Agricultural productivity has two main components that are the type and the quality of inputs (technology) and how well these inputs combine in the production process (technical efficiency) (Mapula, Sandile & Du Toit, 2011:4). Raising agricultural productivity of smallholders to replicate the Asian green revolution is a prominent entry point in economic development (Gassner *et al.*, 2019:313). Hence, suggestions to facilitate transformation through beneficiation for quality and competitiveness by developing countries where, for example, the exportation of textile should be prioritised above that of cotton (Faridi, 2012:143).

While the promotion of agricultural productivity is the key focus of agricultural policies, it is equally important to improve agricultural efficiency because of the scarcity of land and water, including pursuance of minimal environmental footprint regarding the agricultural production (Cachia, 2018:8; Vlontzos & Pardalos, 2017:156). The agricultural growth accounts enable policymakers to determine the extent to which attention should be placed on mobilisation and composition of production factors towards productivity improvement (Jorgenson, 1961:312).

The agricultural sector performance is the key to economic growth and development, seeing that agricultural growth contributes directly to poverty reduction and food security (Wik, Pingali, & Brocai, 2008:2). Even though income and population growth increase resulted in triple demand for the global agricultural products since the early 1960s, increasing demand had always been successfully met as attested to by the long-term real commodity price decline and the steady growth in agricultural output (FAO, 2018:19). Therefore, the agricultural sector performance is measured to gauge how the agricultural economy is performing, its contribution to economic growth and to identify primary agricultural sector growth drivers (Shumway, Fraumeni, Fulginiti, Samuels & Stefanou, 2015:6).

2.2.4 Agricultural employment

Agricultural employment is the share of all people employed in the agricultural sector over total employment in the country (DAFF, 2010:6; Greyling, 2012:53). Labour force participation in the agricultural sector is also an important variable to determine agricultural sector performance whereby both the increase in agricultural sector production and the agricultural sector income improve the living standard of labours and boosts up economic growth (Liu, 2015:20). Employment intensity of growth in the agricultural sector is a measure used to quantify the effect of agricultural employment on levels of employment in the non-agricultural sector (Pleic& Berry, 2009:6.).

However, the employment contribution from the agricultural sector is distorted with only direct agricultural employment figures recorded at one percent whereas the correct figure is 13 percent (Blandford, 2011:9). According to Rao (2012:1), the contribution of agricultural employment is complex and highly context-dependent. Rao (2012:1) further advised that the contribution of agricultural employment varies based on the type of produce e.g., fruits and vegetables versus cereals and the structure of the business as in small landowner versus larger agribusiness. In agreement with Blandford (2011:9), Rao (2012:1) and van Arendonk (2015:7) provided the information in Table 2.3, which captures the contribution of agricultural employment and agricultural value added to both to the economy of countries and the agribusiness.

Altieri (2018:67) cites China as a good example of an economy in which only the agricultural sector employs both unskilled and skilled workforce, lifting out of poverty and feeding 1.3 populations as well as engaging in agricultural produce export. According to FAO (2018:19), poverty reduction cannot be achieved without an increase in both agricultural employment and agricultural income. Increased agricultural output causes labour to move from the low productive agricultural sector into the highly productive non-agricultural sector and accelerates industrialisation (Lewis, 1954:139).

According to Mabaya, Tihanyi&Karaan (2011:11), the agricultural sector has the potential to create direct and indirect employment with 2 more jobs generated by equivalent investment in the manufacturing sector where 90 percent of the country's top employment generators are in agri-business. Agricultural productivity growth influences rural wage rates and the supply side of the rural non-farm economy through the labour market (Haggblade& Hazell, 1989:360).

The agricultural sector in Brazil has been a net generator of employment, importing rather than exporting jobs to other sectors (Arias, Vieira, Contini, Farinelli& Morris, 2017:2) while in South Africa, the agricultural sector is more labour-intensive than other sectors employing around 700 000 workers (Tshuma, 2012:4000) and continue to employ the rural and less skilled workforce (Greyling, 2012:56). In contrast, Wiggings, Deshingkar, Prowse and Vigneri (2007:6) claim that agricultural employment growth is neither as sustainable nor as poverty reducing as the growth from the large agribusinesses. Similarly, existing research suggests that the growth of agricultural sectors in the middle-and-low-income

countries, including fragile and conflict affected states, does not necessarily lead to increased employment (Herrendorf, Rogerson, & Valentinyi, 2014:862). Nonetheless, the agriculture sector continues to impact employment and livelihood opportunities in agri-food systems and the broader non-farm sectors due to its more workers absorptive capacity (Jayne, Yeboah & Henry, 2017:6).

Table 2.3: Agricultural sector contribution to employment, GDP and to the agribusiness

Stage of development	Agricultural employment	Agricultural GVA (Contribution to GDP)	Agricultural GVA (contribution to agribusiness)
Agricultural based economy	50 percent of labour force	25 percent GDP	56 cents
Pre-transition economy	50 percent	Between 10 and 25 percent	87 cents
Transition economy	Between 25 and 50 percent	Between 10 and 25 percent	1.6 dollars
Industrialising economy	Between 10 and 25 percent	Between 10 and 25 percent	1.6 dollars
Developed economy	Less than 10 percent	Less than 10 percent	1.90 dollars

Source: Author’s compilation from van Arendonk (2015)

2.2.5 Agricultural gross value added (GVA)

According to Pacinabao (2019:4), the GVA is an economic productivity metric measuring the contribution of a corporate subsidiary, company or municipality to an economy, producer, sector or region. Pacinabao (2019:4) further explained that the GVA provides a dollar value amount of goods and services produced in a country minus all input and raw materials cost directly because of the production. Value added estimates are differences between gross output and intermediate inputs and are used to compute productivity (Cassing, 1996:195). The net value added at factor cost, which is gross value added adjusted for the consumption of fixed capital, subsidies and taxes on production is a measure of the profitability of agricultural industries and compares with those of the other industries (Da Silva, Utvik & Colantonio, 2018:74).

The value added based estimates, therefore, measure the net revenue generated by the primary factors of production (land labour and capital) (Cristina, 1998:73). Thus, the GVA adjusts the GDP with the impact of subsidies and taxes (tariffs) on products and the formula: $GVA = GDP + SP - TP$ where: SP = Subsidies on products and TP = Taxes on products GVA is used. Hence, value added estimates for all industries are generally produced consistently within a country’s system of national accounts (Cai, Huang & Leung, 2019:9) for reasons stated earlier by Da Silva, Utvik and Colantonio (2018:74). In addition, the value added

elasticity indicates the extent to which productivity or employment drives growth in the sector (Wiggins *et al.*, 2007:2).

While the statistics indicates a slow global disappearance of agricultural GVA (Swinnen, Van Herck & Vandemoortele, 2012:2), through technical change, agricultural productivity is increased with the inclusion of agribusiness which remains the largest industry in absolute size even in the HICs (Timmer, 1988:291). The agribusiness seldom reaches a less than 20 percent decline in any economy, which means that the value added in the agribusiness GDP grows alongside the transformation process indicating the relative significance of agribusiness (table 2.3) (van Arendonk, 2015:7). Similar to agricultural employment, agricultural gross value added is recorded at less than one percent whereas the actual figure is 17 percent (Blandford, 2011:9).

2.2.6 Agricultural exports

Agricultural exports are the primary means through which the agricultural sector contributes to the capital formation during the early stages of economic growth to provide foreign exchange to pay for imports (Fox, Silos & Silos, 1967:132). Failure to increase agricultural exports volumes negatively affects the importation of machinery and capital goods for the development of industries and may force countries to incur heavy balance of payments deficits and therefore, serious foreign exchange challenges (Gilbert, Linyong & Divine, 2013:44). Income increase resulting from the agricultural exports increase also creates employment for the rural communities (Martin, 2018:5). The agricultural export plays an economic development, enabling role through foreign exchange reserves earning or a significant balancing role in economic growth through positive trade balance maintenance (Greyling, 2012:49).

According to Cervantes-Godoy and Dewbre (2010:4), when huge proportions of agricultural output including exports and public investment are absorbed by the industrial sector, they result in an external increase in demand for industrial goods. Hence, the key focus of the economic structural transformation process from the LMC to developed status has always been from agriculture-led to the industry and eventually to service-led status (Cervantes-Godoy & Dewbre, 2010:4). However, in contrast, Nguyen (2009:1) asserted that due to it being pruned to world economic shocks, the agricultural exports may push poor households operating in tradable agriculture into losses and ultimately into poverty arising from the unexpected decline in output prices. In support, Faridi (2012:143) claims that the non-agricultural exports and not the agricultural exports have a significant and positive influence on economic growth since economic growth declines with an increase in agricultural exports.

According to the IMF (1987:98), diversification of agricultural exports plays a hybrid role between price and non-price competitiveness where a wider variety of exports with good international market prospects averts international price swings and reduces a country's exposure to industry-specific external shocks. In addition, the Asian Tigers' success stories of the 70s have made export-led growth stand out as a reference

developmental strategy more so because 30 percent of Asia's exports remain the primary and processed agricultural commodities (Ngaruko, 2003:3).

According to Verter and Bečvářová (2016:691), agricultural export is a critical tool for employment creation and sustainable economic growth and development stimulation during the preparation for take-off. In addition, agricultural exports impact positively on economic development through the provision of savings and extra income, which would otherwise not exist in exporting economies (Ngaruko, 2003:3). Verter and Bečvářová (2014:208) advised that if not for trade restrictions and distortions, agricultural exports have the potential to accelerate a balanced growth in all countries of trade partners. Similarly, Ngaruko (2003:3) sees overtaxing of agricultural exports by developing countries as an impediment to economic development since it tends to thwart agricultural productivity and thus, inhibit agricultural structural transformation. On the other hand, over-reliance on agricultural imports is discouraged for its negative impact on economic growth (Verter & Bečvářová, 2016:697).

2.3 THEORETICAL REVIEW ON THE RELATIONSHIP BETWEEN AGRICULTURE, ECONOMIC GROWTH AND DEVELOPMENT

2.3.1 Agriculture and economic growth

The previous section addressed the definitions of the concepts of economic growth, economic development and agriculture together. This section unpacks the agricultural and economic growth theories, expanding on the relationship between agricultural activity and economic growth. The theories of economic growth continually seek to address the dynamic equilibrium challenges and to appropriately respond to the question as to which combination of available factors of production can produce sustainable growth in real GDP per capita (Sredojević, Cvetanović & Boskovic, 2016:178). Over time, macroeconomists have responded appropriately with rich literature to the growth theory across countries regarding the differences in standards of living. The traditional neoclassical growth theorists reasonably explained the Eastern Asian growth miracle to have resulted from the high growth rates in capital stock (Lui, 2007:42). In addition, the new growth theory models are instrumental in describing the collapse of conditional convergence in other cases. They advocate for the spillover and externalities effects of knowledge and human capital (Sredojević *et al.*, 2016:178).

2.3.1.1 The endogenous growth theory

Elimination of diminishing returns to factors of production is the key postulate of endogenous growth theory (Gabardo, Pereima & Einloft, 2017:37). The distinguishing feature from neoclassical models is that in endogenous growth models, economic growth does not result from external forces but from an endogenous outcome of an economic system (de la Torre, 2000:2). Lucas (1988), Romer (1994) and Mankiw (1990) are the proponents of the endogenous growth theory and their key objective was to determine public and

private sector choices causing a variation in residual growth across countries (Romer, 1994:3). The concerns have been the convergence controversy according to which neoclassical growth models link the long-term growth to the convergence implications (the state in which the economies of the poor countries grow rapidly and their level of per capita income catches up with the level of per capita income in rich countries (de la Torre, 2000:2; Nell& Thirlwall, 2017:3).

The challenge in the construction of an alternative to perfect competition in the aggregate-level theory was another concern (Romer, 1994:3). Endogenous growth models are, therefore, a direct response to the neoclassical or the Solow and the Harrod-Domar models shortcomings, specifically in recognising both savings and technological knowledge as exogenous factors (Joshua,2016:4).The endogenous growth models successfully estimated the lack of convergence (the poor and the rich countries maintain their economic status concerning the standards of living) (Barro& Sala-i-Martin, 1995:1).

The simple Cobb-Douglas formula validates the assumption:

$$Y = A(t)K^{1-\beta}L^\beta \dots\dots\dots (2.1)$$

- Where: Y = net national product
- K = stock of capital
- L = stock of labour, and
- A = level of technology

In the formula, technology (A) is a function of the time, which is an indicator of the neoclassical standard assumption that technology improves because of reasons that are outside the model (Romer, 1994:4).If a constant output savings (s) is saved annually where the investment (sY) is the capital stock growth rate, y = Y/L is the output per worker and k = K/L the capital per worker and (n) is the labour force growth rate. The formula estimates the variation between rich and poor countries.

$$\text{The economy is represented as follows: } \dot{y} = (1-\beta)\dot{k} + \dot{A} \dots\dots\dots (2.2)$$

$$= (1-\beta) [sA(t)(t)K^{1/(1-\beta)}y^{(-\beta)/(1-\beta)} - n] + \dot{A} \dots\dots\dots (2.3)$$

Convergence is tested using data from the rich and the poor countries; exponent β is a key parameter and an expression of labour (output) in the Cobb-Douglas where perfect competition characterises the economy and β is the share of total income used to compensate labour (Romer, 1994:3).The endogenous growth models assume that countries have equal access to technology and leave only capital to respond to the lack of convergence among countries (Lowell& Findlay, 2001:3). In contrast, Lowell and Findlay (2001:3) dispute the assumption of equal access to similar technology because if they were true, both human capital

migration to the developed countries and the receipt of higher wages than at previous workplaces would have been prevented.

Similarly, the reduction of β to the labour level insignificant to production and to the slowest diminishing returns to capital accumulation rate is a challenge (Bernanke & Gürkaynak, 2001:14). The Solow growth model estimated a capital share of factor income at around 0.60 higher than the conventional value of one-third based on the USA data. Hence, consensus was reached over the cross country no fit of one-third on capital and two-thirds on labour since the marginal product of investment in rich countries will always exceed the marginal product of investment in poor countries (Romer, 1994:10).

The Romer model is learning by doing and a knowledge spill-over model based on the Arrow (1962) model, which assumes that the link between investment and knowledge eliminates the diminishing returns to capital and thus, no diminishing returns to the production of human capital (Joshua, 2016:4). In essence, the model supports the neoclassical growth theory's assertions that the long-run steady state output growth results from the labour force and productivity growth rates and not from savings and investment (Barro & Sala-i-Martin, 1995:1; Mankiw *et al.*, 1992:423). Accordingly, productivity explains 80 percent of the cross-country income variation (Mankiw *et al.*, 1992:2).

The endogenous growth theory advocates for a significant investment in agriculture since low agricultural investment harms meeting the economic growth, food security, job creation and poverty reduction objectives (FAO & OECD, 2014:5). Technical progress is a recognised key factor in the agricultural sector growth stimulation (Haji-Rahimi, 2012:249) and technical efficiency increase is a strategy to enhance the living standards in the agricultural sector and the rural economy (Bojnec, Fertő, Jámor & Tóth, 2014:197). Again, higher equilibrium growth rates are linked to higher saving rates through the endogenous growth model assertion that investment in knowledge generates increased growth (Dornbusch *et al.*, 2011:79).

The endogenous growth models are criticised for their dependence on assumptions of the traditional neoclassical models, which are unviable for developing economies (Todaro & Smith, 2011:153). The single production and all symmetrical sectors assumption prohibit the reallocation of capital and labour within sectors transformed during the structural change process (Vollrath, 2009b:326). Imperfect capital and goods markets, inadequate institutional structures and poor infrastructure are often inefficiencies cited for inhibiting economic growth in the developing countries, which factors the endogenous growth theory fails to recognise as significant and restricting its appropriateness in the economic development study (Goulet, 2003:88).

Even though the internet transmits knowledge faster, it does not automatically accrue benefits to countries until innovative policies are designed (Archibugi & Pietrobelli, 2003:862). Hence, the conclusion that the LDCs suffer technological divide due to exclusion from technical progress benefits (Peña-López, 2001:1).

2.3.1.2 *Schumpeter's theory of economic growth*

The Schumpeterian theory is founded on a competitive market, private property and financial markets efficiency to support inventions mostly fashioned for economically developed and democratic countries (Feldman, Hadjimichael, Lanahan & Kemeny, 2016:8). Contrary to the classical economists' belief in the significance of capital accumulation driving economic growth, Schumpeter identified entrepreneur-innovation as the key that fuels economic growth (Aghion, Akcigit & Howitt, 2014:516). His theory centres on entrepreneurship and creative destruction where innovation is cited as the main factor influencing long-term growth (Schiliro, 2017:84).

The theory suggests that new inventions increase profits until the competitor copies the innovation thereby causing the profits to decrease (Piętak, 2014:50). In this case, the decrease in profits is an example of destruction, the cornerstone of capitalism and a process whereby the old technologies are continually pushed out by the emerging ones (Caballero & Hammour, 2001:2). Another good example is the current situation with the introduction of the fourth industrial revolution in Africa where the post- and neo-colonial Africa are being creatively destroyed to give way to the real new Africa that will work for its entire people (Maharajh, 2018). Entrepreneurship drives and feeds the creative destruction process, a process without which there is neither productivity nor economic growth (Wong, Ho & Autio, 2005:33). In return, innovation increased entrepreneurship is a critical component of value added creation where ideas are created by the inventor and are implemented by the entrepreneur (Mujuru, 2014:129). Entrepreneurship therefore accelerates the knowledge spillover process (Lafuente, Szerb & Acs, 2016:1273). Hence, the conclusion that total factor productivity (TFP) across countries is driven by entrepreneurship in a long run (Acs, Lafuente, Sanders & Szerb (2017:18).

Bartelsman, Haltiwanger and Scarpetta (2004:4) advised that economies that allow the process of creative destruction accelerate their productivity and prosperity through better product benefits, better jobs, shorter workweeks, more developed economies and higher standards of living. However, Schumpeter was severely criticised for ignoring the morality of private property, the role of markets and the ability of governments to plan (Gintis, 1991:28). Private property is central to capitalism and the free market system and a highly contentious subject with serious debates concerning whether property ownership should rest with the state or communities (Panesar, 2000:114). As such, it is a subject that cannot be ignored where economic growth and development is concerned (Locke, 2013:1). Private property is a powerful growth determinant and institution (Abdulai, Owusu & Goetz, 2008:1), the security of which is a primary determinant of differences in income levels among countries (Acemoglu, Johnson & Robinson, 2001:1369).

Firstly, secured property rights provide a guarantee for farmers to engage in long-term land improvement and conservation investments without any fear of expropriation (Abdulai, Owusu & Goetz, 2008:1). Secondly, secured land rights are accepted as collateral to raising loans to finance agricultural investments

(Feder&Feeny, 1991:903) and lastly, improved transfer rights enhance factor mobility and simplify selling or renting of farmland (Besley, 1995:936).

With world population growth forecasted to reach approximately 10 billion by 2060 (Gerland, Raftery, Ševčíková, Li, Gu, Spoorenberg, Alkema, Fosdick, Chunn, Lalic& Bay, 2014:2), there is demand for further increase in agricultural productivity growth through the adoption of innovation and technology (Lanz, Dietz& Swanson, 2018:1). Lanz *et al.*, (2018:1) used the Schumpeterian research and development of Aghion and Howitt (1992) model in which $TFP\ growth = f(R\&D\ labour)$ predict cost of production. This was done to ensure that there is enough production to meet the future needs of the people and to avoid the Malthusian concerns (conflict confined to space between humans and nature which leads to famine, epidemic and war (Dean, 2015:21). The model established a development part that put technological progress in the centre and achieved positive outcomes in terms of low food prices (Punyasavatsut& Coxhead, 2002:2).The low food prices, in turn, reduced returns to factors of production used in agriculture and therefore caused development through the transfer of capital and labour from the agricultural sector into the other sectors of the economy (Timmer 1988:324). In addition, low food prices were proof that the Malthusian concerns are alleviated by technological progress where fertility choices trade-off between education and population growth are added advantages (Alston, Beddow&Pardey, 2009:1210).

2.3.1.3 *Robert Solow’s theory of economic growth*

Due to its significance to understanding growth all the economic growth, analyses are initiated through the Solow growth model (Romer, 2011:8). Even the technological innovation in the Schumpeterian theory of economic growth found its base on the Solow growth model (Wong, Ho, &Autio, 2005:336). Both the Solow growth model with technical progress and the basic Solow growth model are exogenous economic growth models (Lui, 2007:5). In the basic Solow growth model, growth is a product of factor accumulation (labour and capital) where labour grows proportionally to population growth and capital accumulates from savings as expressed in this simple formula:

$$\frac{\dot{k}}{k} = s \frac{y}{k} - (d + n) \dots \dots \dots (2.4)$$

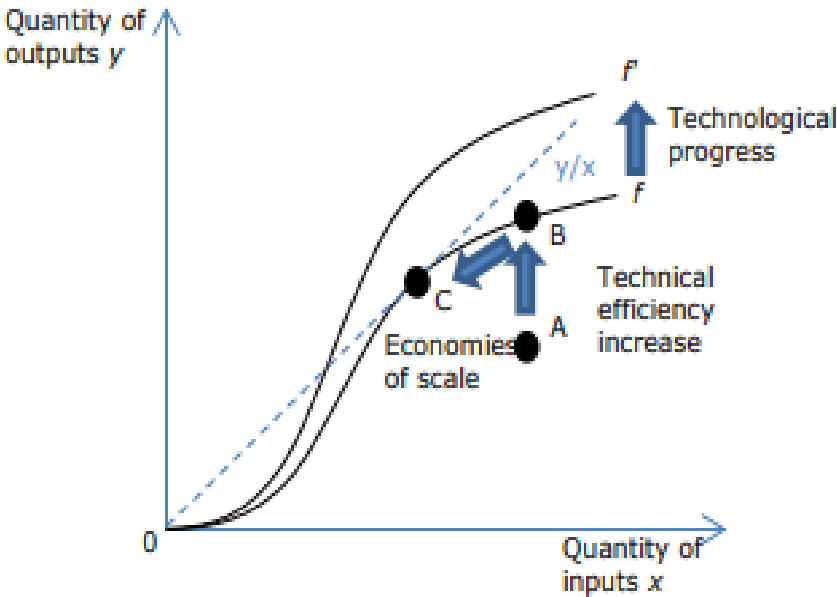
Where: k = capital, s = savings and d= population and n= time factor (Sims, 2012:4). In his quest for sustainable per capita income, Solow augmented his model and introduced technological progress to allow shifts in the production function because without technical progress, the effects of diminishing returns would eventually cause economic growth to cease (Gabardo *et al.*, 2017:395). Population growth, rates of saving and technological progress are all exogenous factors in the Solow growth model (Mankiw *et al.*, 1992:4). The model predicts the long-run improvements in the standards of living due to population growth rate, rate of technical progress, rate of capital depreciation and the savings rate (Sredojević *et al.*, 2016:178). Income convergence does not take place across countries but countries only converge to own steady-state value

(Mankiw, Romer & Weil, 1992:422). Diminishing marginal return to capital remains the unique factor in the model and assures the conditional convergence of capital per labour unit (Comin, 2017:3). The Solow growth model with technical progress begins with a Cobb-Douglas production function ($Y = AK^\alpha L^{1-\alpha}$) or $f(k)$ and assumes output to be a function of labour and capital accumulation where both the labour force growth and the investment growth rates are exogenous (McCracken, 2006:8).

Capital accumulation is the only significant endogenous factor of production in the Solow growth model and capital is exogenously determined through the saving rate increase (Schiliro, 2017:6). Continuous accumulation of capital causes an increase in output per unit of labour while depreciation continuously destroys the capital generated from investment (Liu, 2007:5). The Solow basic growth model succeeded in clarifying the non-existence of long-run growth where technical progress is absent (Aghion, 2016:2). However, the same model failed to explain the origin of technical progress and the Lucas Paradox (the observation that capital never flows out of developed economies to developing ones despite the lower levels of capital per worker in the developing countries) (Alfaro, Kalemli-Ozcan & Volosovych, 2003:1).

According to Goyal, Gautam and Maloney (2019:8), lack of convergence between developing and developed countries results from agricultural productivity divergence where TFP depends on the use of improved technology. Figure 2.1 shows the possible pathways of productivity improvement by the upwards shifting of the production frontier through the new technological implementation (moving the curve f to f') and the technical efficiency increase through the improvement of existing technologies (catching-up) (European Commission (EC), 2016:3). The said progress should apply to all firms if equal access to new technology is assumed, implying that firms will produce more using the same level of inputs.

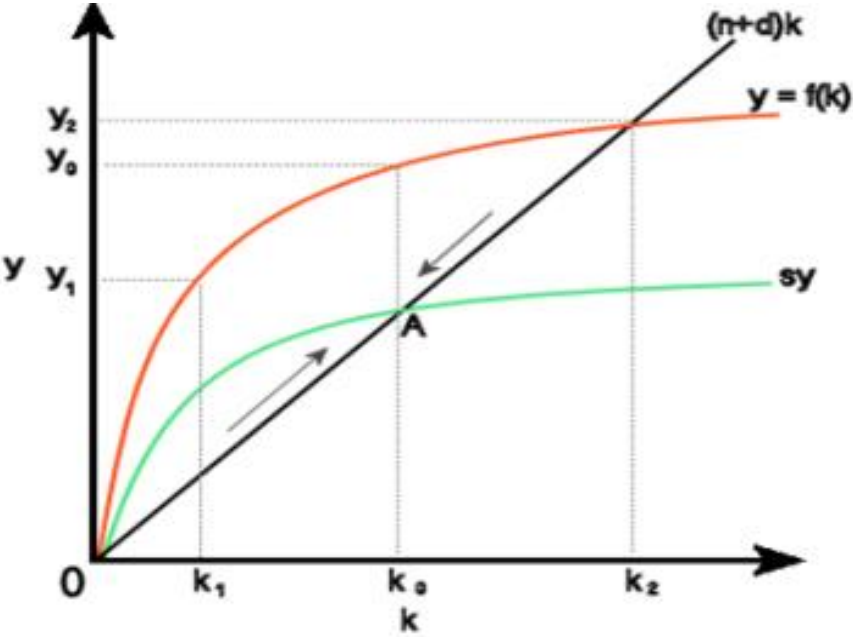
Figure 2.1: Pathways for productivity growth



Source: Latruffe (2010)

On the other hand, technological regress caused by deterioration of worker qualifications will cause a downward shift of the frontier from f to f' and therefore a decrease in the output produced per input used (Latruffe, 2010:19). Notwithstanding the exploration and simplicity of the Solow growth model, it is a key attraction of the growth theory, even though it has attracted criticism through the assumption of flexible prices and automatic clearance of all markets (Park, 2006:34). The separation of both capital deepening and technical progress as per the models is unsubstantial due to their interdependence (Casetti, 1982:1584). In addition, the model is silent on the Keynesian difficulties [output of goods and services (GDP) = consumption (C), investment (I), government purchases (G) and net exports (NX)] concerning the downward inflexibility of the wage rate and liquidity traps (Ozdemir, 2017:136). Figure 2.2 demonstrates a Solow growth model at a steady state ($sf(k) = (n+d)k$) where Y is output, K is capital, L is labour, I is investment and S is savings. Whilst A represents technological progress or productivity, K_0 represents the level of capital at a steady state. At K_1 , the level of capital is less than K_0 and it will therefore increase until it reaches K_0 . In the same way, at K_2 , the level of capital is above K_0 and it will decrease to K_0 .

Figure 2.2: The basic Solow growth model diagram



Source: McCracken (2006:10)

Table 2.3 reflects a summary of the theories of agriculture and economic growth, which have been part of the discussion.

Table 2.3: Empirical summary of the theories of agriculture and economic growth

Theory	Model properties	Determinants of growth	Environment	Contribution to agricultural sector growth
The endogenous growth theory	<p>Explain the human capital's role in economic growth and differences in development between countries (Lucas, 1988).</p> <p>Endogenous models use the AK production function (Piętak, 2014).</p> <p>Elimination of diminishing returns on production factors (Sredojević <i>et al.</i>, 2016:183).</p> <p>No steady state and no convergence between the economies (Romer, 1990).</p>	<p>Increasing return on labour (Sethy, & Sahoo, 2015:286).</p> <p>No zero increase of labour (Lucas, 1988).</p> <p>economic growth determinants are endogenous (Romer, 1990).</p> <p>Technical progress, level of human capital and labour productivity (González, 2018:2).</p> <p>Increasing returns to scale of all factors of production and constant returns to scale of capita (Romer 1986).</p>	Global economies (Piętak, 2014).	<p>Technical progress was identified as a key factor in the agricultural sector growth stimulation (Haji-Rahimi, 2012:249).</p> <p>E-agriculture's ability to enhance rural development and agriculture through improved ICTs (Dlodlo, & Kalezhi, 2015:13; Maumbe & Okello, 2010:20).</p>
Schumpeter's theory of economic growth.	<p>Classical economists (Voosholz, 2014:4).</p> <p>Assumption that private property, efficiency of financial markets and competitive markets support the production of new inventions (Piętak, 2014).</p> <p>Economic growth imbalances (Piętak, 2014).</p> <p>Research and development (Piętak, 2014).</p>	<p>Not accumulation of capital drives economic growth but technical innovation (Voosholz, 2014:6).</p> <p>Innovations increase GDP broadly without a similar increase in input resources through the creation of innovation resource (Bazhal, 2017:4).</p> <p>Capitalism preserved from destruction by innovations at systems level (Bazhal, 2017:4).</p> <p>Entrepreneur-innovator a significant agent (Piętak, 2014).</p>	Democratic and economically developed countries (Piętak, 2014).	<p>From entrepreneur-innovator perspective, agricultural total factor productivity is raised and therefore employment, growth and living standards (Mujuru, 2014:129).</p> <p>Technological progress is central to the developmental path with agricultural yields driven by technology.</p> <p>Malthusian concerns are alleviated by technological progress and fertility choices are trade-off through increasing education costs and population growth slowdown (Lanzet <i>et al.</i>, 2018:1).</p> <p>The best future strategy is the fourth agrarian revolution which is characterised by high-tech construction materials and digital technologies as well as sensor and satellite-based precision, (Frankelius, Norman & Johansen, 2019:703).</p>

Theory	Model properties	Determinants of growth	Environment	Contribution to agricultural sector growth
Robert Solow's theory of economic growth	Neoclassical and a long term economic growth model (Aghion & Howitt, 1998:14). Income per capita growth rate is equal to population growth rate (Solow, 1957:313). Economic growth in a steady state is determined by exogenous variables (Voosholz, 2014:6). Substitution of factors of production (Lui, 2007:42).	Economy achieves equilibrium in the long-run (Diamond, 1965:1139). Confirm the existence of convergence. (Piętak, 2014:2). Production function with constant returns to scale (Lui, 2007:3). Higher rates through lower levels of income per capita economies (Agenor & Montiel, 1999: 673).	Global economies (Lui, 2007:42).	Total Factor Productivity is responsible for agricultural productivity growth and the absence of which retards income convergence between the developing and the developed economies (Goyal, Gautam & Maloney (2019:8).

Source: Author's own compilation

2.3.2 Agriculture and economic development

The previous section dealt with the theories of agriculture and economic growth and this section expounds on the theories of agriculture and economic development. Ancient political scholars were burdened with development since development acquired diverse interpretations from different scholars such as Amartya Sen according to whom development expands the people's freedoms and capabilities, removes all significant causes of *unfreedom* as poverty, , poor economic opportunities, systematic social deprivation, overactivity of repressive states and neglect of public facilities (Thirlwall, 2011:19; Sen, 1999:4). Todaro defined economic development as a multidimensional, not a complete economic phenomenon and about reorganisation and reorientation of the whole system of social and economic development towards improving the quality of all human lives by firstly, increasing availability and improvement of the basic needs as in food, shelter, education, health, and protection, secondly, create an enabling environment in social, political and economic systems and institutions towards the promotion of human dignity, respect and improved standard of living and lastly, broaden the scope of available choices (Todaro, 2012:62). Bryant (2019:1) defined development as a need to choose goals towards achieving the realisation of the human potential, which is about taking action to bring visible change and thus empowering the people to influence positively their future.

The economic development theories explain the tools and strategies to achieve economic development objectives (Mookherjee & Ray, 2001:2). The theories are about variable definitions, domain specifications, the building of internally consistent relationships and specific predictions (Kivunja, 2018:45). This process saw the birth of modernisation, dependency and the feminist theories, the objective of which was a measured assumption of High Income Countries (HICs) status by the Lower Developing Countries (LDCs) through

savings and investment from the external, internal, public and private sectors towards take-off into self-sustainable development (Abuiyada, 2018:116).

2.3.2.1 *Rostow's theory of economic growth and development stages*

Economic development in Rostow's theory of economic growth and development model depends on the accumulation of capital similar to the Lewis structural change theory (Rostow 1960:5). The growth process comprises leading and lagging sectors and the growth rate depends partially on the frequency with which resources shift out of the laggards into the leaders (Flammang, 1979:51). The capital flight stage is the basis of the take-off stage (Rostow, 1960:8). Following the Rostowian framework, the agrarian revolution is a precondition for industrial revolution (Olmstead & Rhode, 2008:8). The model is a basic example of the intersection of economics, politics and geography (Singh, 1960:71). Rostow's theory of economic growth and development stages affirms the critical role the agricultural sector plays in the process of development even where it is not the development leader (Ruttan, 1965:30). Table 2.4 lists and details all the development stages as per Rostow's theory of economic growth and development.

Table 2.4: Rostow's five stages of growth

Growth stage	Characteristics	Study
The traditional society	Primary sector economy with subsistence agriculture or hunting gathering and battering. Limited technology and limited economic growth. Political systems and centralised nations. Investment share is about 5 percent of total economic production.	(van Arendonk, 2015:4)
The preconditions for take-off	New and advances in existing technologies. Economic change due to external demand for raw material. Significant shift from agriculture to industry, trade and commerce. Move from physical environment investment towards production expansion. Individual social mobility. Class and society move from being risk averse to being risk takers. Taiwan and South Korea are products of Rostow's stages of growth model (low-cost productive capital induced the take-off stage).	(Rostow, 1960:7) (Poonyth, Hassan, Kirsten, & Calcaterra, 2001:276) (Mao & Schive, 1995:32)
The take-off	Rapid urbanisation, technological breakthroughs and industrialisation. Political, social and institutional framework supports modern sector expansion. Automatic economic development process with economy achieving self-sustenance with investment between five to ten percent of GNP. Development of a more substantial high growth rate manufacturing sector (Textiles and apparel).	(Mizero, 2018:4) (Rostow, 1968:8)
The drive to maturity	Diversified industrial base, quickly budding new ones and a multiple expansion of industries. Manufacturing shifts from investment-driven towards consumer durables and domestic consumption. Rapid transportation infrastructure development. Huge investment in social, schools, universities and hospitals. Emerges of global trade with the production of goods initially imported. High degree of professionalism and a change in leadership character. Poverty reduction and standards of living improvement. Energy and ICTs are developed and environmental and health costs of industrialisation are acknowledged where relevant policies are designed.	(Singh, 1960:72) (Rostow, 1968:8) van Arendonk, 2015:4)

The age of high mass-consumption	Dominant industrial base and thinning primary sector base in economy and society. Disposable income beyond basic needs and move to consumption of high-value durable goods (cars, art and music). Initiate migration to the suburban. Interest in economic development, desire to develop an egalitarian society.	(Singh, 1960:74) (Mizero, 2018:4)
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Source: Author's compilation

The model is widely cited despite all critiques levelled against it (Singh, 1960:71). Firstly, the model aligns with the western path of development and propagated capitalism (Pearce, 1999:396). Secondly, it disregards the most fundamental, site and situation, geographical principles through the assumption that countries have equal chances of developing without consideration of their population size or location and natural resources endowments (Leys, 1982:101). Thirdly, the assumption of high mass consumption and the development paradigm through urban industry do not hold since countries are diverse with different priorities and development measures (Willis, 2011:39). Lastly, the model is too general in terms of focus and assumes that all countries follow a linear development process because of technological innovation (Itagaki, 1963:3).

2.3.2.2 *Lewis structural change theory*

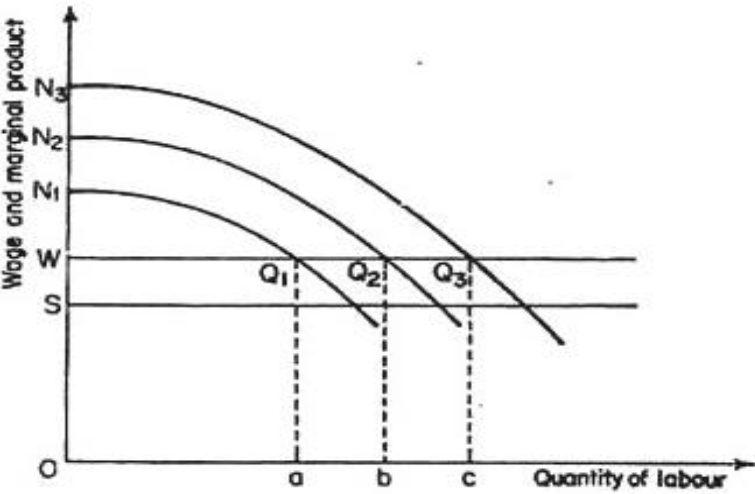
The Lewis structural change theory is rooted in the classical tradition and is the centre of the development theory (Ranis, 2004:2). The model was developed shortly after World War II with the aim of decolonising the third world countries since colonialism was erroneously associated with economic market forces (Acemoglu, Johnson, & Robinson, 2012:3081). Lewis' structural change theory deviated substantially from classical thought (Ranis, 2004:5). Instead of the free labour and rent seeking by capitalists, Lewis (1954) insinuated that the agricultural sector is characterised firstly, by farmers and labourers who are non-capitalist (Lewis, 1954:401). Secondly, it is characterised by the coexistence of traditional subsistence sector (mainly agriculture) and modern commercial sector (mainly manufacturing) and a zero marginal labour productivity (Vollrath, 2009a:287). Thirdly, it is defined by poverty and labour resource riches, which causes more production factors to be allocated to agriculture, a low productivity sector and therefore resulting in low productivity and stagnating economy (Vollrath, 2009b:325). Hence, transferring labour from the low to the highly productive sectors of the economy towards the achievement of one sector modern economy is a significant feature of the Lewis' structural change theory (Hosseini, 2012:132; Islam & Yokota, 2008:363). When surplus labour in the modern commercial sector exceeds surplus labour in the subsistence sector, sustainable development is achieved (Lewis, 1954:139). Therefore, labour transfer, output growth and employment in the modern sector are the key focus areas of Lewis's structural change theory (Todaro & Smith, 2011:115).

The Lewis's structural change theory was criticised for a wrong assumption that employment creation and labour transfer to the modern sector are proportional to the modern-sector capital accumulation rate (Chituka, 2013). The theory implies that the aggregate living standards would not improve as rapidly as

productivity until there is a total elimination of surplus labour. In contrast, however, Astorga, Bergés and Fitzgerald (2005:283.) provided evidence that the living standards in Latin America raised simultaneously with productivity during the twentieth century and the status of health and education enhanced more rapidly than the average incomes with the adoption of the Lewis's structural change theory. Again, critics interpreted the Lewis model as advocating for industrialisation at the expense of agricultural development (Hosseini, 2012:135).

Despite all criticism, countries with high population densities and scarce arable land still base their development objectives on the framework of Lewis's structural change theory (Ranis, 2004:13). Figure 2.3 illustrates how and at which point in the economy is economic development taking place. OW is the capitalist wage; NQ is the demand for labour or marginal productivity. At Q_1 wages (W) is equal to marginal productivity (Oa). Point Oa is within subsistence wage, a point beyond which workers receive whatever amount of wages possible. WN_1Q_1 is a capitalist surplus and is continually reinvested to reach level WN_2Q_2 and WN_3Q_3 and beyond depending on the availability of surplus labour. Increased agricultural output beyond this point will cause a labour movement out of the low productive agricultural sector into the highly productive non-agricultural sector and industrial output will therefore increase significantly without any negative impact on the performance of the agricultural sector (Lewis, 1954:139). The stage is essential for take-off towards industrialisation (Rostow, 1960:8).

Figure 2.3: The Lewis model of development



Source: Lewis (1954:406)

2.3.2.3 *The international-dependence theory*

The International-dependence theory is simply defined as the relationship between the rich and the poor countries that leads to the rich or the capitalists (core) countries enriching themselves at the expense of the poor countries (periphery) countries (Todaro & Smith, 2015:131). It is also defined as subjection of

peripheries to the development and expansion of their core countries first (Namkoong, 1999:124). The international dependency theory was popularised by its ability to explain the virtuous poverty circle endured by the poor countries and the failure of modernisation theories to eventuate (Hryniewicz, 2014:2). The exploitation of the periphery by the core was hypothesised to occur through decapitalisation, unequal exchange and controls in a competitive system (Chase-Dunn, 1975:722). However, dependency is not a theory (Kvangraven, Styve, Kufakurinani & Santanta (2017:13) but an accumulation of ideas with a strong potential towards influencing policy actions in the poor or the Low Developed Countries (LDCs) (Ahiakpor, 1985:536).

Since the independence of the ex-colonies of Asia and Africa, development has been the quest of all developing countries (Omvedt, 1994:169). It is the agricultural sector and the agro-industry that normally play a central if not a leading role in transition. However, due to dependency, agriculture in Africa is in crisis because it produces raw materials and supplies food to the core rather than feeding the local non-agricultural sector (Omvedt, 1994:170). In return, the periphery depends on imports supply of foodstuffs and manufactured goods from other countries (Beckford, 1968:235). For this reason, the periphery strategically engages in mining, agriculture and related trade while the core engages in the industry (Eneka, 2018:135). With this regard, the terms of international trade were set to affect the primary sectors negatively through the division of labour and to retard the economic development of the periphery (Frank, 1967:9). In the same manner, the development of Africa was stagnated by development in Europe when the latter invested in its productive economy, capital accumulated from Africa, thereby growing its riches and national wealth (Rodney, 1972:149).

The decrease in food self-sufficiency in the Middle East region where the staples failed to keep up with domestic consumption is also clear evidence of the existence of the core and periphery status (Ateş & Bayraktar, 2005:255). Moreover, the impoverishing dependency relationship is being maintained through the promulgation of development initiatives that are deeply alien but chanted as in the interest of the poor nations (Matunhu, 2011:71). The tariffs higher than those imposed on the industry (4 percent) are set on the agricultural produce (40 percent) and ensure that peripheries do not gain access to the produce markets from the core (Sánchez, 2003:45). Jonah (2015:40) posits that the core countries also influence the quality of education in the periphery through study aids.

Peripheries are not only a source of raw materials and cheap labour but professionals and specialists through brain drain (Matunhu, 2011:61). In 2015 already, more than 300,000 Doctors in philosophy (PhD) graduates from Africa worked in the United States of America (USA), impacting mainly institutions of higher learning, science and technology and the medical fraternity (Shinn, 2002:2). Brain drain denies developing countries an opportunity to sustain universities, a global knowledge divide risks threatening economic growth and development (Rizvi, 2005:176). Drainage of human-capital from developing countries as a

growth determinant not only harms education, infrastructure and income distribution but also on the welfare of developing economies (Wong & Yip, 1999: 699).

The economic community of Latin America (ECLA) called for the state to protect domestic industries against foreign competition until they are well established (Willis, 2011:74). High import tariffs also levied against foreign companies to raise their prices to enable domestic companies an opportunity to compete for sales (Jonah, 2015:35). Due to the high inequality of landownership, land reforms programmes were proposed for land to be redistributed to the small-scale farmers for increased production and therefore poverty eradication (Jackson, Russett, Snidal & Sylvan, 1979:8). The international dependency theory calls for clarity on ownership and control over private and public assets to establish more effective means out of income inequality, unemployment and absolute poverty and to raise the living standards of the masses (Todaro, 2012:125).

Even though, the international dependency theory failed to explain the origin of underdevelopment, it opened up a new perspective on the realities of the international political economy (Mock, 2017:4). The success of the Asian Tigers (South Korea, Singapore, Hong Kong, Taiwan) in attaining the developed country status is evidence of a lack of basis against the theory (Reyes, 2001:7). Taiwan applied the neoclassical capital accumulation, greater efficiency and technological innovation to pull itself out of poverty into a developing country status (Amsden, 1979:342; Sánchez, 2003:39). The international dependency theory does not acknowledge the influences of social, political and cultural factors including the impact of internal conflict on economic growth and development (Kufakurinani *et al.*, 2017:51). Needless to say, the corruption, indebtedness and backwardness experienced in the developing countries and the premium payable to the developed countries for development input relative to their trade receipt from the developed countries are the long-run effects of the international dependency (Thirlwall, 2011:23).

2.3.2.4 *Schultz theory of traditional agriculture*

The Schultz (1954) theory of traditional agriculture centres on the following three questions: Firstly, on whether an efficient allocation of production factors by traditional farmers can increase such farmers' output, secondly, on the question of which, production factors cause different growth rates in agricultural sectors across the globe and thirdly, under which condition will investments in agriculture yield good results (Lundahl, 1987:109). The response to these questions was that the traditional agriculturalists derive no benefits from the reallocation of factors since the aim of production is to minimise the food shortage risk rather than to maximise profit or expected yield (Hansson, 2019:31). The theory refutes the old thinking about traditional farmers being conservative while they are constraint by a lack of investment in the sector (Lundahl, 1987:109).

Schultz (1978) proposed that traditional agriculture be modernised with emphasis on the development of the non-agricultural sectors towards transformation through investment in knowledge, education and

improvement in material and human capital (Alston&Pardey, 2017:2). The agricultural failures are attributable to misguided government policies rather than to irrational farmers and a bad climate (Schultz, 1980:649). With new knowledge and adoption of modern production factors, capital investment will yield benefits (Akudugu, Guo& Dadzie, 292:6). Schultz (1978) identified equilibrium in traditional agriculture as a challenge since the same capital and same knowledge consistently produce low yield (Johnson, 1972:150). Hence, intensive agricultural knowledge results in a new equilibrium with increased productivity and therefore self-sufficiency in food security to prepare countries for economic growth and modernisation process (Gollin, 2010:3844). This view is the foundation of the economic development literature (Thirlwall, 2011:12).

The theory of traditional agriculture not only emphasised the significance of incentives but also that of infrastructure, good governance institutions as well as functioning markets including law-abiding and peaceful societies (Schultz, 1964:206). Schultz (1954) also stressed the importance of human capital as the driving force behind the movement away from traditional agriculture (Gollin, 2010:3844). The hypothesis became central arguments of Johnston and Mellor (1961), Johnston (1970), Johnston and Kilby (1975), Timmer (1988) and Johnson (1997) and also featured prominently in the works of Mellor (1995, 1996), the analyses of Eswaran and Kotwal (1993) and Mundlak (2000).

According to Gollin (2010:3849), Mellor hypothesised a framework outlining the general equilibrium impacts set, which result from increased agricultural productivity:

- Poor rural farmers' improved welfare from the farm income and profit growth;
- Food prices decline to benefit the poor rural and urban consumers including all net food purchasers;
- Domestic demand increase for industrial products;
- Real wage increases through nominal wage reduction towards industrial sector cost reduction;
- Migration of resources and labour out of agriculture towards the expansion of the industrial sector;
- Hard currency earnings from the improvement of competitiveness and agricultural exports.

This theory was, however, heavily criticised for irrelevant assumptions where Myrdal (1972:7) opined that developing countries needed institutional reforms rather than education. One of its premises is the no zero value of labour or disguised unemployment, which means that all factors of production and resources are fully employed except for on a voluntary basis since when unemployed labour recourses could be employed it began to demand employment at a price which the production process could absorb, it will immediately be employed (Davar, 2016:3). Nonetheless, it became clear upon testing that the LDCs can utilise the disguisedly unemployed labour for capital formation (Benanav, 2019:109). Table 2.5 summarises the theories of agriculture and economic development as discussed.

Table 2.5: Empirical summary of the theories of agriculture and economic development

Theory	Model properties	Determinants of development	Environment	Contribution to agricultural sector development
<p>Rostow's theory of economic growth stages</p>	<p>Counter theory to Marxism (Pearce, 1999:396).</p> <p>Capital accumulation.</p> <p>Development is based on 6 stages of development. Achievement of the third stage, the 'take-off stage' is a breakthrough for poor countries Piętak (2014).</p> <p>Reconstruction from agriculture to industry is significant Piętak (2014).</p>	<p>Capital accumulation.</p> <p>Sixth stage (quality).</p>	<p>Transformation from agricultural to industrial, globally (Pearce, 1999:396).</p>	<p>Leading sector model and the agricultural development approaches revealed the critical role the agricultural sector plays in the development process (Ruttan, 1965:30).</p> <p>Without growth in the agricultural sector there is no development since industrialisation depends on agricultural growth. (Poonyth <i>et al.</i>, 2001:269).</p>
<p>Lewis Structural change theory</p>	<p>Income growth in the long-run and own level of life in the short-run (Piętak (2014).</p> <p>Critical role by the state (Kanbur, 2018:7).</p> <p>Increased capital accumulation through consumption reduction (Piętak, 2014).</p> <p>Continuous improvement of quality of goods and services (Rostow, 1971).</p> <p>Existence of both capitalist and the subsistence sectors (Bauer, 1956:633).</p>	<p>The will to Economise; Economic Institutions; Knowledge; Capital; Population and Resources; Government (Bauer, 1956:632).</p> <p>Agricultural productivity and the supply of labour in the non-agricultural sector (Islam&Yokota (2008:363).</p> <p>Sustainable development is achieved when surplus labour in the commercial sector exceeds surplus labour in the agricultural sector (Lewis, (1954:139)..</p>	<p>Poor countries (Acemogluet <i>al.</i>, 2012:3081).</p>	<p>High capital accumulation and investment in the non-agricultural sector cause expansion and the agricultural sector supply labour.</p> <p>As productivity increases, demand for agricultural products increases, then the structural transformation starts (Gabardo<i>et al.</i>, 2017:395; Pereima, &Einloft,2017:399).</p>

Theory	Model properties	Determinants of development	Environment	Contribution to agricultural sector development
The international-dependence theory	<p>Southern countries are poor because of exploitation by Northern countries (Willis, 2011:69).</p> <p>Static dualism of the dependency models. core' and periphery) (Berger, 1994:262).</p> <p>class formation (Shareia, 2015:123).</p>	<p>The economic stagnation of the periphery and the continued, even expanding gap, between the periphery and the core (Berger, 1994:263).</p>	<p>Poor countries, mainly Latin American countries (Willis, 2011:69).</p>	<p>Terms of trade work against the primary sectors of the peripheries (agriculture is a primary sector) and therefore retards development (Frank, 1967:9).</p> <p>Agriculture moves away from feeding locals and is oriented towards the export Market (Omvedt, 1994:170).</p> <p>Access to international markets denied through high tariffs on agricultural exports (compared to manufacturing) from the periphery (Sánchez, 2003:135).</p>
Schultz's theory of traditional agriculture	<p>Elimination of doctrine of Labour of zero Value (Mishra, 1966:799).</p> <p>Physical capital stocks (Lundahl, 1987:109).</p> <p>Price of the sources of incomes stream is irrelevant (Lundahl, 1987:109).</p> <p>Aid of traditional production factors cannot grow the traditional agricultural sector (Lundahl, 1987:112).</p> <p>farmer rationality and responsiveness to economic stimuli (Olmstead & Rhode, 2008:11).</p>	<p>Human capital (Lui, 2007:2).</p> <p>Investments in human capital (Schultz, 1960).</p>	<p>Poor countries.</p>	<p>Supports traditional agriculture and promotes increased productivity, constant demand and prices towards a green revolution (Schultz, 1978:15).</p>

Source: Author's own compilation

2.4 EMPIRICAL RELATIONSHIP BETWEEN AGRICULTURE, ECONOMIC GROWTH AND DEVELOPMENT

Section 2.3 reviewed the agricultural development theories and their impact on the agricultural sector. Section 2.4 will review the empirical relationship between agriculture, economic growth and development. The presumed relationship between agriculture, economic growth and development is an extensively debated topic (Bekun, 2015:1). However, in various influential development reports, the agricultural sector is advocated as a significant sector towards economic growth generation and poverty reduction (Ciglovska, 2018:550). The agricultural sector is the first and the most critical source of economic growth and development in regions where agriculture is a dominant sector (Gollin, 2010: 3827). It contributes indirectly to economic growth by providing food price stability, food, poverty reduction and better intake of caloric nutrients by the poor (Timmer, 1995:425). Nonetheless, the role played by the agricultural sector in economic growth and development remains a subject of much contention among researchers and development economists. Hence, conflicting, mixed evidence and continuing disagreements (Awokuse&Xie, 2015:78). Some researchers maintain that agricultural development is a precondition for economic growth and transformation while others greatly differ and assert a divergent path (Kay, 2009:105).

2.4.1 Developed countries

This section reviews empirical findings that highlight agriculture as an engine of economic growth and development in developed countries. However, there is a lack of empirical studies that analyses the impact of agriculture on economic growth and development in developed countries as most researches on the subject focus mainly on the developing countries. Similarly, the technically induced growth and the responses to relative factor prices have also pulled people away from the agricultural sector (Fuglie& Heisey, 2007:4; Shoka, 2015:3; Tiffin& Irz, 2006:86).

Shoka (2015:3) commissioned research to determine a relationship between GDP per capita and the agricultural GVA using the time series analysis on data samples from 2005 to 2013. The analysis used descriptive statistics, multiple regression, co-integration and Granger causality tests. He discovered an inverse and a most persistent relationship between the two variables as demonstrated by a decline in agricultural GVA when GDP per capita increases. The decline leads to a comparatively flat agricultural productivity path, a less labour intensive agricultural sector and finally to the declining share of agriculture in total employment and GDP (Alston&Pardey, 2014:123).

The GDP per capita increases the demand for high value durable goods and the less demand for food as per the effect of the Engels law (Tschirely, Snyder, Dolislager, Reardon, Haggblade, Goeb, Traud, Ejobi & Meyer. 2015:13). Notwithstanding the decline, the agricultural sector remains significant (van Arendonk, (2015:1). The decreasing relative size of the agricultural GVA and employment contribution is nonetheless the strength of the relationship and a major feature of economic development (Vollrath, 2009b:325). The

relationship also fulfils the drive to maturity stage of Rostow's theory of economic growth stages (Rostow, 1968:8).

Sheng, Jackson, Zhao and Zhang (2017) adopted the growth accounting method and the national accounts data to measure empirically the capital and labour contribution to agricultural productivity in Australia using data from 1949 to 2012. The analysis used forecasted and actual methods together with international best practice. The study discovered that higher returns are more from capital yields than from labour. The conclusion was that agricultural productivity was enhanced by varying input and output efficiencies. In addition, there was a shift in outputs from livestock to crop production and an adjustment input mix resulting from capital deepening and technical progress, which were the driving force behind the rapid industry-level productivity growth. These results affirm Solow's theory of economic growth and specifically, Solow's basic growth model where growth results from labour and capital from which growth the labour-capital exchanges took place (Solow, 1956).

Tiffin and Irz (2006) used bivariate Granger causality tests to examine the relationships between agricultural GVA and economic growth for a panel of 85 from both the developed and the developing countries. No long-run relation was established between GDP per capita and the agricultural GVA per worker except Australia, Canada, Netherlands, UK and the United States, which are major agricultural produce exporters with a clear comparative advantage. It was, therefore, concluded that except for the developed countries with a high comparative advantage in agriculture, the agricultural sector does not drive economic growth in the developed countries.

2.4.2 Developing countries

Many studies have investigated the relationship between the agricultural sector, economic growth and development (Dim&Ezenekwe, 2013; Johnston& Mellor, 1961; Matsuyama, 1992; Timmer, 2002:2). Historically, the currently developed countries obtained their development through the agricultural sector transformation process even though the comparative advantage validity for the currently developing countries weakens gradually against the developed countries model (WEF, 2017:5). To establish facts about the agricultural sector being a leading sector in development through its strong production linkages to other economic sectors, Vogel (1994) engaged in a study using the social accounting matrix (SAM) to analyse data from 27 countries. Agricultural production multipliers were decomposed using path analysis.

The study found that the institutional final demand is a key contributory factor to production linkages. Secondly, it discovered that the agricultural sector is indeed a leading sector in development and that support from economy-wide activities is critical. Thirdly, it noted the induced demand from rural household general equilibrium linkage that the ADLI can exploit further as a development strategy. The study concluded that the ADLI development strategy is the most feasible for developing countries. This study affirms Rostow's theory of economic growth and development stages where rapid growth and the expansion

happening during the early stages of evolution create leading sectors. It is worth noting that rapid growth in the sector is not a result of production functions discontinuity only but also of the high price or income elasticities of demand (Rostow, 1959:2).

Awokuse (2009) analysed the vital synergy between agricultural productivity and economic growth using the time series analysis of fifteen developing and transition economies in Africa, Latin America and Asia. Data from 1971 to 2006 were analysed. He used autoregressive distributed lag model and cointegration to determine the empirical relationship among the chosen variables. The results indicated that agriculture is an important factor for economic growth and an engine for economic development.

Awan and Anum (2014) examined the major factors of the agricultural sector, the mutual relationship between agriculture, economic development and the GDP as well as how the agriculture sector assisted with economic development for the period 1980 - 2012. World Bank Metadata of Pakistan was analysed and cointegration and the vector error correction models were used as econometric techniques for measuring the variable relationship. The results indicated that there is numerically a significant and positive link between agricultural growth and GDP growth.

Increased productivity most critically and permanently determines living standards in the long-run (Akande&Fani, 2017:311; Harris, 1999:1; Matsuyama, 1992:2; Rostow, 1960:8). According to Bravo-Ortega and Lederman (2005:1) and Dim and Ezenekwe (2013:61), agricultural development has a positive impact on the national welfare of developing countries. To establish these facts, Bravo-Ortega and Lederman (2005) used a panel data approach to estimate the effect of agricultural productivity on economic growth using the 1960 to 2000 data from the Latin American and the Caribbean countries. They discovered that an increase in agricultural GVA increases the non-agricultural GDP and concluded that agricultural development is the most robust instrument of extreme poverty eradication, feeding the world population and lifting shared prosperity. However, the same study as was conducted by Matahir and Tuyon (2013) in Malaysia using data from 1970 to 2010, revealed a bi-directional causality relationship in the long-run and the existence of no causality in the short run. Nevertheless, the conclusion was that the agricultural sector is still the key and has the potential to contribute more to the Malaysian economy than the current levels of contribution. The study affirms the Lewis (1954) structural change theory.

In addition, human capital links significantly to productivity through the skills capacity of farmers towards increased productivity, economic growth expansion, access to modern technology, more market information and extension services (Das, Mourmouras& Rangazas, 2015:51). To affirm this, Gosh (2013) undertook to study the linkage between human development and agriculture and to evaluate sustainability indicators in the Barak Valley zone of Assam in India. He employed as analytical tools the regression techniques and econometric models. The study discovered a vital relationship between the agricultural sector and human development. Due to human development, farmer productivity expands because of the acquired farming skill, enabling the farmer to access modern technology, market information and service

extension. The growth rate increases in return, poverty reduces and human skills are further developed. Therefore, the study concluded that economic development needs the reinforcing effect of both human development and agrarian policies. The findings of the study validated the endogenous growth (Romer, 1994) and the Schultz (1954) theories.

In contrast, however, Zortuk and Karacan (2016) undertook a study to determine the causal relationship between the agricultural sector and economic development. The Pesaran (2007) second generation panel unit root test and the Dumitrescu – Hurlin (2012) heterogeneous panel causality testing procedures were employed. Bidirectional causality was established between the variables but for the majority of countries, the results showed a unidirectional causality from economic growth to the agricultural sector. It was, therefore, concluded that agricultural development is dependent on economic growth, which is the reason the agricultural sector in many developing countries does not have a positive impact on economic growth.

Similarly, the exponents of this antithesis contend that there are no strong linkages between the agricultural sector and other sectors of the economy and that the agricultural sector lacks the innovative structure required to foster higher export and productivity growth (Lewis 1954; Hirschman 1958; Fei & Ranis 1961; Jorgenson, 1961). The comparative advantage argument is also engaged in a theoretical analysis to refute the assertion that agricultural productivity is an engine of economic growth (Matsuyama, 1992:2).

2.4.3 African and sub-Saharan African countries

After the success of the green revolution in Asia, there was hope that the same agricultural miracle would be achieved in Africa but it never materialised due to the failure of agricultural productivity increase, the negative impact of pollution and over usage of pesticides (Meijerink & Roza, 2007:1). However, there are significant economic development changes within the agricultural sector within the SSA, which coincide with the renewed debate on the role of agriculture in economic growth and development whereby the significance of the linkages between agricultural and non-agricultural sectors are realised and the role of agriculture is reaffirmed (Meijerink & Roza, 2007:21). According to Turrey and Maqbool (2018:51), economic development is the solution to substantial inequalities manifesting through interchanges between the regions, nations, globalised world and its political constructions, markets and trade patterns.

Furthermore, the impact of agriculture on economic growth and development was affirmed by the study undertaken by Los and Gardebreek (2015:11) wherein the panel cointegration and granger causality tests were applied on 52 African countries for 1961-2010 to elucidate the relationship between agriculture and economic growth. Firstly, the results insinuated that the agricultural sector impacts each economic development stage differently wherein, in the low income countries (LDCs), increased food production plays a key role in stimulating economic development in alignment with Schultz (1954). Secondly, in the

middle income countries (MICs), the transfer of labour from the agricultural sector into leading sectors is a driving force behind the economic growth process in alignment to Lewis (1954). Thirdly, causality results show evidence of a bidirectional relation between agricultural and economic development. The study concluded that the transfer of labour out of the agricultural sector towards other economic sectors and urban areas does not benefit the LICs in Africa as it did Western Europe during the green revolution due to the differences in the economic and social context structures. These differences affect the absorption of labour from the agricultural sector by other economic sectors.

Another study was conducted by Odero (2017:8) based on annual data covering between 1980 and 2015 utilising the techniques of unit root, cointegration and pairwise Granger causality to establish the relationship between agricultural GVA and the GDP in Namibia. A long-run unidirectional causal relationship from the agricultural GVA to the GDP and not vice versa was established. This means that agricultural development causes economic growth.

In contrast, however, the study conducted by Awokuse and Xie (2015:78) found a long-run causal relationship from economic growth to the agricultural GVA, which implied that aggregate economic growth could serve to stimulate the agricultural sector growth and therefore suggests the coexistence of both a productive agricultural sector and a vibrant aggregate economy in developing countries in pursuit of sustainable development.

Ogunlesi and Bokana (2018) researched to establish the long and the short-run impact of agricultural productivity in 37 developing countries of sub-Saharan Africa. The panel autoregressive distributed lag modelling technique (ARDL) was employed to interrogate the 1990 to 2016 data. The findings are that all the selected independent variables have a long-run and a significant impact on agricultural output. This means that it is possible to achieve a long-run equilibrium among agricultural productivity, capital labour, real exchange rate, degree of openness and income per capita in SSA.

In the same breath, Dim and Ezenekwe (2013) modelled life expectancy against agricultural output (socio-economic, natural and human factors influencing agricultural productivity and agricultural expenditure) to test the impact of agriculture on economic development. The Augmented Dickey-Fuller unit root test, Ordinary Least Squares and the Newey-West method were the analysis tools used by the study and a negative and significant impact from the agricultural output on life expectancy was revealed. Both a significant and a detrimental effect from the agricultural GVA on economic development in Nigeria were established. However, the study acknowledged the critical role played by the agricultural sector in economic development where the support and contribution from other economic sectors such as health, education industry and the agricultural sector are simultaneously developed and more benefits accrue to economic development.

Akande, Obekpa and Fani (2017) analysed the relationship between agricultural exports and productivity in SSA countries using stochastic regression analysis between 1981 and 2005. They found that exports growth impact negatively on agricultural GVA and advocates for policies that promote both exports and institutional quality to further boost agricultural productivity.

Oyakhilomen and Zibah (2014:209) employed the annual time series data for 1970 to 2011 in Nigeria to study the relationship between economic growth and poverty reduction in Nigeria. The outcome of the study contradicted mainstream economics in that poverty persists despite the unprecedented economic growth experienced in Sub-Saharan Africa. Therefore, they concluded that the agricultural sector is not always an elixir for economic development and poverty reduction.

In contrast, however, Ogundipe, Oduntan, Adebayo and Olagunju (2016) commissioned a similar study. The results revealed that agricultural productivity reduces poverty through the three main linkages, which are market expansion, sustenance enhancement and income empowerment. The study employed the dynamic panel data approach to do the estimation through the System-GMM technique on the data for the period 1991-2015. They concluded that the agricultural value added per worker contributes significantly towards rural poverty reduction; the non-farm poor have a large food marginal propensity (MPC) for consumption and that other sectors do not have influence on the livelihood of poor farmers due to their subsistence nature. They also concluded that the domestic credit to private sectors and institutions were also significant in reducing all categories of poverty with the largest impact on rural poverty.

The study further concluded that the credit accessing strategies should form part of the strategies to enhance agricultural productivity to improve the asset base of rural farmers to large-scale commercial farming. Again, appropriate macroeconomic policies and institutional quality are able to enhance equitable land, credit access and social services. Theoretically, multiple pathways through which employment creation, real income changes, food prices effects and the rural non-farm multiplier effect reduce poverty from agricultural productivity growth are proof that there are linkages between agricultural productivity and poverty reduction.

According to Setshedi (2019:1), the agricultural sector plays a permissive instead of a growth-leading role within the South African economy. Furthermore, the Presidency (2017) recognises the agricultural sector as one of the significant forces driving economic growth and making a difference in the informal employment sectors by absorbing both unskilled and low-skilled labourers.

The research commissioned by Teweldemedhin (2009) investigated the impact of the trade liberalisation on the ability of the agricultural sector to contribute meaningfully to economic growth and poverty reduction in South Africa. He employed the cross-sectional and the time series approaches, covering nine agricultural commodities and covering the period from 1995-2007 and 1970-2007 respectively. He discovered that the desired growth was attainable by trade openness, improved education and financial

depth in the agricultural sector. He also concluded that trade agreements generally enhance the flow of trade between South Africa, African regions and other countries. Hence, he advised that maintenance of trade links is prudent since it has the potential to extend to developed regions and countries.

Setshedi (2019) empirically analysed the macro-economic variables towards agricultural productivity in South Africa. He applied the VECM and the Johansen cointegration approaches to analyse both the long-run and the short-run relationship between the macroeconomic variables and the agricultural productivity covering the period between 1975 and 2016. He found that there is a long-run relationship between agricultural productivity and all the other macroeconomic variables. He reached the same conclusion as Teweldemedhin (2009) regarding the financial support towards the improvement of farming skills and infrastructure. Farmer support is also encouraged in the form of investments by both the public and private organisations.

Kargbo (2007) examined the dynamic effect of macroeconomic variables (inflation rate, money supply, money and interest rate, exchange rate) on the agricultural sector in South Africa. He used the VECM to interrogate the data within the 1957 and 2004 parameters. He concluded that all the chosen variables have a positive and significant impact on agricultural output. He concluded further that macroeconomic instability is a result of agricultural prices.

In contrast, however, the study undertaken by Greyling (2015) using the Engle-granger two-step technique on the data covering the period between 1970 and 2010 revealed that the long-run inflation rate hurts agricultural productivity. He recommended that the government should support the agricultural sector through protective policies and investments towards the promotion of agricultural exports.

The myriad of researchers has established a positive, significant and unidirectional relationship between agriculture and economic growth and development where agricultural exports are cited as growth determinant. The theories of agriculture and economic growth and those of agriculture and economic development were reviewed to establish the economic growth and development linkages to the agricultural sector. However, there is a lack of consensus among researchers concerning the relationship among the chosen variables and the impact of agriculture on growth and development. Nonetheless, the said variables were mostly researched in isolation as in cases of Awokuse and Xie (2015); Kenny (2019); Lambert, Lim, Tweeten, Leistritz, Wilson, McKee, Nganje, DeVuyst and Saxowsky (2006); Meijerink and Roza (2007:1); Rahman and Hossain (2014); Siaw, Jiang, Pickson and Dunya (2018) and Verter and Bečvářová (2016).

Notwithstanding, fragmentation of empirical findings, contributions from the structural change and economic growth theories provide a concrete analytical framework for benchmarking, evaluating and assessing the objectives of this study. Despite being fragmented, the findings are also contrasting. Therefore, this study will be supported by existing literature concerning the relations of the agricultural sector, economic growth and development and whether a long or a short-run exists.

This chapter is composed of four extensive sections (sections 2.1 – 2.4), which together, construct both the empirical and the theoretical base for the study. Section 2.1 introduces the study, section 2.2 gives clarity on the important concepts used by contra-distinguishing between economic growth, economic development and the agricultural sector. This will help give readers a greater understanding of the concepts for their comprehension.

It is a challenge to define economic growth without touching on economic development. The concepts are like the two sides of the same coin, hence the vast difference of opinions about whether growth leads to development or vice versa. While economic growth is an overall increase of the aggregate or the per capita national product as determined by the market values of all the goods produced by an economy of a country within a specified period, economic development is economic growth together with its distributing mechanism. Economic development is cited as a precursor and the outcome of economic growth. It establishes a foundation for continuous economic growth. The agricultural sector, on the other hand, links to the development process through the impact it has on food supply for survival, growth and health for both humans and animals and due to it being a factor and very fundamental to the development process. Agricultural employment, agricultural GVA and agricultural exports' roles in growth and development are said to depend on the status of the development of countries. There is a lot of controversy regarding the contribution of agricultural employment to growth and development. This is because agricultural productivity growth is inversely proportional to agricultural employment growth. Agricultural GVA also increases as employment decreases. However, all these are attributed to the agricultural structural transformation, which attests to the agricultural sector being the engine of economic growth and economic transformation. Nevertheless, the agricultural sector's effectiveness in poverty alleviation is acknowledged. Hence, the agricultural sector has become the bedrock of many developing economies.

Growth theorists attach too much value to the agricultural sector, especially the primary sector. This view comes at a time when developed countries are investing enormously in research and development programmes to raise their levels of agricultural productivity. Technical progress is a significant factor in agricultural sector growth stimulation in that an increase in the agricultural total factor productivity leads to increased employment, increased growth and improved standards of living. Theorists believe that the absence of technological progress thwarts income convergence between the developed and the developing countries. However, the transformation theorists affirm the critical role the agricultural sector plays in the process of development even where it is not the development leader. Hence, the agricultural sector was labelled a lagging sector out of which resources are to be quickly shifted out to pave way for development, making the agrarian revolution a precondition for an industrial revolution. The models used are the intersection of economics, politics and geography and as such, attract criticism.

In the developed countries, the share of agriculture has dropped considerably mainly due to income increase being inversely proportional to the agricultural gross value added. Studies concerned with development mainly focus on developing countries, hence, the lack of literature in this regard. However, developed countries are seeking to accelerate their growth. Hence, they engage in research and development towards increasing their total factor productivity. Technically induced growth is a contributory factor to the declining share of agriculture in developed countries. Amidst contradictory findings concerning the role of agriculture in the Sub Saharan region, the lack of supportive policies, resources (infrastructure, farming skills, funding) and government investment were discovered to be the most critical impediments. This is true also for South Africa. However, empirical findings from relevant case studies indicated that the agricultural sector is still an engine of economic growth and development in South Africa and other developing countries as compared to developed countries. Furthermore, the sector is not playing a growth leading but a growth permissive role in the economy of South Africa.

CHAPTER 3

A GLOBAL AND REGIONAL REVIEW ON THE NATURE OF THE AGRICULTURAL SECTOR AND ITS IMPACT ON ECONOMIC GROWTH AND DEVELOPMENT

3.1 INTRODUCTION

The previous chapter, Chapter 2, reviewed the theories and literature that are specific to the concerns of the study. It detailed and analysed theoretic prepositions on the impact, relationship and empirical findings on the impact of the agricultural sector on economic growth and development. This chapter, i.e. Chapter 3, analyses the chosen and related variable trends and performance towards the achievement of the third theoretical objective of the study, which sets to analyse global trends, regional and local historic performance and review of policies interrelated to the agricultural sector, economic growth and development in South Africa. Firstly, the chapter reviews the global trends in agriculture and sector performance. In this section, countries that have had a successful agricultural transformation that impacted positively on economic growth and development are selected, studied and profiled to benchmark on their best practices. Secondly, the African and Sub-Saharan African agricultural sector trends and performance are reviewed. Thirdly, the South African agricultural sector and its contribution to economic growth and development are overviewed. Next, the major economic policies and their impact on the agricultural sector performance in South Africa are reviewed and lastly, the whole chapter is summarised.

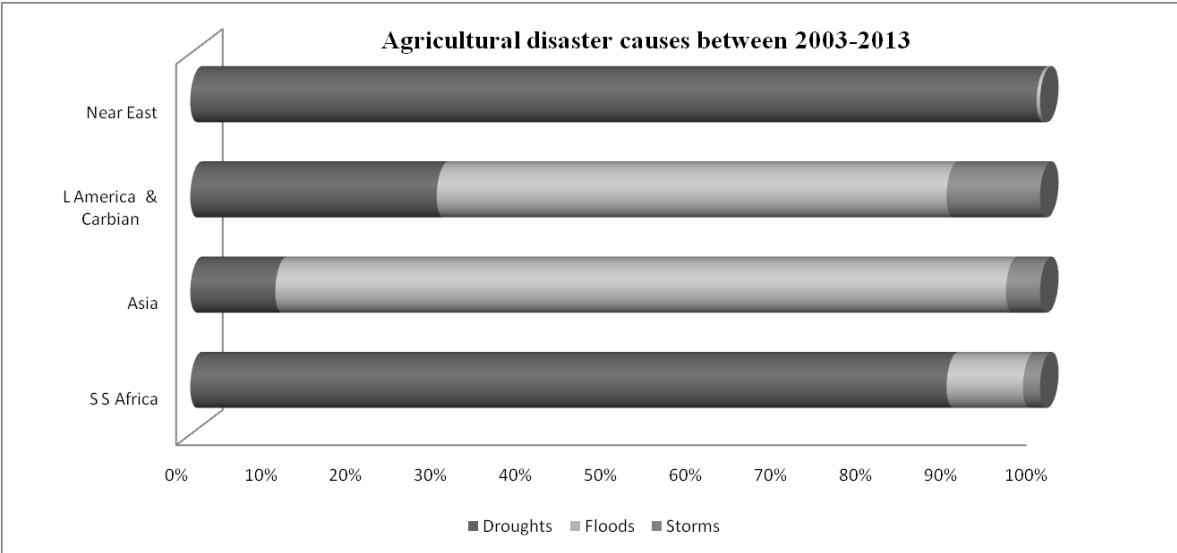
3.2 GLOBAL TRENDS ON AGRICULTURE AND SECTOR PERFORMANCE

To improve the living standards, global economies focus on reducing multidimensional poverty towards economic growth and economic development (Baez Ramirez, Caruso, Niu & Myers, 2018:56). A common but efficient strategy has always been the creation of pro-poor economic policies targeted at raising incomes or creating employment within sectors mostly endowed with the poor (Thath, 2016:3). The poor mostly dwell in rural areas and therefore, render poverty a rural phenomenon (Adjaye, 2004:196; Francois, Stringer & Sarris, 2005:61). Agriculture is also associated with economic development by a compendium of statistical descriptive analysis (Department for Internal Development (DFID), 2008:21; Cervantes-Godoy & Dewbre, 2010:13). Hence, agricultural performance is monitored through indicators that incorporate political, social and biophysical effects accommodating different economic growth stages and growth rates characterising regions from which progress of set targets is evaluated for policy adjustment or fine-tune (Olubode-Awosola, Chilonda, Minde & Bhatt, 2008:1).

The global share of agriculture in total GDP fell from nine to four percent since the 1970s (Wik *et al.*, 2007:15). The falling trend was considerably higher in developing countries, failing to keep pace with population growth and the demand for agricultural and food production (FAO, 2002:10). In sub-Saharan Africa and the North East, drought wreaked the greatest harm on agriculture between 2003 and 2013 while

in Asia, agriculture was mainly affected by floods and Latin America and Caribbean countries mostly suffered floods, droughts and storms to a lesser extent (World Bank, 2019:4). Low Income Countries (LICs) absorbed 22 percent impact of natural disasters, infrastructure and physical assets damages and losses caused by changes in economic flows (FAO, 2015: 67).The management of disruptive impact of climate related shocks is critical due to the latter’s debilitating effect on the social, fiscal and economic status of countries with policy intervention necessary for identification and mitigation (World Bank, 2019:3). With the assumption that exogenous shocks in agricultural output have a tremendous impact on agricultural exports, a public policy that only allows for exporting of agricultural produce after the domestic market had been supplied was introduced in Argentina (Horrell, 2014:3).Due to the negative impact of this public policy, Argentina suffered an agricultural exports reduction during the 2017-2018 droughts (Horrell, 2014:3). Figure 3.1 is an illustration of agricultural production losses after disasters in developing countries.

Figure 3.1: Agricultural production disasters cause and region (2003-2013)



Source: Own computation from FAO (2015)

Despite all stated effects, agricultural production increased three folds between 1960 and 2015 because of productivity-enhancing green revolution technologies and significant expansion in using agricultural production factors followed by remarkable industrialisation, food and agricultural globalisation process even though the progress rate does not eradicate hunger (FAO, 2017:4). The said production increase was also indirectly linked to the Washington Consensus through which countries were urged to lower fiscal deficits, import tariffs, taxes and to impose fewer international trade and capital flows restrictions, deregulation, privatisation including secure property rights and a greater role for markets in allocating resources as a general rule (DFID, 2008:12).

In addition, Cervantes-Godoy and Dewbre (2010:20) noted significant growth in agricultural performance and an impressive reduction in poverty from 25 developing countries to which performance they attributed to both the Washington consensus and the Maputo 2003 Declaration. The Maputo Declaration is the

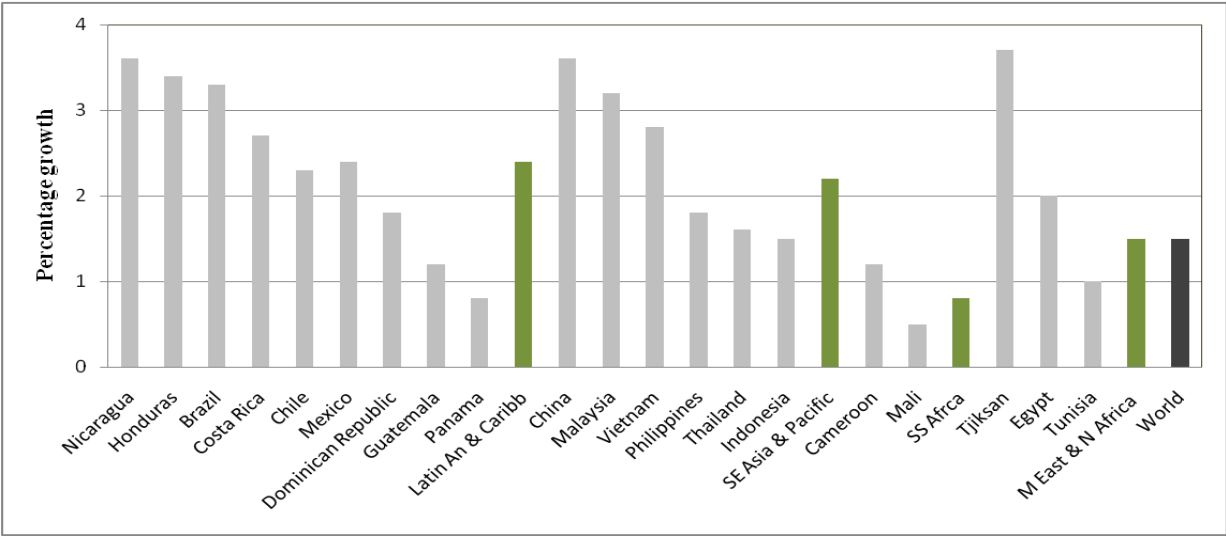
Comprehensive Development Programme for African Agriculture (CAADP) to which governments from African states committed to appropriating 10 percent of their national budgets to spend towards six percent agricultural performance improvement in their countries (Cervantes-Godoy & Dewbre, 2010:20; Olubode-Awosola, Chilonda, Minde & Bhatt, 2008:1). It is a stylised fact that all countries whose technical efficiency coefficients were at or below 0.6 in 1980 had their total factor productivity growth at 3.6 percent while countries which were at the frontier in 1980 had only registered a 1.3 percent growth, a clear sign of productivity levels catch-up between low and high performing countries (Coelli & Rao, 2005:131).

The small average annual agricultural total factor productivity growth from 116 countries recorded between 1961–1980 and 1981–2000 resulted from the opening up of the Eastern Bloc after the collapse of the Soviet Union because of the overnight disappearance of \$6 billion in subsidies during 1989 (Coelli & Rao, 2005:120; Ludena, 2010:21; Ludena, Hertel, Preckel, Foster & Nin, 2007:6). Similarly, a global grain reserve reduction of 50 percent presenting demand/supply imbalance was discovered and presumed to have been caused by the slow rate of production in the global food economy (Troostle, 2010:2). However, Ray (2008:2) learnt that the decline in reserves as highlighted resulted from the Chinese deliberate policy to lower excessive surplus cereal grain stockpiled since the 1990s and not from low productivity during 1991 to 2007.

According to Fuglie (2008:431), even though agricultural performance has been uneven since the 1960s, total factor productivity results show the sector experienced two percent average annual growth between 1991 and 2006. Following the studies by Cervantes-Godoy and Dewbre (2010), Fuglie (2008), Ray (2008), Huang, Rozelle and Qui (2008) and Sotelsek-Salem and Laborda-Castillo (2019), no evidence of low agricultural productivity was established. In fact, different variable mixtures and different agricultural performance measuring tools and methods requiring more data were used in most studies, limiting the studies to single countries because of sensitivity to the context of set countries being analysed where agricultural productivity of some countries was erroneously interpreted (Fuglie, 2008:431; Sotelsek-Salem & Laborda-Castillo, 2019:61).

Nonetheless, economic growth and development in developing countries globally outperformed that of the developed economies for the first time in the 1990s with massive reduction in aggregate poverty levels even though progress was uneven across countries (DFID, 2008:11). Notwithstanding, the fact that 820 million of the developing countries' population is undernourished, a long-term decline in real commodity prices and steady growth in agricultural output attest to the outstanding performance of the agricultural sector in meeting the increased demand of the ever growing world population (Wik, Pingali & Brocai, 2008:2). Figure 3.2 shows average annual agricultural growth measured using the total factor production between 1991 and 2006 from developing countries against annual global agricultural growth rates.

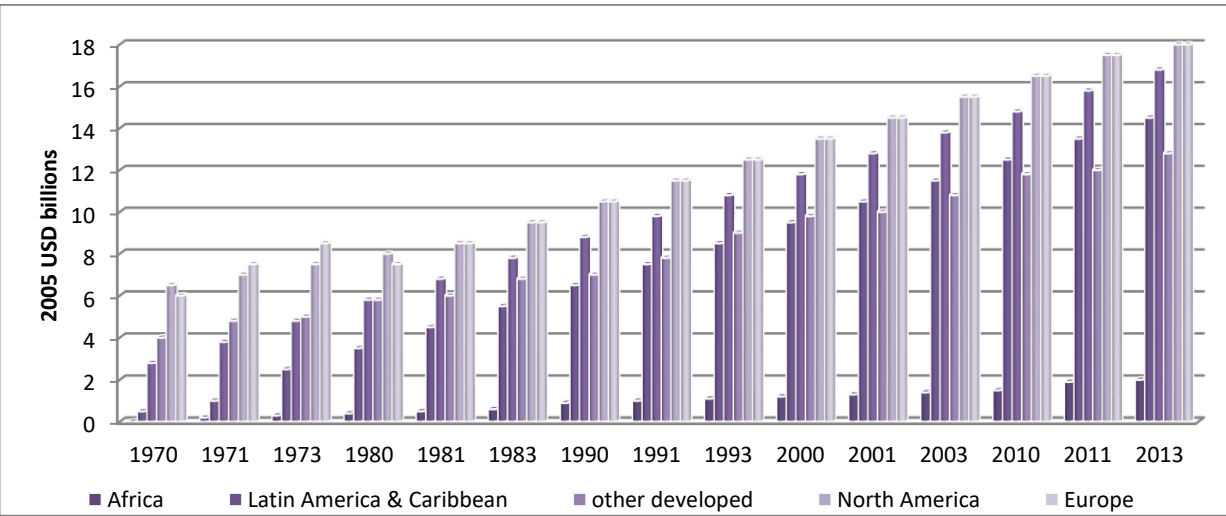
Figure 3.2: Average annual agricultural TFP growth from developing countries (1991-2006)



Source: Own compilation from Cervantes-Godoy and Dewbre (2010:20)

During 2017, the real global GDP annual rate increased by 3.1 percent with six percent, 3.5 percent and 3.4 percent contributions from Asia, Africa and Latin America respectively while North America, Europe and other developed countries combined, contributed 7.5 percent (UN, 2019:1). However, global agricultural gross value added (GVA) in Asia and the Pacific declined drastically to 7.7 percent from 23.8 percent as a sign of increased growth of other regional sectors due to the high investments in both GDP and agriculture, with Africa increasing to 12.1 percent from nine percent; North America maintaining the nine percent while Latin America and the Caribbean grew from 8.3 percent to nine percent (FAO, 2015). Figure 3.3 shows the contribution of the agricultural value added to the Global GDP by regional constant 2005 \$(billions) prices between 1970 and 2013.

Figure 3.3: Contribution of agricultural GVA to GDP (1970-2013)



Source: Author’s compilation from FAO (2015)

On the other hand, the real GDP per capita of agricultural sector contribution declined to 3.3 percent in 2013 from 4.3 percent since 1970 and the global real agricultural sector GVA increased to \$1.9 trillion in 2013 from \$0.7 trillion since 1970 (FAO, 2015). Key contributors were Europe at 27.5 percent, Asia and the Pacific at 34.0 percent while other developed countries, 12.4 percent (Herrendorf, Rogerson & Valentinyi, 2014:862). The agricultural GVA grew three folds from \$1.9 trillion in 2013 to \$3.4 trillion in 2017 and the global GDP grew four folds from \$20 trillion to \$80 trillion in monetary terms during the period between 1970 and 2017 (FAO, 2019). Again, agricultural exports recorded 10 percent of total global exports, claiming third position after fuels and the mining products at 15 percent and the manufacturing sector leading at 70 percent while products from other sectors were at five percent only (FAO, 2018:19). The subsequent section looks at the agricultural sector in developed countries.

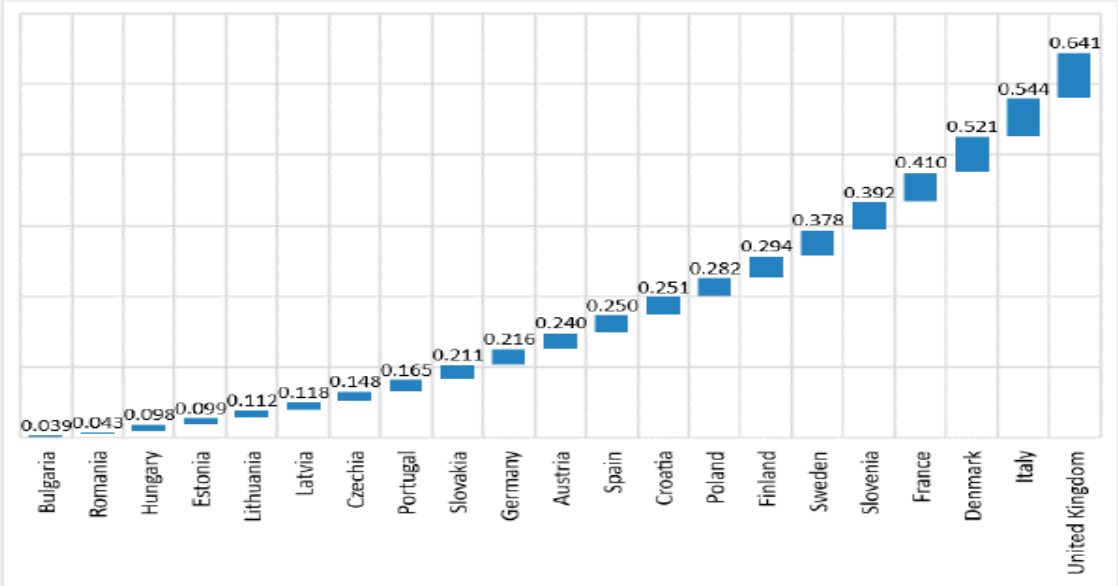
3.2.1 Agricultural sector in developed regions

3.2.1.1 Europe

In Europe, agriculture is still a significant economic sector through which social stability is promoted, poverty and inequality are alleviated without compromising environmental sustainability and the living standards of rural communities are improved (Janker, Mann & Rist, 2019:38). It is a stylised fact that agricultural performance efficiency and competitiveness come at a cost to environmental sustainability, hence, eco-efficiency is a prevailing theme in the agricultural and environment literature in developed countries (Buckley & Carney, 2013:118). Consequently, the common agricultural policy (CAP) was implemented by the EU in 2015 to seek collaboration on trade and finance, migration and security, environment and climate change and food security (Blanco, 2018:6). As a result, significant funding was allocated for the renewal of agricultural machinery for the new EU Member States towards agricultural performance improvement (Volkov *et al.*, 2019:1). The EU's agricultural sector created agricultural GVA to the tune of EUR 188.5 billion in 2017, which is a new high with a strong rebound that laid the basis for a sharp rise of about 12.4 percent in agricultural GVA and the cost of intermediate consumption goods and services grew moderately by about 1.8 percent (Da Silva, Utvik, Colantonio & Colantonio, 2018:13).

The GVA generated by the EU's agricultural sector reached a new peak in 2017, confirming the upward trend recorded since 2005 (Da Silva *et al.*, 2018:13). During 2016, agricultural employment recorded 4.2 percent of total employment that is equivalent to 9.7 million people (European Statistics (EUROSTAT), 2018:24). Figure 3.4 depicts the EU's high and low performing countries in specialist oilseeds and cereals protein crops on average using the composite VIKOR-based performance indicator. The Figure shows that Bulgaria, Romania, Hungary and Estonia, with mean values ranging from 0.039 to 0.099 being the best performers while France, Denmark, Italy and the United Kingdom are the worst performers with mean values ending with 0.641.

Figure 3.4: Composite VIKOR-based performance indicators of EU countries (2007–2017)



Source: Volkov et al. (2019)

3.2.1.2 North America

Economically, North America is a well used asahighly productive leader, even though agriculture is not a principal economic sector in North America due to the advanced nature of the economy, it is still significant with the continent taking advantage of the growing global population and demand for agricultural produce(Oosterbaan& Morris, 2017:257).Canada is the world’s fifth largest agri-food and agricultural products exporter of agricultural with the agricultural sector generating about \$100 billion for the economy (Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), 2017:6).Over 40 years, OMAFRA has engaged rural stakeholders in the development of solutions to drive agricultural and food systems innovation and growth in rural Ontario (Oosterbaan& Morris, 2017:257).However, the federal and provincial agricultural policies favour production, distribution and marketing of large scale agricultural production systems in Southern Ontario while there is policy inadequacy for support and promotion of local food security and food systems for Northern Ontario and non-metros (Hay, Varga-Toth& Hines, 2006:1).

Communities in Northern Ontario and non-metros currently depend on the unsustainable food system and generally lack food security (Chapagain, 2017:1).OMAFRA established the business attraction, business retention and expansion (BRE) project to provide expertise, strategic planning process support and financial assistance towards addressing capacity barriers the rural communities are facing and improve their ability to tackle economic development matters (Oosterbaan& Morris, 2017:257). With the agricultural sector significantly driving local, provincial and national economy, in 2016, Canada enjoyed roughly \$37 billion GDP contribution and almost 11.5 percent of total employment from the agricultural sector in the Ontario province only (OMAFRA, 2017:6). Table 3.1 lists all the activities of the community based programmes supporting agricultural development towards economic development.

Table 3.1: Community based programmes supporting agricultural development

Agriculture sector support activities	Low capacity	Medium capacity	High capacity
Investment attraction			✓
Export and trade development services			✓
Agriculture / local food			✓
Regional infrastructure (food processing facilities, grain terminals etc.)			✓
Agriculture community improvement plan			✓
Agriculture system inventory - value chain gap analysis		✓	✓
Implement local food procurement policies		✓	✓
Agriculture strategic action plan		✓	✓
Implement/update agriculture impact study		✓	✓
Agri-tourism development and local food initiatives		✓	✓
Promote local agri-business innovations	✓	✓	✓
Regional collaborations	✓	✓	✓
Food charter	✓	✓	✓
Familiarisation/ vip ag tours	✓	✓	✓
Agricultural advisory committee	✓	✓	✓
Stakeholder engagement	✓	✓	✓
Agriculture innovation, research and development	✓	✓	✓
Agri-businessworkshops: new crop opportunities, value-added food, etc.	✓	✓	✓
Community leadership & volunteer development	✓	✓	✓
Agriculture sector community profile	✓	✓	✓

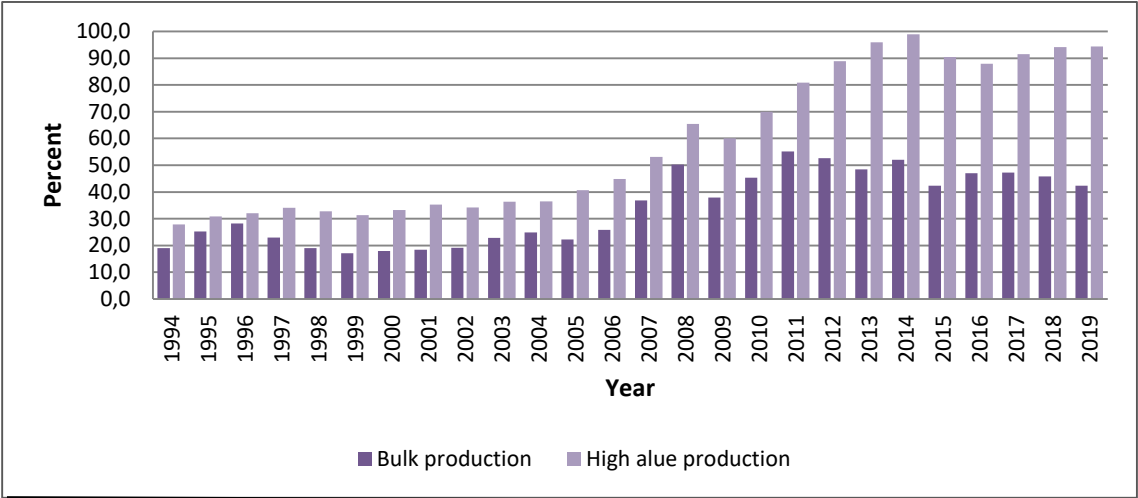
Source: Author's compilation from OMAFRA (2017:48)

The agricultural performance in the USA is mostly benchmarked against since this country maintains a considerable volume of agricultural production and displays high productivity indices and thus is considered a world leader of many crops production (Fornazier & Filho, 2016:218). Because of global population and income growth, the USA experienced increased demand for greater foods diversification (FAO, 2018:185; Tschirley, Snyder, Dolislager, Reardon, Haggblade, Goeb, Traud, Ejobi & Meyer, 2015:1).

Therefore, the high-value products (HVP) in the USA recorded strong growth in conformance to Bennett’s law, where between 1994 and 2019, the budget allocated towards food decreased against income increases (FAO, 2018:185). Notwithstanding, agricultural export growth in the USA, through increasing participation of Russia, Brazil, China, Indonesia and India, the global agricultural trade share of the USA has declined (Beckman, Dyck & Heerman, 2017:24).

Productivity growth in the USA is mainly driven by changes in both input and output mix; the increasing use of fertilizer and pesticides, the use of mechanistic ways of production and the type of production (crop or livestock) (Wang, Heisey, Schimmelpfennig & Ball, 2015:1). Even though, trade and agricultural policies together with the regulatory environment harm input use and output changes, input growth between 1948 and 2011 recorded a 0.07 percent growth against the total factor productivity average annual growth rate of 1.42 percent, where total factor productivity growth was attributed to innovation and research and development (R&D) investments (Heisey, Wang & Fuglie, 2011:5). Figure 3.5 illustrates the status of the USA agricultural export trends between 1994 and 2019, where exports of high-value products increased against the bulk of agricultural exports since 2013. This process aligns with the Schultz theory of traditional agriculture, where equilibrium shifts occur because of changes in the demand trend (Lundahl, 1987:111).

Figure 3.5: USA bulk v/s high value agricultural export production trends (1994- 2019)



Source: Beckman, Dyck and Heerman (2017:14)

3.1.2.3 Oceania

Australia and New Zealand are developed countries, which together with the Pacific Islands, are countries grouped as Oceania while the Pacific Islands are classified as developing economies (Lambeth, Hanchard, Aslin, Fay-Sauni, Tuara, Rochers & Vunisea, 2002:127). The economy in New Zealand relies heavily on international trade, particularly with Australia, China, USA and Japan, with food and beverages dominating export at 38 percent during 2013 (Turpin, Woolley, Intarakumnerd & Amaradasa, 2015:714). The government in New Zealand has prioritised investment in primary sectors with the largest sectorial priority

being agriculture at 20 percent of total investment (Turpin *et al.*, 2015:716). The agricultural sector is, therefore, a backbone of the economy in New Zealand (Ballingall & Lattimore, 2004:1). Australia remains dependent on commodity exports with the share of primary products in exports, recording 61 percent in 2018 from 59 percent in 2017 (Ballingall & Lattimore, 2004:1).

The 1980 economic reforms in New Zealand abolished farming subsidies from 35 percent in 1980 to nine percent in 1985 and further to two percent in 1990 and saw farmers adopting smart farming and increasing productivity from one percent to two percent in 1985 and subsequently to 2.3 percent annually in the 1990s (Rae, Nixon & Lattimore, 2004:5). Be that as it may, the reforms resulted in an 11 percent decline in agricultural employment (Rae *et al.*, 2004:13). Nevertheless, the negative impact of policy reforms, the agricultural sector in New Zealand has emerged as more efficient, diverse, innovative and dynamic in the early 21st century (Turpin *et al.*, 2015:10).

The share of the agricultural sector in Australia is declining, with contributions of five and 3.3 percent to employment and GDP respectively. However; agriculture remains a key economic sector for exports due to the comparative advantage of agricultural production and a huge deficit in the balance of payment (Martin, 2007:2). Australia experienced a slow agricultural productivity growth between 1977 and 2011 such that it even failed to compete against New Zealand, which is one of its major international dairy export competitors (Sheng, Gray & Mullen, 2011:2). Productivity stalled in both crop and mixed crop livestock sub-sectors between 1999 and 2010, with widespread drought causing about 0.75 percentage further economic growth decline between 2006 and 2007 (Penm & Glyde 2007:22).

At two percent steady annual agricultural productivity increase had been maintained since the 1950s despite the slow productivity growth (Gray, Oss-Emer & Sheng, 2014:18). Slower spread and adoption of new technologies, drought, smaller advances in farming systems and technologies, knowledge constraints and shifts away from productivity in research priorities were all major causes of productivity slowdown (Jackson, Zammit & Hatfield-Dodds, 2018:60). Amidst declining terms of trade trends in the form of output prices in relation to input prices, sub-sector productivity sustained output growth in both broadacre and dairy sub-sectors in Australia as depicted in Table 3.2.

Table 3.2: Average input, output and total factor productivity growth in broadacre and dairy sub-sectors (annual %)

Sub-sector	Period	Input growth	Output growth	Total factor productivity growth
Broadacre	1977–78 to 2010–11	-0.9	0.1	1.0
Dairy	1978–79 to 2010–11	-0.2	1.4	1.6

Source: Dahl, Leith and Gray (2013)

To improve agricultural performance and to keep Australia in global agricultural innovation boom leadership across economies, the Australian government collected R&D levies from agricultural sub-sectors as a strategy to fund production (Hay& Harrington, 2016:9). Agricultural sector productivity growth was enhanced by deregulating agriculture and reducing historical producer support distortion (Gray, Oss-Emer& Sheng, 2014:2). Through these reforms, the economy opened, foreign investment were liberalised and competition was increased by allowing foreign producers entry into the Australian domestic markets, while wage bargaining mechanisms were decentralised with the introduction of individual employment contracts known as Australian Workplace Agreements (Jackson, Zammit& Hatfield-Dodds, 2018:16). The latter ensures the availability of skilled labour as a significant determinant of agricultural productivity growth where it was determined through research that farmer educational attainments have a positive and significant impact on innovativeness (Nossal & Lim, 2011:1).

Consequently, the agricultural multifactor productivity recorded an annual growth rate of 2.7 percent, which is considerably higher than the market sector growth average (Hughes, Lawson & Valle, 2017:22). Farmers profitability increased by an estimated \$7.7 billion in net present value terms whilst costing was about \$2.3 billion in net present value terms representing an estimated cost-benefit ratio of \$3.30 of economic benefit for each dollar invested in R&D (Australian Bureau of Agricultural Resource Economics Services (ABARES), 2012:19). Most contributions came from the milk production that doubled despite an unchanged number of cows and a 35 percent grazing area reduction (Gray, Oss-Emer & Sheng, 2014:1). Moreover, the real agricultural production value increased from \$14 billion in the 1980s to \$30 billion between 2011–12 (ABARES, 2012:5). More than any sector during 2011–12, the agricultural exports contributed over 10 percent of total goods and services traded as well as employment to 200 000 Australian workforce (Australian Bureau of Statistics (ABS), 2011:15).

3.2.1.4 *Asian countries*

According to Kuhn, Milasi and Yoon (2018:21), the structural transformation process has been slow in Southern Asia, where agricultural employment still represents 59 percent of total employment, with manufacturing accounting for only 12 percent and the services sector for about 24 percent. Economies in South Eastern Asia and the Pacific present stronger signs of diversification away from agriculture, increasingly becoming service based economies with slight increases in the share of manufacturing employment (Kuhn *et al.*, 2018:21).

Declining share of agricultural employment coupled with high economic growth levels have led to a rapid decrease in poverty rates, especially in the Eastern Asia region (Milasi, 2019:47). China has also successfully reduced poverty, measuring household per capita income against the \$1.25/day, from 81.6 percent in 1981 to 10.4 per cent in 2005, which is equivalent to lifting 608.8 million people's livelihoods above the aforementioned poverty line in rural areas (Chen & Ravallion, 2008:10). As with India and China, accelerated agricultural development also contributed substantially to the drastic poverty reduction in

Vietnam over the past years and is likely to remain an important pathway out of poverty for many of Vietnam's poor (World Bank, 2007:7). As means to fuel poverty reduction, during the green revolution, staple food price decline reduces farm incomes, however, increased expenditure on staple food and total factor productivity will raise the demand for increased labour and the green revolution increased declining farm incomes (Lipton, 2005:13).

Another country in the region is Japan, which has the ninth largest agricultural sector in the world, having grown modestly from \$12 billion in 1970 to \$58 billion in 2013 (Goedde, Fischer, Denis, Tanaka & Yamada, 2016:3). There has also been an expeditious agricultural growth in India, China and Vietnam, which created an industrial upsurge (World Bank, 2007:7). In Taiwan, the rural development success of rural modernisation carried out by a special public-private partnership (PPP) formed under state administration (Liao & Lin, 2018:1).

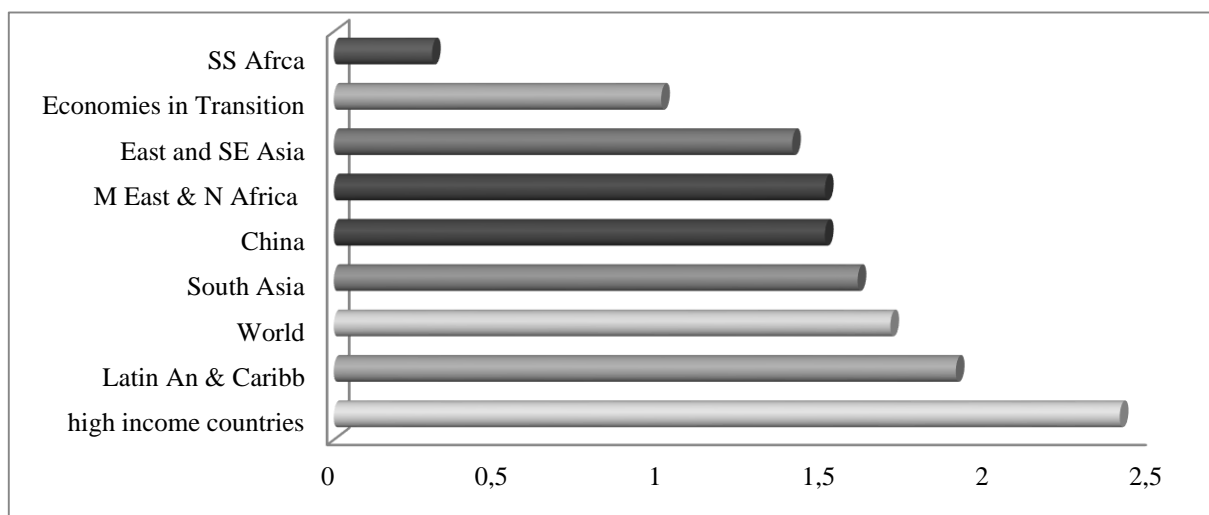
Vietnam experienced six percent high growth rates between 1993 and 1998, which led to significant increases in household incomes and therefore, increased demand for education. The average years of school attendance grew from 7.5 to 8.1 years with secondary school enrolment rates increasing by approximately 8 percentage (DFID, 2008:8). In Korea, the implementation of the New Rural Community Campaign to revitalise the agricultural industry and rural community played a significant role in making villages more vibrant places to live (Liao & Lin, 2018:4). Continuous institutional reforms and innovation also helped overcome the agricultural sector challenges and modernised agriculture through the involvement of farming cooperatives from communities and NGOs with similar governance and close relations with governments in Japan, Korea and Taiwan (Liao & Lin, 2018:4).

Despite the agricultural sector not being a key sector in the Philippines and contributing only 10 percent towards GDP, it plays a critical development role since it employs 30 percent of the country's labour force, supplying raw material, food and labour to the non-agricultural industry (Brown, Ebor & Decena, 2018:1). The government in the Philippines promulgated an Agriculture and Fisheries Modernization Act to facilitate the building of rural infrastructure, rural education, credit financing and the identification of Agriculture and Fisheries Modernization Development Zones (Habito & Briones, 2005:1). As in the case of Mexico, the agricultural sector in the Philippines is confronted with low productivity and lack of diversification due to lack of access to credit facilities, loss in biodiversity due to deforestation and a lack of investment in agriculture especially in R & D and high disaster risk index (Brown *et al.*, 2018:5). Agricultural development has been prioritised in the developmental plan 2017-2022 to improve agricultural productivity by abolishing small farmers' irrigation service fees and the implementation of the Land Administration Reform Act (Habito & Briones, 2005:5). All these have the potential of improving the sector's contribution to economic growth and employment.

3.2.1.5 South America

Living standards in Latin America have risen simultaneously with productivity during the twentieth century and that the status of health and education enhanced more rapidly than average incomes (Fitzgerald, 2004:24). Due to its fast growing population, overall economic growth in Latin America is more employment-intensive than growth in the Caribbean (Rao, 2012:3). The region is the fastest growing and is diversifying away from agriculture into the service sector (Charlton, 2015:49). Latin America and the Caribbean have experienced the highest growth rate of 1.9 percent agricultural productivity among developing regions even higher than Asian countries and all transitioning economies between 1961 and 2007 (Ludena, 2010:8). This highest growth rate resulted from the livestock sector, especially non-ruminants (pigs and poultry), due to ease of production technology transferability in these sectors from developed to developing countries (Ludena, 2010:8) (see Figure 3.6).

Figure 3.6: Annual percentage total factor productivity growth in agricultural 1961-2007



Source: Ludena (2010:8).

In Brazil, agriculture is heterogeneous because it has been undergoing structural changes towards productivity increase through technologies, modern techniques and the use of land and labour since 1970 (Fornazier & Filho, 2012:15). Using external competitiveness models was employed to narrow the international productivity gap (Filho, 2013:2). Brazil's economy boasts the strongest economic performance regarding other developing regions through which its efficiency increased and the gap with respect to high-income countries, especially the United States, narrowed (Ludena, 2010:5). While some states within Brazil experienced negative growth, an annual average growth rate of 2.27 percent was posted consistently between 1970 and 2006 (Gasques, Filho & Navarro, 2010:13). Even though agriculture is a major contributor to GDP, exports, employment, energy and food in Brazil, development does not homogeneously occur across all regions in Brazil (Vieira Filho, 2016:204).

As a strategy to improve agricultural performance, the regional agricultural sector is sub-divided according to income levels, i.e. extreme poverty, low income, middle income and high income sub-sectors towards designing different strategies specific for each sub-division to achieve more productivity using fewer inputs through land economising, labour-saving technologies and reduction of negative impact on the environment (Filho, 2013:7). Table 3.3 captures different sub-divisions of the agricultural sector in Brazil and relevant strategies as a form of government intervention.

Table 3.3: Regional agricultural sector sub-divisions since 2006

Income level	Number of farms (thousands)	Annual (billions)	Government strategy
Extreme poverty	3.2 million	6.5	Excluded from economic activity to focus on local food production.
Low income	960 000	18.5	Development policies, credit access, technical assistance and R&D.
Middle income	416 000	59.9	Policies stimulate competitiveness, export promotion, improve distribution logistics, agricultural insurance and technological absorption capacity, sales growth, focus on crops conducive to prevailing soil and climate conditions.
High income	23 000	81.7	
Total	4 641	166.7	

Source: Author's compilation from Fornazier and Filho (2016:217)

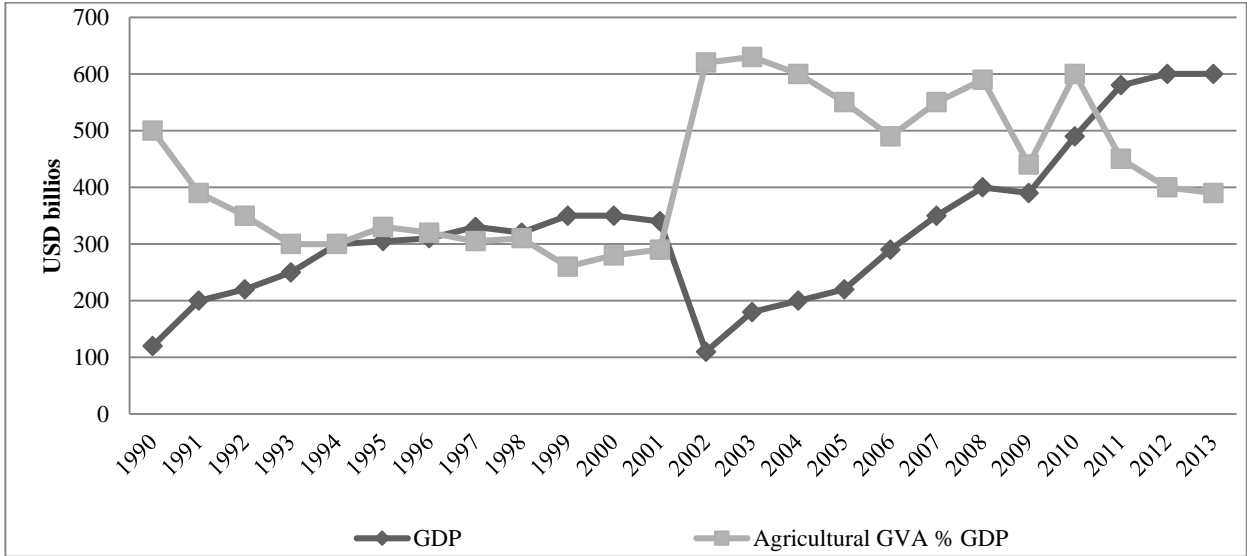
In Mexico, this economy is heavily invested in rural infrastructure, rapid industrialisation of agriculture, agricultural mechanisation and rural education (Charlton, 2015:48). Mexico is a model for green revolution technology package promotion globally and has shifted from a dualistic agricultural policy to industrialisation, with increased agricultural productivity as a key focus towards economic development (Sonnenfeld, 1992:29). Despite its huge investment in rural infrastructure, rapid industrialisation of agriculture, agricultural mechanisation and rural education, Mexico ended up with environmental destruction instead of agricultural development (Camps, 2014:6).

The country sustained high social inequality rates, declining agricultural productivity, rapid population growth, agricultural policy changes and ultimately, it lost its self-sufficiency in food status (Orozco-Ramirez, Astier & Barrasa, 2017:66). A continuous decline in living conditions and deteriorating environmental status in rural Mexico resulted in forced emigration of farmers to other regions inside the country and to the USA (Camps, 2014:9). Nonetheless, the migration had both negative and positive impact on the agricultural sector of Mexico in that between 1995 and 2010 agricultural employment declined by about 25 percent. However, farmworker productivity tripled and per capita income grew to about \$15,000 per year (Charlton & Taylor, 2013:2). Consequently, rural Mexico has started transitioning out of agriculture into the service sector with a small low-skilled labour force, declining fertility rate and rural

education expansion as well as an increase of 4.9 years of fifty years and older, 9.7 years of twenty years and older average schooling where they better educate agricultural labour force (Charlton, 2015:2).

Next is Argentina, an upper middle income country and among world leaders in the production and export of agricultural products because of its rich endowment with natural agricultural production resources and human capital, even though it is relatively sparsely populated (Lence, 2010:4009). The agricultural sector is a key economic sector in Argentina with agricultural GVA contributing about 8.7 percent to GDP, constituting an average of 60 percent in the country’s exports and a significant source of foreign revenue between 2010 and 2019 (World Bank, 2019:16). However, agricultural employment has been disappointing at two percent contribution to total employment in 2018 because of a high production mechanisation (OECD, 2019:17). Figure 3.7 illustrates the gross domestic product growth and the agricultural sector GVA contribution to Argentina's economy between 1990 and 2013.

Figure 3.7: GDP v/s Agricultural GVA in Argentina (1990-2013)



Source: Own computation from Horrel (2014:14)

Even though the agro-food sector has grown and innovated remarkably in the last three decades, driven by technological change and high international agricultural prices, agricultural policies have burdened the agro-food exporting through export taxes (Antón, Cervantes-Godoy, Bossard & Guerrero, 2019:11). Argentina is a large net exporter of soybean, corn, wheat, sorghum, sunflower, rice, milk and beef. However, policy instability, volatile macroeconomic conditions and an underdeveloped financial sector creates an unfavourable environment for agricultural risk management (Lema & Gallacher, 2015:1). Unlike with Brazil, where the sector is divided according to income levels for better management by the government, the apple-and-pear value chain in Argentina is dually structured with large and medium-sized farms coexisting with less integrated small-scale farmers (Horrell, 2014:33). The agricultural sector in Argentina suffers low levels of investment in private R&D including a lack of infrastructure (Lema & Gallacher, 2015:2).

According to Lence (2010:422), the agricultural sector played a significant role regarding fiscal surplus and the accumulation of reserves after the 2008 financial crisis prompted the government to impose taxes on agricultural exports to obtain hard currency. Cicowicz, Díaz-Bonilla and Díaz-Bonilla (2010:121) insinuated that tax on agricultural export assists in poverty and inequality reduction as well as generating employment opportunities, which would not be provided by the sector following the production and export of raw materials in support of more competitive exchange rate. In contrast, the population is faced with qualitative and quantitative food security challenges, which despite Argentina being both a net producer and net exporter of food to the world, these challenges are not being solved (Feeney & MacClay, 2016:1).

Despite a well-developed agricultural sector with high productivity levels averaging at 2.8 percent annual rate of increase for the past two decades and currently at 4.4 percent, the level of development in Argentina is moderate (Lence, 2010:411). Severe cases of chronic under-nutrition are caused by the government implementing export of raw material restrictions to redirect food supply towards local markets, which causes the production of some raw materials to decline and food prices to increase (Feeney & MacClay, 2016:2).

3.3 AFRICAN AND SUB-SAHARAN AFRICA (SSA) AGRICULTURAL SECTOR TREND AND PERFORMANCE

Most countries in Africa are engaging in agriculture to help create more jobs for the substantially high numbers of unskilled labourers as they have realised the potential of agriculture in meeting the needs of over 41 percent of illiterate African adults and rural poor across the continent (Ojebode, 2017). The poverty depth and breadth remains a dominant challenge in Africa as evidenced by the analysis of poverty trends against global trends, which have revealed that most of the 700 million people living in extreme poverty in 2015 were in SSA (Mahembe & Odhiambo, 2018:33:24). Despite the agricultural sector being the hope for Africa, its share in the continent's economy is surprisingly low and has significantly declined from 22 percent in 1961 to 11.9 percent in 2011 mainly because of the increased role of mineral and energy exports (Timmer, 2014:17). Though the contribution was far below the six percent target set at Maputo in 2003, African agricultural productivity grew by an annual average rate of 3.2 percent a year between 1990–92 and 2009–11 (Wiggins, 2014:538). This growth was faster than the population growth and expanded the per capita production by 0.8 percent a year throughout the 1970s and 1980s (Wiggins, 2014:538).

3.3.1 North Africa

North Africa comprises Morocco, Algeria, Tunisia, Libya, Mauritania and Egypt and is a successful transformation case with 3.7 percent economic expansion from improvement in tourism revenues and growth in agricultural productivity (Bakari & Mabrouki, 2018:11). This growth is higher than the 1.5 percent Euro zone average and 3.1 percent global average (Mukasa, Woldemichael, Salami & Simpasa, 2017:1). With a 40 percent labour force in agriculture, Morocco provided free health care and free education

as well as affordable access to basic food products for both the poor and rich after the attainment of its independence in 1956 (Achy, 2010:4). In 2015, the agricultural sector contributed 14 percent to the GDP causing the economy to grow by 4.5 percent because of agricultural productivity increase resulting from the combined positive effects of a good rainy season and implementation of the Morocco Green Plan (North African outlook (NAO), 2019:3). Algeria, Libya and Mauritania depend on commodities and Mauritania contributed only 0.5 percent to GDP (NAO, 2019:6). Moreover, close to 10 percent of the population (about 18 million people) in the North African region lived below \$2.90 a day while close to 20 percent of the labour force, particularly the youth, was unemployed during in 2016 (North African Outlook, 2018:21).

Nonetheless, North Africa experienced less than \$1.90 a day decline from about 13 million (13 percent) in 1981 to three million (2percent) in 2015, when the number of people living in extreme poverty was rising in Africa (Achy, 2010:13). Rapid poverty reduction is attributed to faster growth in per capita consumption increasing at three percent average annual rate from 1980 to 2013, doubling in approximately 20 years (NAO, 2019:7). Rising populations, increasing demand for value added food and improved production capacities and higher per capita income were favourable factors boosting agricultural sector productivity growth (Iyigun, 2016:1).North Africa was ranked first in Africa with an average human development index at 0.667 (NAO, 2019:14).

3.3.2 West Africa

The West Africa region comprises Benin, Burkina Faso, Cape Verde, Gambia, Cote D'Ivoire, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo.All countries' governments and development partners recognise the agriculture sector's significant role in economic growth and poverty reduction after years of neglect (Osabohien, Matthew, Gershon, Ogunbiyi& Nwosu, 2019:87). Cape Verde, Ghana, Burkina Faso, Nigeria and Mali had strong per capita GDP growth of between two and three percent per annum over the past two decadesthough growth in Ghana and Burkina Faso was broad-based while in Nigeria and Mali,it was coupled with worsening income distributions (Hollinger& Staatz, 2015:3). Hollinger and Staatz (2015:24) advised further that Cape Verde, Côte d'Ivoire, Ghana and Senegal had the lowest poverty rateswhile in Guinea Bissau, poverty rates remained unchanged; there was a decline in Burkina Faso, Mauritania, Mali, Sierra Leone, Togo, Gambia, Benin and Liberia. Nevertheless, the total number of undernourished people in West Africa declined from 37.3 million in 1990 to 28.5 million between 2006 and 2008 (Hollinger& Staatz, 2015:24). In addition, agricultural employment in the region accounted for about 54 percent of the total employment rate in 2016 and the agricultural sector contributed 35 percent to GDP during the same period (Osabohien *et al.*, 2019:83).

West Africa, with the exclusion of Nigeria, specialises in cash crops like cotton, coffee, cacao, groundnut, palm and cashew nut export, representing about \$6 billion or 16.3 percent of the region's total exports (Blein, Soule, Dupaigne, & Yerima, 2008:10).However, Nigeria's main export is oil and it accounts for 10

percent of total exports in the region (Blein *et al.*, 2008:10). In 2017, West Africa's average human development index was 0.461 (NAO, 2018:21).

3.3.3 Central Africa

Central Africa consists of Cameroon, Central African Republic, Chad, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon and São Tomé and Príncipe with a population of about 185 million in 2017 that covered an area of 6.7 million square kilometres (Regional Economic Outlook (REO), 2019:3). The region is highly unequal at number ten of the 19 extremely unequal countries in the world and has just exited a -0.2 percent recession in 2017 and achieved a 2.2 percent growth rate in 2018 (World Bank, 2018c:119). With the exclusion of Cameroon, Central African Republic and Chad, the region depends highly on oil revenue with 18 percent GDP contribution (NEPAD, 2013:28). GDP contributions of 17, 43 and 50 percent GVA from Cameroon, Central African Republic and Chad, respectively evidenced great agricultural potential (World Bank, 2016:16).

In addition, more than half of the labour force in the latter countries is employed in agriculture while in Equatorial Guinea and Gabon, only 19 and 16 percent labour force is employed in agriculture, respectively (World Bank, 2018d:5). The region is a strong exporter of chicken, cocoa, fruits and vegetables while Cameroon was the leading exporter at \$13 million, the Republic of Congo second at \$2 million and the rest in the region following at less than \$1 million during 2015 (World Bank, 2018d:5). Overall, agricultural sector performance in Central Africa has been disappointing, impeded by political instability, poor climatic conditions and recurring conflict (NEPAD, 2013:19). The average human development index rating of Central Africa was 0.503 in 2017 (NAO, 2018:21).

3.3.4 Eastern Africa

The agricultural sector is a significant economic activity that plays a critical role in economic growth, food security, poverty reduction and employment in Kenya, Tanzania, Burundi, Ethiopia, Djibouti, Seychelles, Mauritius, Reunion, Somalia, Somaliland, Madagascar, Malawi, Burundi, South Sudan, Comoros, Rwanda, Eritrea and Uganda (East Africa Economic Outlook (EAEO), 2019:1). However, productivity growth is depressed due to the continued use of crude implements like hoes and cutlasses that yield little returns (Osabohien *et al.*, 2019:88). Despite the region being dependent on rain-fed agriculture, it experiences negative impact from the climatic change on the yield quality and quantity (Ouma, Kimani & Manyasa, 2016:206). Moreover, the agricultural sector in the region is dominated by smallholder farmers whose crop production results mainly from land expansion rather than from production efficiency while land expansion is also restricted due to population densities (Karugia, Massawe, Guthiga & Macharia, 2013:22). Consequently, the low agricultural productivity levels contribute to slow overall growth and to low per capita income levels while high population growth rates also pose a threat to food security (Ouma *et*

al.,2016:206).In addition, high staple import levels cause extensive child and adult malnutrition as well as high child mortality rates (Waithaka, Gerald, Timothy&Kyotalimye, 2013:2).

Real GDP in East Africa grew by almost 5.7 percent in 2018, the highest in Africa and SSA with the highest contributions from Ethiopia, Rwanda, Tanzania, Kenya, and Djibouti (EAEO, 2019:58).The average annual contribution of the agricultural sector to the GDP was 43 percent in 2013, with Burundi, Ethiopia, DRC, Tanzania and Sudan contributing 50 percent while Kenya, Madagascar and Eritrea were the lowest at 30 percent (Waithaka *et al.*, 2013:2). According to Ouma *et al.*, (2016:206), 75 percent of the labour force in East Africa is engaged in agriculture. However, the cause of the lowest performer in Kenya was structural transformation towards a less agriculture-based economy (Waithaka *et al.*, 2013:2).Subsequently, the agricultural value-added from Kenya increased from KSh 2,699.1 billion in 2017 to KSh 2,885.2 billion (6.9 percent) in 2018 due to favourable weather conditions (Kenya Bureau of National Statistics (KBNS), 2019:110). The average HDI rating of East Africa was 0.496 in 2017 (NAO, 2018:21).

3.3.5 Southern Africa

The Southern Africa region of the African continent is formed by Angola, Botswana, Lesotho, Mozambique, South Africa, Namibia, Zimbabwe, Zambia and Swaziland (Sikora, Terry, Vlek& Chitja, 2017:3). The region has a population of 160 million people, growing at about 2.4 percent a year since 2010 (Southern Africa Economic Outlook (SAEO), 2019:4). According to Minde *et al.*, (2008:1), Agriculture is the bedrock of the Southern Africa economy with 70 percent of the population depending on agriculture for employment, food, opportunities and income generation (Bekun& Akadiri, 2019:2).Similarly, as in the case of Eastern Africa, the Southern Africa region is characterised by a prevalence of rain-fed agriculture dependant smallholder farmers (Karugia *et al.*, 2013:22).

Smallholder dominance poses challenges for policymakers and other relevant stakeholders because of the unsustainable nature of its operations due to inability to attract resources and access agricultural markets (Ransom, Cockerill& Weatherly, 2019:7). The agricultural sector in the region grows at 2.6 percent per annum and contributes about eight percent to the GDP with gross export earnings at 13 percent (Bekun& Akadiri, 2019:2).The key agricultural production in the region is maize, fruits, tubers, roots, beef and milk (Chilonda *et al.*, 2007:1). However, the region has 16 percent severe malnutrition cases and high HIV infection rates with Swaziland and South Africa being the most affected at 27 and 20 percent infection cases, respectively, affecting agricultural labour productivity and health budgets negatively (Ransom *et al.*, 2019:11).In addition, the region experiences extreme inequality that exacerbates the inability of vulnerable communities to participate in agricultural transformation (Open Society Initiative for Southern Africa(OSISA), 2011:1).

Concerning per capita income growth between 1990-2006, Angola was the highest at 12.6 percent, Mozambique was the fastest growing at 7.8 percent while South Africa's and Botswana's growth rates

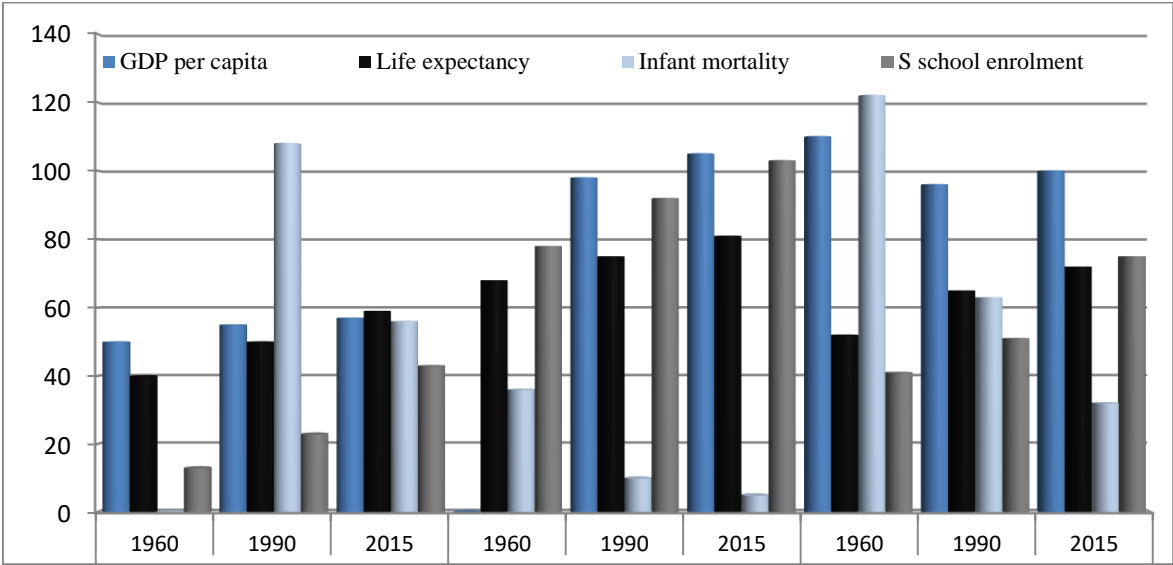
ranged between 5.5 and 6.2 percent, respectively, with Swaziland the lowest at 3.2 percent (Minde *et al.*, 2008:10). The poverty rate in the region was hovering around 33 percent, hence the establishment of agriculture-led growth strategies towards poverty reduction (Chilonda *et al.*, 2007:1). Notwithstanding the high growth rates, poverty and inequality levels remained high during the same intervals (World Bank, 2017:4), confirming that high growth rates do not translate into poverty reduction, inclusive growth and development in Africa and the SSA countries (Kolawole & Omobitan, 2014:63). The average human development index rating of Southern Africa is 0.503 (NAO, 2018:21).

In a nutshell, the current economic landscape in SSA is characterised by uneven growth patterns created by globalisation through the significant impact it has on the world economic structure from which costs and benefits are unevenly distributed within and between countries (International Labour Organisation (ILO), 2008:2). Since the employment structure in SSA is transforming rapidly, the agricultural sector has become a critical source of employment and livelihoods (Jayne, Yeboah & Henry, 2017:2). Rapid urbanisation and strong economic growth are achieved through agricultural employment but economic development remains constrained (Diao *et al.*, 2019:36). Food insecurity is also impacting negatively on national security and labour productivity as well as placing a heavy burden on both the national health and social security systems (Hendriks & Olivier, 2015:556). Even though some SSA countries like South Africa and Equatorial Guinea boast extremely high levels of education at above 90 percent (Beegle, Christiaensen, Dabalén & Gaddis, 2016:87), most countries like Ethiopia increased the undergraduate degrees enrolment from 3000 during 1990 to 10000 during 2010, yet on average, the labour force educational attainment remains below the secondary school level and below the primary level for agricultural workers due to the poor quality of and limited access to education (Sulla & Zikhali, 2018:4). Therefore, both the level of education and access to modern technologies has not been sufficient enough to raise agricultural productivity to levels that are sufficient for poverty reduction (Ferreira, 2018:35).

According to Teal, Sandefur, Fafchamps and Soderbom (2006:3), lack of economic growth in SSA is attributed to weaknesses in both the macro and micro-economic links through which human development and economic growth operate especially the links among, growth, wages and poverty. Teal *et al.*, (2006:3) alluded further that while the per capita GDP is correlated with global real wage increases, shortage of skilled workers with post secondary education, weak domestic investment climate, low labour productivity and poor infrastructure quality have been a norm in most African countries. There has been a failure to increase the continent's tax base to enable more spending on key public services to raise the incomes of the poor and increase their ability to buy goods and services that improve the levels of education and health (Department for International Development (DFID), 2008:9). Due to the impact of extreme inequality and low life expectancy, the SSA economy is much poorer than the level of its per capita income suggest (Jones & Klenow, 2016:3). Hence, regional economic and agricultural performance on average had significantly fallen below world averages (Fosu, 2012:1).

Figure 3.8 shows low life expectancy, high infant mortality and low school enrolments levels of people in developing countries. All measures rank the lowest for SSA, where only 59 years of life expectancy is experienced as compared to 81 years of life expectancy in the High Income Countries. One baby out of every seventeen babies born dies before they reach the age of 5 years and secondary schools registered only 43 percent of learners in 2015. These trends, together with those comparing SSA to China, invalidate the findings of a positive correlation between population and economic development (Furuoka 2009:1).

Figure 3.8: Non-monetary poverty indicators by regions of the world



Source: Mahembe and Odhiambo (2018:20)

When Sub Saharan Africa’s agricultural performance is compared to that of China, due to their limited area of arable land and high population growth rates, China has significantly increased both labour and land productivity whereas in Africa, land productivity has not risen while labour productivity has fallen (Khan & Khan,1995:1). Table 3.4 compares the microeconomic and agricultural performances of both SSA and China. The share of GDP has stayed between 30-35 percent in 25 years while the share of agriculture in the GDP in China had fallen from about 38 percent to 27 percent during the same interval. However, agriculture employs about two-thirds of the total labour force, both in SSA and China. The low real GDP growth rate in SSA is mirrored by the poor performance of the agricultural sector with an annual output growth rate of 1.9 percent only during 1965-1980 and 1.7 percent between 1980 and 1992.

Table 3.4: Macroeconomic and agricultural performances indicators in SSA and China

Indicators (% annual average growth rates)	Sub Saharan Africa			China		
	1965-1980	1970-1980	1980-1992	1965-1980	1970-1980	1980-1992
Population	2.7	2.8	3.0	2.1	1.8	1.4

Indicators (% annual average growth rates)	Sub Saharan Africa			China		
	1965-1980	1970-1980	1980-1992	1965-1980	1970-1980	1980-1992
Period						
GDP	5.3	3.6	1.8	6.4	5.2	9.1
Share of agriculture in GDP	35	32	30	38	28	27
Agricultural Employment	78	73	66	78	74	67
Agricultural Value added	1.9	1.6	1.7	3.0	2.6	5.4

Source: Khan and Khan (1995:4)

3.4 AN OVERVIEW OF THE SOUTH AFRICAN AGRICULTURAL SECTOR AND ITS CONTRIBUTION TO GROWTH AND DEVELOPMENT

3.4.1 Socio-economic background

The South African economy is growing very slowly even though world economies are experiencing accelerating economic growth rates (World Bank, 2018a:6). Since democracy, there has been a moderate reduction in poverty levels, combined with a sharp rise in income inequality, with primary sectors being the key drivers of growth, particularly the agricultural and the mining sectors (Bhorat, 2016). In 2015, over 50 percent of the population lived below the upper bound poverty line of R992 per person per month (StatsSA, 2019). South Africa's integration into global and regional value chains except for parts of the services sector is weak, largely because its main exports continue to be unbeneficiated commodities (World Bank, 2018a:6).

South Africa could not address the triple challenges of poverty, unemployment and inequality with the figures constantly rising and placing an unnecessary burden on the limited government resources (Chipeta, 2016:1). Weak and declining growth was consistently posted by South Africa since 2011 (World Bank, 2018a:6). A study by Turrey and Maqbool (2018) attests to one percent income growth levels being able to translate into 4.3 percent poverty decline in very low inequality countries and a 0.6 percent poverty decline in highly unequal countries. The result in South Africa has been moderate poverty reduction levels accompanied by a sharp rise in income inequality since 1994 (Bhorat, 2015). Due to extremely high inequality levels, poverty reduction in the country is hindered (Bhorat, Naidoo, Oosthuizen & Pillay, 2015:4). Inequality, in return, is perpetuated mainly by insufficient employment creation from non-poor economic growth strategies and a legacy of exclusion causing the country not to only lag peers on poverty and inequality reduction but also in consumption growth inclusiveness (Sulla & Zikhali, 2018:60). Poverty and the lack of economic growth in South Africa are blamed on high illiteracy levels (Tshuma, 2012:4015). However, there has been an improvement in enrolment numbers even though approximately

50 percent of the population aged between 25 and 34 did not complete upper secondary education in 2015 while the quality of education is also poor (Bhorat *et al.*, 2015:7).

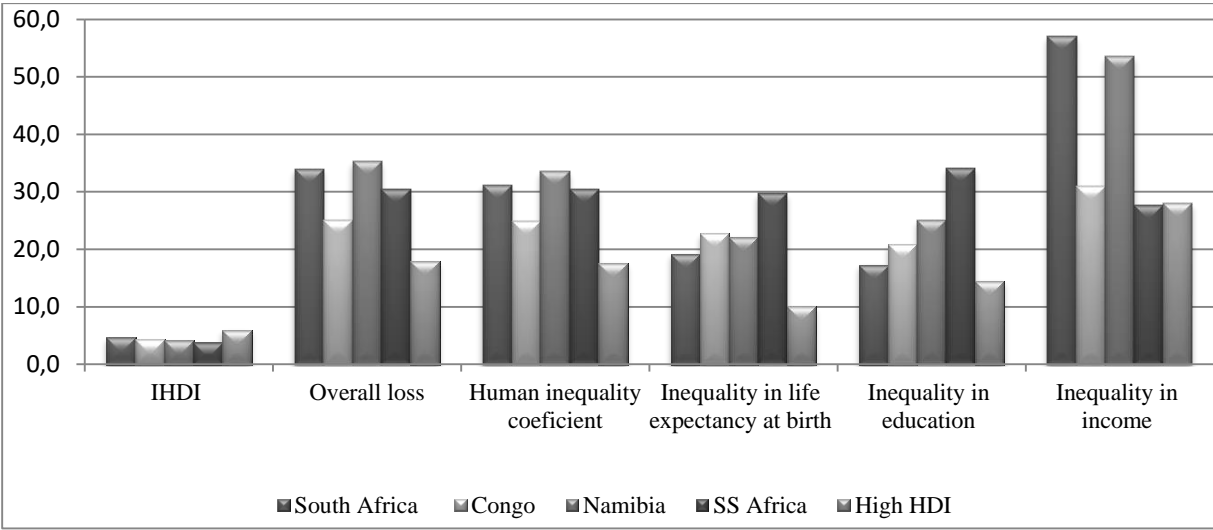
Education plays a critical role in helping medium-size farmers to move towards the agricultural productivity frontier by increasing their absorptive capacity and adoption of new practices and technologies (Filho, 2017:21). Lack of education has also been cited as a major barrier slowing the uptake of agricultural innovations (Ferreira, 2018:3). Nonetheless, the government is already allocating a high share of resources to education relative to other developing countries (Keeton, 2014:31). Hence, the Opportunity Index for South Africa indicates the near-universal access to primary education achievement with the matric performance analysis for 2002, 2009 and 2016 revealing a 65 percent increase of university entrance for black engineering students (World Bank, 2018a:27). The results of the Opportunity Index together with a rapid rise in access to electricity, telecommunications, sanitation and school infrastructure improve opportunities for black children even though persistent disparities in access to quality basic and higher education and the ability to finish primary school on time continue to constrain progress (Sulla & Zikhali, 2018:48).

During 2017, primary sectors were the key drivers of growth, particularly the agricultural and mining sectors, which encouraged household spending on consumer goods (World Bank, 2018a:6). However, the impact was insignificant and failed to bring changes in per capita terms (Swartz, 2019:132). Nonetheless, HDI improvements not only depend on GDP growth but strong income distributive mechanism of a country, too (Ranis, 2004:4). The South African government spends on free health care and free education from highly progressive personal income taxes collected while households spend income from social grants towards human development oriented goods and services (Osabohien *et al.*, 2019:84; Maboshe & Woolard, 2019:1). These cash transfers were effective in income redistribution and reduction in both inequality and poverty from 0.72 percent in 2006 to 0.68 percent in 2015 and from 51 percent in 2006 to 40 percent in 2015 respectively (World Bank, 2018e:xxv).

Hence, there was a rapid decline in childhood mortality projecting the achievement of sustainable development goals (SDG) 2030 target of 25 per 1000 for children under five years mortality rate (Nannan, Groenewald, Pillay-van Wyk, Nicol, Msemburi, Dorrington & Bradshaw, 2019:485). South Africa was, therefore, ranked at a high HDI value category of 0.705 in 2018 (an increase from 0.625 since 1990), which positioned the country at number 113 out of 189 countries and territories (Conceição, 2019:2). Figure 3.9 highlights South Africa's progress in each of the HDI indicators between 1990 and 2018 when compared to the HDI status of the world, HICs and that of Namibia and Congo, which ranks above 0.547 in SAA. The life expectancy at birth increased by 0.5 years; the mean years of schooling increased by 3.8 years and the expected years of schooling increased by 2.3 years. There was a GNI per capita increase of about 22.6 percent between 1990 and 2018. However, the 2018 HDI fell to 0.463 a loss of 34.4 percent when compared to Congo and Namibia with losses of 25.0 percent and 35.3 percent respectively due to high inequality. The

loss due to inequality registered on average, 17.9 percent for High Income Countries and 30.5 percent for SSA. South Africa registered a 31.4 percent human inequality coefficient.

Figure 3.9: SA Human Development Index (HDI) trend between 1990 and 2018



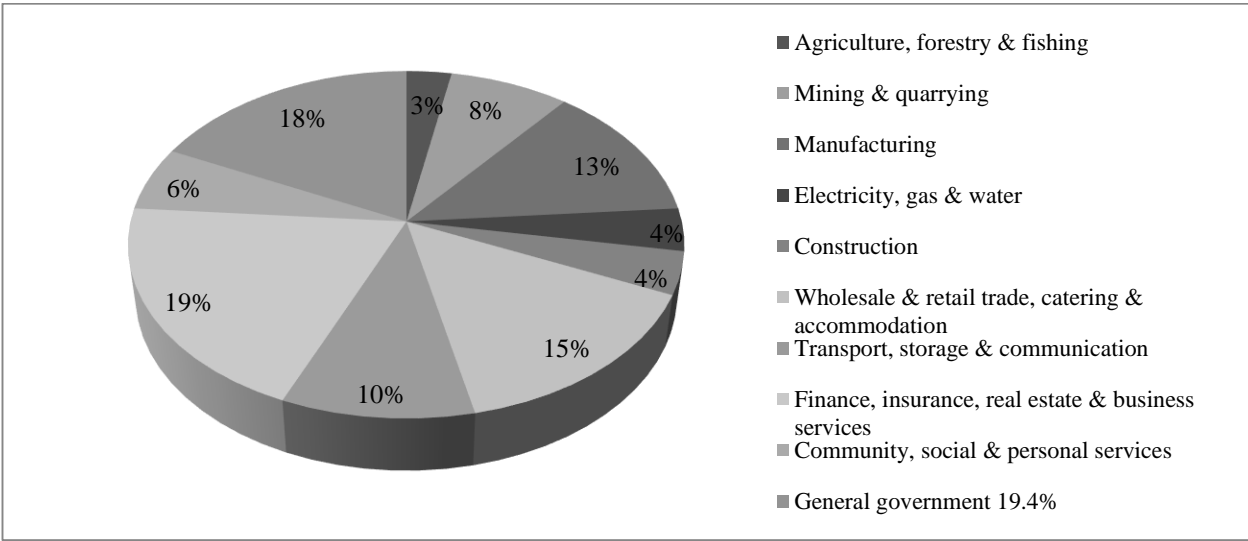
Source: Own computation from the United Nations Development Programme (UNDP) (2019:4)

3.4.2 Agricultural sectors performance and contribution to economic growth and development

South Africa is the most sophisticated, diverse and promising global emerging market, with the economy ranked the second largest in Africa, 33rd largest in the world and first among the upper middle-income countries (South African Investor’s Handbook (SAIH), 2015:1). Key economic sectors in South Africa are the manufacturing, wholesale and retail trade, financial services, transport, mining, agriculture and tourism (Brand South Africa (BSA), 2018). Traditionally, the South African economy relied on primary sectors, favourable agricultural conditions and minerals as the source of wealth (SAIH, 2015:39).

The economy shifted to the tertiary sectors since the 1990s and is currently driven by wholesale and retail trade, tourism and communications but rapidly becoming knowledge-based with a greater focus on technology, e-commerce, financial and other services (Swartz, 2019:131). However, the agricultural sector remains vitally important to the economy, with about 8.5 million people, directly and indirectly, dependent on agricultural sector income and employment (Water Research Commission (WRC), 2017:1). Agricultural activities range from intensive crop production in maize, wheat, oats, sugar cane, sunflowers and mixed farming in cattle ranching (BSA, 2018). The South African government implemented support programmes to promote commercially oriented small-scale farming and smallholders on land acquired through land reforms (Cousins, 2016:7). South Africa is not only food sufficient but also a major agricultural product and net food exporter (BSA, 2018). Figure 3.10 reflects the sector composition and its contributions to the South African economy.

Figure 3.10: Sectoral composition of the South African economy in 2019



Source: IDC (2019:5)

The dualistic nature of South Africa’s economy is also reflected in agriculture where the agricultural sector is characterised by highly developed commercial white farmers and subsistence farming in which most farmers are black (Sihlobo & Nel, 2016:69). The key transformation objective of the agricultural sector in South Africa is based on the Broad-Based Black Economic Empowerment (BBBEE) scorecard flowing from the Reconstruction and Development Programme (Mabaya, Tihanyi, Karaan & Johan van Rooyen, 2011:8). It was to increase participation of the previously disadvantaged people in mainstream economy through the land reforms policy by redistributing 30 percent of the land from white farmers to black farmers by 2014 (Boudreaux, 2010:16). This would have been the most effective strategy to address land reform in South Africa (Sihlobo & Nel, 2016:71). However, the agricultural policy failed to address the abovementioned agricultural dualism since the 1990s (Karaan&Vink, 2014).

The agricultural sector is one of the biggest economic sectors in South Africa, employing approximately 700 000 workers because of its labour intensiveness compared to other sectors (Greyling, 2015:5). South Africa is the largest producer of maize on the African continent, trading 40 percent of maize produced in the Southern African Development Community (SADC) region and livestock contributing approximately 48 percent of agricultural output to total agricultural GDP (WRC, 2017:3). The contribution of agriculture, forestry and fisheries to value added for the year ended 31 December 2016 was estimated at R94 408 million (Baudoin, Vogel, Nortje & Naik, 2017:134). This represents 2.4 percent of the total value added to the economy (DAFF, 2016:8). The total agricultural GVA for 2018 was estimated at R281 370 million with an increase of 4.7percent compared to R268 671 million estimated for 2017 (DAFF, 2019:3). There was also an export surge in 2016, which culminated in \$10.0 billion (R119 billion) and a positive trade balance of \$3.3 billion (IDC, 2019:17). In this way, the agricultural sector affirmed its role as a buffer and lifted South Africa out of the second recession in 2017 (Baudoin, Vogel, Nortje & Naik, 2017:134). However, the

agricultural sector contribution to GDP and total employment declined during the fiscal years 2017 and 2018 due to the Western Cape drought (Van der Walt, 2018).

Bottlenecks in infrastructure, including electricity, water and gas supply shortages following the 2016 drought, slowed down growth in the agricultural sector (Dessus, Goddard & Hanusch, 2017:4). Since exports are a significant economic growth driver in South Africa, the government has committed a change of strategy to increase agricultural national export basket by enhancing the export sector competitiveness, lowering the costs of electricity, transportation, trade and communications as well as finding new and bigger agricultural markets (IDC, 2019:17). This commitment is positive, according to Bakari (2017:14), in that, this will not only help South Africa to grow its economy and develop its people but it will also help take South Africa out of developing country status to developed country status. Table 3.5 lists value-added contribution of agriculture, forestry and fisheries from 2010 to 2018.

Table 3.5: Value-added contribution of agriculture, forestry and fisheries

Year	Total value added (R' million)	Contribution of agriculture to value added (R' million)	Contribution of agriculture (as % of total value added)
2010	2 494 860	52 001	2.1
2011	2 724 400	55 47	2.0
2012	2 932 879	59 934	2.0
2013	3 183 618	63 321	2.0
2014	3 414 943	70 605	2.1
2015	3 624 908	72 479	2.0
2016	3 891 559	83 655	2.1
2017	4 173 328	95 094	2.3
2018	4 341 292	106 057	2.4

Source: DAFF (2019:7)

Despite its relatively small share of the total GDP, the primary agricultural sector remains a significant provider of employment and a major earner of foreign exchange especially in the rural areas (DAFF, 2016). The real GDP growth of 3.3 percent was recorded annually over the period 1994 to 2012 with primary sectors contributing 11.8 percent of GVA in 2012 (IDC, 2013:5). A continuous decline of primary sectors culminated in the highly labour intensive agricultural sector losing 1.1 million jobs since 1994 because of farming subsidy withdrawals, unfavourable agricultural policies and mechanisation of farming (Swartz, 2019:22). Hence, the economy cannot advance economic development and create employment (Du Plessis & Smit, 2006:29). According to Stats SA (2015:3), tertiary sectors contributed 69 percent of GDP, meaning that tertiary industries such as community and social services as well as trade and industry are currently a focus for employment creation. Employment in agriculture, mining and manufacturing decreased from 34

percent of total employment in 2000 to 20 percent in 2015 (Stats SA, 2015:5). Though overall employment increased during the same period, the unemployment rate remained relatively steady from 29.88 percent in 2000 to 25.15 percent in 2015 due to labour force growth (Kenworthy& Marx 2018:3).

The agricultural sector in South Africa is mostly recognised for its potential foremployment creation because of strategic links the sector has with beneficiation opportunities (Agricultural Action Policy Plan (APAP), 2014:1). Despite global market isolation of South Africa since 1985, the agricultural sector in South African faced multiple policy changes including the Marketing of Agricultural Products Act 47 of 1996 whose deregulation impacted mainly the domestic market during 1997 and 1998 (Sihlobo& Nel, 2016:70). Farmers were then exposed to harshglobal market conditions such as stock levels, exchange rate fluctuations, commodity price volatility and others (Sihlobo, 2016a). Although between 1994 and 2012, the real contribution of agriculture to GDP increased by 29 percent, over the same period, employment declined in both primary production and agro-processing by about 30 to 40 percent (APAP, 2014:1).

On the other hand, the declining GDP share of the agricultural sector indicated an accelerating growth of the services sectors, evidenced by about R90 billion nominal term growths in 2008 from roughly R50 billion real gross farm incomes in 2006 (Vink& Van Rooyen, 2009:5). According to Gollin, Parente and Rogerson (2002:164), the low agricultural productivity substantially delays the industrialisation process, which may harm agricultural technologies or policies, causing per capita income to fall far behind that of countries being benchmarked against based on similar environments or level of development.

3.4.3 Major economic policies and their impact on the agricultural sector performance and growth in South Africa

The Presidency (2015) identified the agricultural sector as one sector that could boost economic growth and create employment in South Africa should agriculture and the agro-processing value chain be reinvigorated. The agricultural sector can address challenges of economic growth, development, poverty, unemployment and inequality. However, growth and development in the sector are skewed as a result of the dualistic nature of both the South African economy and the agricultural sector (Sihlobo& Nel, 2016:70). According to Brand (2013:107), countries struggling with education, poverty reduction and improving the quality of life of their people need transitional public policies for the achievement of sustainable development. In this case, state intervention is critical instead of resource allocation being determined by market forces (Gumedde, 2009:4). This calls for the facilitation of the delivery of capability-enhancing collective goods than focusing on capital accumulation (Evans, 2018:4). Hence, the South African government, in partnership with the Agri-Sector Unity Forum (ASUF), designed solutions for the sector, specifically the transition of black small holder farmers into commercial farming (Sihlobo& Nel, 2016:71). Therefore, the key policies and strategies formulated to address the agricultural sector performance and growth are discussed in this section.

3.4.3.1 *Reconstruction and Development Programme (RDP)*

The Reconstruction and Development Programme (RDP) was the people-oriented development policy and the first economic recovery programme and its primary goal was to address the imbalances of the past through delivery of basic needs, human resources development, building the economy, democratising the state and implementation of the programme itself (Cameron, 1996:283). The transformation of social welfare through poverty eradication, reducing inequality and improving the quality of life of the people was central to the RDP policy (Gray, 2006:6). The industrial and trade as well as the land and agrarian reform policies were formulated to provide equal access to land, economic institutions, water, finance and infrastructure to farmworkers and smallholder farmers, landless people as well as increasing agricultural productivity through diversification of rural economies and rural employment (Capuzzo, 2014:60). The RDP policy prioritised food security and the government re-prioritised public spending to focus on the food security conditions of the historically disadvantaged people (Tshuma, 2012:400).

The Comprehensive Agricultural Support Programme (CASP) was implemented in 1994 to help approximately 387 000 land reform beneficiaries with access to agricultural support and service delivery to a tune of R5.8 billion between 1994 and 2013 (Liebenberg, Makhura & Moloto, 2015:16). Regarding financial inclusion, the Straus Commission of inquiry was established in 1996 to investigate rural financial services provision and recommend policy, institutional and legislative measures towards improved financial services access for farmers, rural households and other entrepreneurs (Strauss Commission (SC), 1996:11). SC (1996:11) suggests that the government was advised to set up a rural bank that will report to the National Treasury and advance credit to farmers and NGOs while the credit function is taken away from the National Department of Agriculture (NDA) and the Agricultural Credit Board. In addition, the bank will also design a rural development policy that aligns with that of the NDA to avoid policy duplication and risk of ill-coordinated, inefficient use of public resources. The bank would avoid interest bearing loans and therefore be financed through grants until it can stand on its own (Coetzee, 1998:517).

However, Coetzee (1998:518) contends that the recommendations of the Strauss Commission of Inquiry address more of the national level than the retail level of micro financing due to lack of clarity in terms of the target group where failure to define target groups resulted in inefficiencies of policy implementation. Thus, infrastructure provided was insufficient and did not achieve project goals for the beneficiaries (Nkanyani, 2017:1).

The RDP only succeeded in establishing a well-developed social security system and failed to grow the economy while land reform remains unresolved (Natrass, 2011:5). The effectiveness of social security grants is acknowledged for fuelling savings and stimulating a development virtuous circle. However, grants also have a negative visible impact on recipients' willingness to participate in economic activity (De Klerk, Fraser & Fullerton, 2013:11). The RDP was criticised for lack of detailed implementation plan and unrealistic targets (Masters, 2019:46). Hence, only 11000 farmers and land reforms beneficiaries could be

assisted by DAFF and only 7500 seasonal and 560 permanent employment was created between 2004 and 2012 (De Klerk, Fraser & Fullerton, 2013:9).

3.4.3.2 *Growth, Employment and Redistribution (GEAR)*

The GEAR policy was a macro-economic strategy that emphasised private sector investment, with the state playing a facilitating role (Kepe, 2001:279). The GEAR was implemented during 1995 and 2000 to liberalise foreign exchange controls, tighten fiscal policy and stimulate rapid economic growth by increasing foreign direct and private sector investments (Mahedea, 1998:448). The free market system was the base upon which the GEAR was founded, with its focus mainly on economic development (Brits, 2014: 507). Employment creation linked the GEAR to economic growth and poverty and inequality reduction were its key outcomes. However, there were no clearly defined targets for inequality reduction hence, inequality increased with economic growth (Streak, 2004:273).

Higher growth was to be achieved through the manufacturing sector orientated towards exports and employment creation with more attention paid to the development of small, medium and micro enterprises as well as agriculture (Mahedea, 1998:448). The targeted economic growth rate of six percent and 400,000 jobs per annum by the year 2000 were specified targets (Makino 2013:4). However, The GEAR ignored the potential of commercial agriculture's role in employment creation for the rural population and economic growth though it emphasised export promotion, smallholder farmer training and land reforms (Mathe, 2002:13). Nonetheless, the expanded public works programme (EPWP) created 8,420 low wage temporary employment opportunities in agriculture for women, youth and people with disabilities (Koch, 2011:7). The policy is mainly criticised for opening the South African economy too wide and placing much reliance on globalisation (Masters, 2019:60).

The GEAR successfully delivered on stable macroeconomic policy and effective institutions (Bhorat *et al.*, 2015:1), fiscal deficit reduction to 2.2 percent, decreased inflation to 5.4 percent, reduced government consumption to 18 percent and reversed the negative RDP growth of the early 1990s but failed to attract private sector investment, distribute wealth, create employment and reduce inequality (Capuzzo, 2014:97).

3.4.3.3 *Accelerated and shared growth initiative for South Africa (AsgiSA)*

AsgiSA (Accelerated growth initiative of South Africa) was implemented during 2006 to halve both poverty and unemployment rates by the year 2014 towards the achievement of the Millennium Development Goals (Masters, 2019:4). In addition, 300 000 operational small enterprises and one million jobs would be created in five years (Fourie, 2019:388). The South African government increased public disbursement on fixed capital investment to about R370 billion in three consecutive years aiming at helping the marginalised poor and to reduce income inequality through trickle-down (Mosala, Venter & Bain, 2017:334). Skills

improvement through the Joint Initiative on Priority Skills Acquisition (JIPSA) was a key strategy to enable the poor to share in economic growth (Behar, 2006:20).

AsgiSA, similar to the GEAR macroeconomic policy, recognised food production and subsistence agriculture as providing safety nets for the rural poor (APAP, 2014:1). Reference was made to 11.6 poor farmers and communities who sought to be empowered through antipoverty strategies linked to social policy and basic service delivery (Mphahlwa, 2008: 20). The massive food production programme (MFPP) was implemented to focus mainly on maize production in the Eastern Cape and KwaZulu Natal provinces for job creation and poverty alleviation (Jacobson, Salomonsson & Friman, 2012:35). The programme was to use GMO maize seed, to mechanise agriculture and to benefit from the economies of scale. However, most stakeholders including municipalities did not support the programme for its top down approach in relocation and merging of fields, disregarding local initiatives and development choices (Cooksey & Kikula, 2005:2). Many smallholder farmers were also expelled from the project for failing to honour the back payments of conditional grants used to finance the agricultural activities as expected (Jacobson *et al.*, 2012:36).

Then, AsgiSA EC Pty Ltd was established by the government to focus on primary agriculture and agro-processing with the aim of input provision, overall farm management, reinvestment of 90 percent proceeds back into farming activities and 10 percent profit sharing among farmers (Mphahlwa, 2008:38). The projects failed to improve the living standards of participants due to a lack of information transfer (Kotey, Assefa, Obi & Van den Berg, 2016:60). The poor ownership of process and outcome as well as communication difficulties rendered participation of farmers impossible (Cooksey & Kikula, 2005:2). AsgiSA succeeded in infrastructure development and increased public sector expenditure to 9.6 percent from 4.6 percent during 2006 to 2010 (Mosala, *et al.*, 2017:334). However, it failed to create jobs and reduce poverty and inequality (Kgatle, 2017:5).

3.4.3.4 *Medium Term Strategic Framework (MTSF)*

The Medium Term Strategic Framework (MTSF) was introduced in 2009 to implement government policy and ensure that policies are coherent, planning and budgeting process are coordinated and aligned across all government spheres (Treasury, 2012:4). The MTSF, similar to AsgiSA, pursued halving unemployment and poverty rates by 2014 and in addition, build decent jobs and sustainable livelihoods through higher and more inclusive economic growth (Fourie, 2019:390). The first 20 years of democracy whose focus had been the democratic transition based on fundamental human rights, equality and unity in diversity (Medium Term Strategic Framework (MTSF), 2014:4) and the second phase whose foundation is radical economic transformation and seeking to place the economy on a qualitatively different path where poverty is eliminated, employment is created, livelihoods are sustainable and inequality is reduced, are separated (Gordhan, 2014:4).

Among others, MTSF (2019) will prioritise the following government objectives:

- Radical economic transformation, rapid economic growth and job creation;
- Rural development, land and agrarian reform and food security.

The agricultural sector would be supported through IPAP to strengthen agricultural productivity, competitiveness and trade performance for promotion of the greeneconomy, ocean economy and exports of goods and services to growing markets in African (MTSF, 2019:7). MTSF (2019:7) will further ensure research and technology that developments are continuously supported through partnerships between science councils and the business sector from tax incentives.

3.4.3.5 *New Growth Path (NGP)*

The New Growth Path (NGP) was developed by the National Department of Economic Development and introduced in 2010 to tackle mass joblessness, poverty and inequality through economic growth acceleration (Nattrass, 2011:1). The NGP was paired with the interventionist industrial policy formulated under AsgiSA in the form of Industrial Policy Action Plans (IPAP) to address labour and business matters (Naidoo & Maré, 2015:415). Public infrastructure programmes such as the Expanded Public Works Programme (EPWP) would be used to create five million more jobs within labour intensive economic sectors for ten percent unemployment rate reduction while fostering a more efficient, more inclusive and more labour absorptive economy (Tregenna, 2011:627).

Smallholder agriculture is recognised as the driver of agricultural production in South Africa due to the significant impact it has on livelihood improvement and exposure of the rural poor and urban household to food insecurity (Baiphethi & Jacobs, 2009:259). So, the government, in its efforts to reduce food insecurity and poverty, adopted the Provincial Growth and Development Plan (PGDP) to focus on subsistence agriculture and food security (Ndhleve & Obi, 2013:264). In addition, 300 000 households would be put into agricultural smallholder schemes to create 145 000 jobs in agro-processing by 2020 (Kaplan, 2013:3).

The NGP acknowledged agricultural policies as significant in the creation of conducive environment to support transformation and growth, alignment and integration of trade, agriculture and land development policies without mention of food security policy (Hendriks, 2013:14). Hendriks (2013:14) highlighted further that the production and consumption elements of the food system were noted and the negative impact of high and volatile inflation on farm input and food staples considered. Consequently, the cropping programme in the Eastern Cape and KwaZulu Natal provinces was adopted for continued farmer support services towards increased food production with the use of new technologies and mechanisation of the agricultural sector (Jacobson, 2013:22).

The programme failed to deliver on objectives due to a lack of commitment from extension service officers that affected the farmers' participation negatively (Kepe, 2001:291). Lack of technical skills by extension

service officers is an impediment to the dissemination of adopted new farming technologies to rural farmers whose literacy levels are also low (Kotey, Assefa& Van den Berg, 2010:221). Despite the shortcomings of extension services delivery, there is generally poor social and economic infrastructure as well as lack of poor maintenance of existing infrastructure in the rural areas especially water resources, health, education, housing, roads, electricity and land (Wall 2007:26).

Infrastructure development was recognised as a significant driver for job creation, economic growth and inclusivity (Nkanyani, 2017:1). Consequently, the Integrated Development Plan (IDP) was introduced as part of the PGDP to build infrastructure for various community projects ranging from agriculture, enterprises, construction, arts and craft to create employment, reduce poverty and improve the living standards of rural communalities (Wall 2007:27). In general, the NGP policy is more of a vision to redistribute than a plan to create wealth for lack of specific implementable steps (Duvenhage, 2011:15). The five million jobs by 2020 target is over ambitious and unattainable since only 300 000 jobs were created during the economic boom of between 2002 and 2008 (Meyer, 2013:10; Tregenna, 2011:628).

3.4.3.6 *National Development Plan (NDP)*

The National Development Plan (NDP) was developed by the National Planning Commission in 2011 and tabled in 2012 with a broad and multi-sectoral agenda of policy measures aimed at guiding government planning (Naidoo& Maré, 2015:408). Kretzschmar (2014:6) outlines unity, active citizenry, growing economy, building capabilities, capable state and responsible leadership as the six pillars of the NDP. Poverty and inequality reduction strategies in the NDP were constructed from all post-apartheid policies (NPC, 2012: 24; StatsSA, 2015:29).

The key outcomes of the NDP are the creation of at least 11 million jobs by 2030, annual employment growth of 3.3 percent to 2030, 15 percent investment growth a year until 2030, 5.4 percent GDP growth between 2010 and 2030 and six percent average annual volume of exports growth by 2030 (Kaplan, 2013:3). While the NDP acknowledged the role of the government in policy formulation, stakeholder participation and decisive leadership as key (Hendriks, 2013:14), it ignored both agriculture and food security and also failed to articulate opportunities or challenges presented by food insecurity (Kaplan, 2013:13). However, there was a commitment to support the agricultural sector through the objectives set below even though neither agricultural policy, food security policy, food security information system nor a regular collection of such information was implemented (Hendriks, 2013:2).

- Development and support for subsistence agriculture, smallholder and small-scale commercial farming through research and extension services (Fourie, 2015:404);
- Basic services provision to develop capabilities of farmers to contribute to communities through remittances and skills transfer (NDP, 2012:44);

- Development of agro-processing industries, tourism, fisheries and small enterprises with potential (Hendriks, 2013:8).

In addressing the above objectives, the focus shifted to food insecurity (Hendriks, 2013:2). The Agricultural projects implemented during the RDP continued to enjoy support from the provinces through the Provincial Growth and Development Strategy (PGDS), which aligned the said projects to the NDP objectives (Subban& Theron, 2016:1). The purpose of the PGDS is to critically guide and coordinate resource allocation across the three spheres of government (National, Provincial and Local government) as well as private sector investment towards the achievement of sustainable development outcomes (Presidency, 2005:2). According to Bell, Goga, Mondliwa and Roberts (2018:1), the NDP is poorly co-ordinated to industrial and macroeconomic policies in that there is:

- Limited collaboration between the learning and building capabilities;
- Lack of coherence between technology and policies;
- More reliance on law enforcement and competition to make markets work; and
- Poorly designed policy instruments.

In addition, Fourie (2015:408) asserts that employment-creation policy failing to address inherent challenges of disabling environment in an informaleconomy that entrepreneurs and the workforce are exposed to, carries the highest risk of failure to impact positively on poverty, inequality and unemployment. Further, Fourie (2015:408) confirmed that entrepreneurs and the informal-sector workers are subject to non-support and harassment, policy vacuums, incoherent, inconsistent, non-integrated, uncoordinated policy measures from the government, under capacitated agencies and policy directorates under the NDP. Nonetheless, the projects address the food insecurity vulnerability even though they cannot tackle job creation, poverty alleviation and improve the living standards of the people (Mabaso, 2014:5; Mahlombe, 2018:87).

3.4.3.7 *Agricultural Action Policy Plan (APAP)*

The agricultural sector is mostly recognised as a sector with potential for employment creation because of strategic links the sector has on beneficiation opportunities (Agricultural Action Policy Plan (APAP), 2014:1). The agricultural sector in South Africa faces multiple policy changes including the Marketing of Agricultural Products Act 47 of 1996 whose deregulation impacted negatively the domestic market during 1997 and 1998 since the country was isolated, globally (Sihlobo& Nel, 2016:70). Farmers were then exposed to harsh global market conditions such as stock levels and exchange rate fluctuations, commodity price volatility and others (Sihlobo, 2016).

The current agricultural policy, the Agricultural Policy Action Plan (APAP) similar to other post-apartheid agricultural policies, seeks to promote equity and transformation, governance, environmental stability,

equitable growth and competitiveness (Mudavanhu, 2015:14). According to Drimie (2016:1), more emphasis is put on the following:

- Improving commercial agriculture competitiveness in a free market dispensation;
- Improvement of participation by disadvantaged communities and;
- Natural resource base protection.

The NDP through the APAP will redistribute 20 percent of viable agricultural land to the previously disadvantaged communities by 2030 and with support from the agribusiness and the South African commercial farmers, empower the previously disadvantaged farmers through skills development and mentorship programmes (Sihlobo& Nel, 2016:70). The APAP adopts ecosystem-based management approach aimed at conserving key natural resources and adopting climate-smart agricultural approaches to encourage the broad use of new technologies (Blignaut, Knot, Smith, Nkambule, Crookes, Saki, Drimie, Midgley, De Wit, von Loeper& Strauss, 2015:9).

According to Kassim, Mahmoud, Kurdi and Breisinger (2017:1), to be effective, agricultural policy needs to integrate policies from other sectors, which have an impact on agriculture, growth and development as well as food security, water, environment, jobs, trade and transformation and so on. Accordingly, agriculture, finance and international trade are key principles needing government intervention towards meeting developmental goals (UNCTAD, 2001:48). Integration of all three in a policy will enhance investment profitability, lower technical and financial constraints and provide a stable environment and therefore, encourage sector productivity growth and capital formation (UNCTAD, 2001:48). However, there is a lack of coordination, specifically with the food security policies, which are also fragmented and subject to piecemeal implementation entities of the Department of Rural Development and Land Reforms (DRDLR) (Mudavanhu, 2015:14). The policy is neither reviewed nor monitored as with the CASP Canada and Taiwan Integrated Rural Development Programmes (Fulton, 2015:8).

3.5 CHAPTER SYNOPSIS

This chapter analysed global, regional and local agricultural chosen and related variables trends and performance. The South African agricultural sector and its contribution to economic growth and development were reviewed. Countries that successfully transformed through agricultural sector performance were selected and reviewed for best practice benchmarking as well as major economic drivers and their impact on the agricultural sector performance and growth in South Africa's growth and development policies and their impact on the agricultural sector performance in South Africa were also reviewed. Agricultural performance measurement is critical because different stakeholders need an appraisal on progress and achievement as a constant search for means to grow economies and transform lives, decrease multidimensional poverty and sustain natural environments is pursued by governments and

development agencies. The stakeholders formulate pro-poor policies focusing on the agricultural sector and participation of the poor in the development strategies. Hence, implemented policies need monitoring and compliance reviews to ensure progress towards the achievement of policy objectives and identification of threats so policies could be amended or new policies are formulated. Sector performance measurement is also critical for comparing performances of regions or countries and for benchmarking. Because of the complex nature of the agricultural sector, different performance measuring systems and variable mixtures are used from different countries and regions, making it possible to produce inaccurate outcomes. However, using the total factor productivity and time series as performance measures produced consistent outcomes across regions and countries. In addition, total factor productivity outcomes reflect an average annual performance increase of two percent between 1980 and 2006 from developing countries with no evidence of low performance except for instances where the sector responded to external shocks. Most of the shocks result from climate change, unfavourable policies and irrational political decisions. There is also evidence of massive poverty reduction attributable to rising incomes though at uneven rates dependant on country specific inequality rates between 1980 and 2006. Despite the low contribution to the GDP in high income countries, the agricultural sector remains significant for community development.

Developed countries promote stability, alleviate poverty and inequality through the agricultural sector and improve the living standards of rural communities without compromising environmental sustainability. Notwithstanding the declining nature of the sector against per capita income growth, investment in research and development are made in pursuance of economic growth and agricultural productivity and enhanced through technological means. In Canada, the agricultural sector drives local, provincial and national economies. Subsequently, communities are empowered through the business attraction, business retention and expansion (BRE) project, which provide expertise, strategic planning, process support and financial assistance towards addressing rural community capacity barriers to ensure efficiency in their development. Consequently, high GDP and employment contributions from the agricultural sector were enjoyed during 2016 in the Ontario province only. In the USA, changes in input and output mix, specialisation and mechanisation drove productivity to high total factor productivity average annual contribution attributed to innovation, research and development (R&D) investments between 1948 and 2011. The agricultural sector is still a backbone of the economy in New Zealand while Australia remains dependent on commodity exports with the primary sector contributing the highest in 2018. Farming subsidies reduction between 1980 and 1990 resulted in farmers adopting smart farming and therefore, increased productivity from the 1990s. Similarly, Australia has maintained a two percent steady annual agricultural productivity increase since the 1950s amidst deteriorating productivity and declining terms of trade trends. The Australian government funds agricultural production through R&D levies collection from agricultural sub-sectors. Agricultural reforms improved trade relations, increased foreign investment and competition. The new labour relations also brought about efficiencies through skilled labour force, technological uptake and innovation in Australia.

The structural transformation process is slow in Southern Asia with agricultural employment still high at 59 percent of total employment while the South Eastern Asia and the Pacific economy is highly diversified away from agriculture and increasingly becoming service based with a low share of employment in manufacturing. Rapid growth in agriculture succeeded in many regions including China, Vietnam, Taiwan, Korea and Japan with substantially reduced poverty rates and greatly enhanced living standards as evidenced by the high HDI ratings when compared with the HDI rating of Sub Saharan Africa and that of South Africa. The achievements were made possible through the design of inclusive policies and smallholder participation strategies. Community and government involvement as well as infrastructure availability played critical roles. In Korea, farmers associations are contracted to the government to deliver farmer supplies, extension services, insurance and financing. These activities are departmentalised with the departments carrying out the farmer associations business as well as implement all programmes commissioned by the government. Farmer service provision, policy formulation, production and marketing are a multi-function-goal. Policy formulation is the responsibility of stakeholders. Rural villages were revitalised with the industrialisation of agriculture during community campaigns.

Latin America and the Caribbean are the fastest growing countries in North American region, which enjoyed 1.9 percent agricultural productivity growth rate between 1961 and 2007, the highest among transitioning economies because of livestock specialisation and easily available technology. Brazil on the other hand, is a good convergence story between itself and the USA. It enjoys 2.27 percent average annual growth, with agriculture being the main contributor. Different strategies with farms subdivided according to income levels and designing of specific policies for each subsection to improve agricultural performance are used in Brazil. Mexico had the best policies and strategies, heavily invested in rural infrastructure, rapid industrialisation of agriculture, rural education and agricultural mechanisation. However, there were no investments towards environmental sustainability. Therefore, all the gains were reversed by the deteriorating environmental status of rural Mexico. The country is currently transitioning out of the agricultural into the service sector. The agricultural sector in Argentina is highly mechanised and only employs two percent of the total labour force while the sector suffers heavy taxation from the government. The revenue from the taxes is used to create employment opportunities. Moreover, Argentina, like most developing countries, is a net exporter of food and raw materials where the latter is done to support more competitive exchange rate while the population is experiencing food insecurity and chronic under-nutrition challenges.

An analysis of global per capita income growth trends in isolation paints a perfect picture until the non-monetary poverty trends are also analysed. This is the story of Africa and Sub Saharan Africa, whose economies are impacted negatively by extreme inequality and low life expectancy. Consequently, African and Sub Saharan African countries are much poorer than the levels of their per capita incomes suggest. Despite the continent housing high numbers of the extremely poor population as reflected by the economic development index ratings, it is experiencing slow growth in terms of incomes from agricultural exports

due to the export of raw materials. Poor quality infrastructure (especially transport, funding and education), declining trade terms, lack of access to farming technologies and lack of skills to operate such technology, unfavourable policies, poor planning, poor health and a negative impact from climate change also contribute to the challenges. In addition, weak links among growth, wages and poverty have also been discovered as another impediment. In recent years, economies in Africa are experiencing GDP growth faster than population growth but it does not translate into poverty reduction, job creation and development. Some researchers blame low levels of per capita income in African and Sub Saharan regions on the agricultural sector with over 50 percent labour force still engaged in the low productivity agriculture sector. Moreover, Morocco decimated poverty from investments in infrastructure programmes by the government in partnerships with municipalities and civil society. The population in Morocco enjoyed free education, health care and subsidised food. In 2015, agriculture contributed 14 percent to the GDP and the economy recorded higher growth figures. Unfortunately, the gains are recently declining because of failure of the education system to improve the people's capabilities. However, the agricultural sector performance on the continent improved gradually and growth expanded the per capita production by 0.8 percent a year throughout the 1970s and 1980s.

The South African economy, on the other hand, is plagued by poverty and inequality. The latter is not only a challenge on its own but renders the country's poverty reduction strategies ineffective. While employment is an income distribution mechanism for the poor, the South African government faces a job creation challenge, too. The agricultural sector, therefore, becomes significant as the most dominant economic activity for the poor and the rural communities because of its links to other sectors and the fact that poverty is both a rural and agricultural phenomenon. However, the primary economic sectors in South Africa are declining rapidly leaving the economic growth burden to the tertiary sectors only, as influenced by the move from labour intensiveness to capital intensiveness approach failing to create employment, especially for the low and unskilled workforce. The situation is further exacerbated mainly by the incapacity of state machinery to plan strategically, design and implement policies and government programmes to improve agricultural sector performance. Notwithstanding, the climate change, land reforms and policy challenges, the agricultural sector proved to be resilient, still key and relevant when it bounced back in 2016 and lifted the South African economy out of the recession in 2017. During the same time, some economies in Africa also enjoyed good agricultural performance, which is generally attributed to favourable weather. The HDI values, together with poverty reduction, had slightly improved but as with Africa and Sub Saharan Africa, were eroded by the high inequality rate. However, poverty reduction improvement would not be sustainable because it is sponsored through social security grants, which are sponsored through increased tax revenues and public debt. In South Africa, government policies are fragmented due to a lack of stakeholders' consultation during policies formulation or revision. Not only agricultural policies are uncoordinated but also policies across the sectors and from sectors that have a direct impact on agricultural activities. Trade policies, transformation policies, employment creation policies and employment

regulatory frameworks are examples of such policy fragmentation. Monitoring and evaluation of policies are limited. Hence, policy gaps, budget spent and non-compliance issues are not easily identifiable and progress is minimal. Plans to implement policies are poorly or not funded at all, with the unavailability of reports where the government has successfully supported and funded programmes.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 INTRODUCTION

The previous chapter focussed on detailed trend analysis of the relationship between the agricultural sector, economic growth, development and some of the macroeconomic variables. This helped create the basis for the analysis of historic performance trends and policy interventions relevant to the local historical performance trends and policy interventions interrelated to the agricultural sector. Economic growth and development were analysed and notable observations were made. Most of the analysed findings revealed that a significant interaction exists between the agricultural sector and economic indicators such as per capita GDP, agricultural exports, agricultural employment, agricultural gross value added and development indices. These mentioned variables are also indispensable towards employment creation within the agricultural sector. The study is pursuing empirical objectives as listed below:

- Determine the long-run impact of agricultural employment, agricultural exports and agricultural (GVA) on economic growth and development in South Africa;
- To determine the short-run impact of agricultural employment, agricultural exports and agricultural (GVA) on economic growth and development in South Africa;
- To analyse the causal effects between agricultural employment, agricultural exports and agricultural (GVA) and economic growth and development in South Africa;
- To formulate recommendations for improved development regarding the agricultural sector and economic growth and development in South Africa.

The study also employed various quantitative econometric approaches. These approaches included the unit root test, pairwise correlation, test for integration, granger causality, Autoregressive Distributed Lag (ARDL) model as well as the diagnostic tests. The study employed two models, one for economic growth (GDP) and the other for the economic development index (EDI). The ARDL model was used to determine the short run and long-run effect of the independent variables (agricultural employment, agricultural value added and agricultural exports) on both dependent variables namely economic growth (GDP) and the economic development indices (EDI). The ARDL model was selected owing to its ability to establish robust analysis results and its flexibility when dealing with a combination of integration order namely I(0) and I(1).

The primary focus of the current chapter is to present and discuss the methodological composition, foundation and properties of different time series accompanied by various econometric tests for the study. Besides the outlined sections, the chapter includes a description and discussion of data, specification of the study models and diagnostic tests.

In doing so, this chapter comprises nine main sections: the first section 4.1, is the introduction. This is followed by section 4.2, that is, the philosophical foundations adopted in this study, section 4.3, data origin, sample size and variables elucidation, section 4.4, methodological approaches and models specifications. Section 4.5, is the autoregressive distributed lag (ARDL) model while section 4.6 is Toda-Yamamoto granger causality. Section 4.7 is the lag length selection. Section 4.8 is about the diagnostic tests and section 4.9 is the chapter synopsis.

4.2 PHILOSOPHICAL FOUNDATIONS ADOPTED IN THIS STUDY

Research paradigm is a concept that is understood and defined in various ways. For some scholars, a research paradigm is a set of beliefs used to describe the origin of a problem and the strategies to investigate or to take action towards the same problem (Fraser& Robinson, 2004:59). Others describe a research paradigm as a way of perceiving the world that surrounds the study, which also impact the way the researcher understands the research topic (Hughes, 2010:35). In simple terms, the research paradigm is elucidated as a system of thinking (Neuman, 2011:94). Therefore, to understand what the truth is and have the knowledge, every topic is understood through a paradigm or way of trying to make sense of it (Mukherji& Albon, 2015: 24). In other words, a research paradigm assists researchers in shaping the way they perceive their views and thought, how they view and think about others and the world surrounding them (Chilisa& Kawulich, 2012). In this regard, the researcher's action is guided or directed by their paradigm through data collection and analysis approaches (Kivunja& Kuyini, 2017:26).

Paradigms can be classified as positivism, post-positivism, interpretivism and pragmatism (Wahyuni, 2012:70). Positivists interrogate large data samples using statistical tests (Creswell, 2009:23) and are strongly and related to the quantitative research methods (Makombe, 2017:3369). The functionalist paradigmatic approach is deeply rooted in the sociology of regulation (Burrell& Morgan, 2005:18). Its approaches and concerns are positivists, realists, nomothetic and determinists (which are other forms of paradigms) and its objective with its basics of social sciences is to provide practical solutions to practical problems (Ogundiya& Amzat, 2012:125). Furthermore, the functionalist research paradigm focuses mainly on the role which social phenomena play where culture and utility are equated. Functionalism is teleological and ethnographic and follows qualitative research principles (Harvey, 2012:20). Thus, the current study is grounded on the functionalist paradigmatic approach for it to remain objective (Weigend, 2018:7).

4.3 DATA ORIGIN, SAMPLE SIZE AND VARIABLES ELUCIDATION

4.3.1 Data selection and sample period

This study is built on a quantitative research approach. An annual time series data is used to determine the relationship that exists between the underpinned variables. The data set spans from 1995 to 2019 and consists of 25 annual observations. The time frame was selected primarily based on data availability.

Secondly, the data mix of pre and post-1994 might lead to spurious results as the pre-1994 data could have been distorted by political and economic sanctions imposed on the apartheid government. All the used data were seasonally adjusted. The data set comprises Economic Growth (GDP per capita), Economic Development, measured using the Economic Development Index (EDI), agricultural employment (AEMP), agricultural gross value added (AGVA) and agricultural exports (AEXP). Inflation was added as a control variable. These data were acquired from the South African Reserve Bank (SARB), the World Bank's world development indicators (WDI) and Quantec. All data were transformed into natural logarithms for various purposes, which included reducing variability, conforming to normality and allowing ease of interpretation of the dependent variables' elasticities (Changyong, 2014:10; Habanabakize, 2019:43).

4.3.2 Variable description and measurement

4.3.2.1 Dependent variables

The study analyses the impact of the agricultural sector on economic growth and development in South Africa. In other words, as the study of Rahman and Hossain (2014:167) discovered that the agricultural sector impacts both economic growth and economic development, this study also seeks to determine the responsiveness of both South African economic growth and economic development towards changes in agricultural employment, productivity and exports. Thus, economic development and economic growth are considered as dependent variables of the study.

- *Economic growth (GDP per capita)*

As mentioned in the previous section, the study analyses the impact of the agricultural sector on economic growth (per capita GDP). The per capita gross domestic product (per capita GDP) breaks down economic output per person and is computed by dividing the GDP at constant prices by the country's population (Fariss, Crabtree, Anders, Jones, Linder & Markowitz, 2017:12). Per capita GDP is a global prosperity and economic development measure used to analyse prosperity based on the status of the country's economic growth (Dyan & Sheiner, 2018:25). In simplified terms, the per capita GDP reflects economic production value attributed to each citizen and regular updates are published by the IMF (Downturn, 2019:11; World Bank, 2016:3). Per capita Gross domestic product in South Africa is principally designed through the production function approach. According to the South African Reserve Bank (SARB) (2019), the South African economic growth experienced a contraction of 3.2 percent during the first quarter of 2019, which is the highest annualised contraction ever since 2009. This decline was because of the contractions on economic activities from all economic sectors namely; primary, secondary and tertiary sectors. Despite its decline over time, it remained unchanged when measured over four quarters. Nevertheless, acknowledging the contribution of the GDP to the growth of the national economy is indispensable (Boumans, 2014:801). The gross domestic product in South Africa is measured in millions of Rands at constant prices, with 2010 as the base year to avoid the price inflation effect (SARB, 2019).

- *The economic development index (EDI)*

Economic development is defined by Hadjimichael *et al.*, (2014:1) as a combination of both theory and practice (activity) that can result or lead to economic growth. Additionally, Malizia *et al.*(2020:12) view economic development as a continuous and evolving process in which some social and economic problems are solved and others are created. Furthermore, the International Economic Development Council (IEDC) (2018:3) describes economic development as any process that impacts on restricting the growth of a country’s economy to enhancesocial, economic wellbeing.

Although it is difficult to find a common definition of economic development,which includes all the components and features of economic development, the standard definition should include job creation, wealth enhancement and quality of life improvement (IEDC, 2018:3). Various measures including but not limited to economic growth (GDP), Genuine Progress Indicator (GPI) and the Human Development Index (HDI) may measure economic development, however, they fail to completely capture all the different developmental processes dimensions (Aliyu, 2019:2;Meyer, de Jongh& Meyer, 2016:100). Hence, Meyer, de Jongh and Meyer (2019) constructed a composite regional development index capturing the most significant development dimensions i.e. demographic, social, labour and economic from 18 indicators to be utilised in future analysis measuring local and regional progress and for comparing the socio-economic developmental levels of different regions. The study, therefore, use the Meyer, de Jongh and Meyer (2019) constructed index EDI variable indicator as summarised in Table 4.1.

Table 4.1: Summary of variable indicator description

Name	Description	Scoring
HDI index	HDI expressed as percentage (HDI x 100). Where higher scores indicate a higher standard of living.	Scoring ranges from 0 – 100. Where 0 is the minimum value and 100 is the maximum value.
Poverty Levels	% people above the upper bound poverty line (UBL). Calculated by taking the 100 - % of people below the UBL poverty line.	Scoring ranging from 0 – 100. Where scores closer to 0 indicates higher poverty levels and closer to 100 low poverty levels.
Employment rate	Indicates the percentage of the labour force that are employed. Calculated by taking 100 – unemployment rate.	Scoring ranging from 0 - 100. Where scores closer to 0 indicates a high unemployment rate and those closer to a 100 a low unemployment rate.

Source: Author’s own compilation

4.3.2.2 *Independent variables*

For the countries in the initial stage of developing the agricultural sector rather than other existing economic sectors, it is esteemed as the prime driver of development (Rahman& Hossain, 2014:168). The impact of the agricultural sector, for this study, is measured through the changes in agricultural employment,

agricultural gross value added and agricultural exports, which are all independent variables in the study. That is, the agricultural contribution to economic growth and development is used to explain both growth (GDP) and development (EDI).

- *Agricultural employment (AGEMP)*

Employment is a contractual obligation between an employer and an employee where an employer offers employment and the employee accepts the offer in exchange for remuneration where the employee will perform work in line with the employer's vision, mission, objectives and values (Aliyu, 2019:102). There is the supply and the demand side to the labour market with the labour supply side being the labour force or the economically active population (EAP) further divided into the employed and unemployed persons (Hussmanns, 2007:1). Employment growth drives shared and sustainable economic development (Aliyu, 2019:102; Martin & Murfin, 2019:12) whereas, unemployment results in the erosion of human capital, protests, social exclusion, increased crime rates and morbidity, thus, contributing immensely to widespread income inequality and poverty (Makarings & Khobai, 2018:2).

Agricultural employment covers the maintenance of crops and the tending of livestock, together with machine operation and physical labour performance (Olajide, Akinlabi & Tijani, 2012:104). Agricultural employment, agricultural gross value added and agricultural exports are all independent variables representing the agricultural sector (AG). As highlighted in Chapter 2, the agricultural sector's employment share of total employment is, therefore, used as a measure in the study (Rao, 2012:1; Pleic & Berry, 2009:6). Using employment as a measure in this study does not focus on quantitative performance only but more of the qualitative performance. Agricultural employment is a production function (Gordon & Vaughan, 2011:25) and contributes both to economic development and economic growth (Meijerink & Roza, 2007:22). As such, agricultural employment is measured in thousands of people employed in the sector where in South Africa 768 171 in 2019 compared with 764 428 in June 2017 annualised at 0.2 percent (Mashabela, 2019:3). During the second quarter of 2019, the unemployment rate was 29.0 percent, a 1.4 percent increase as compared to the first quarter of 2019 (SARB, 2019).

- *Agricultural gross value added (AGVA)*

As stated in Chapter 2, the agricultural gross value added is defined as output less intermediate input costs where output is the value of goods and services produced within a production unit but available for use outside that production unit (Rick, Brunton & Carol Trickett, 2007:1). The agricultural gross value added is determined through a production approach and is measured in both chain volume terms and current price as the agricultural gross value of production less production cost incurred (Fariss *et al.*, 2017:11). Hence, value added is the difference between the cost of inputs in production and the value of goods or services produced (Lambert *et al.*, 2006:2). About \$10.7 billion, which is roughly 10 percent, was contributed to GDP by the agricultural sector in South Africa. Thus, the economic growth rebound from a low base to positive growth of 3.1 percent during the last quarter of 2019 (SARB, 2019).

- *Agricultural exports (AGEXP)*

Exports are goods or services produced by a local economy and sold to foreign countries. Empirical evidence confirms exports as essential in stimulating sustainable economic growth and development in developing countries (Edeme, Nkalu, & Ijeh, 2018:123). Agricultural exports are an economic growth catalyst (Verter & Bečvářová, 2014:692) playing a significant policy role in the determination of economic development of exporting developing countries, hence its inclusion as a variable of interest in this study (Siaw *et al.*, 2018:2252). Agricultural exports are measured in terms of export price, export quantity and export volumes (Zammit, Boulton, Zhao & Cao, 2019:2). Exports are a factor of production function and measured in millions of Rands (SARB, 2015:14). The current study utilises the share of agricultural exports in total exports as a measurement. An increase in agricultural imports retards economic growth (Bakari & Mabrouki, 2018:5). Because of the demand elasticity of exportable products, country openness to trade and total output, higher manufacturing growth rates accrue to developed countries from unbeneficiated exports from the developing countries (Kilavuz & Topcu, 2012:201). The South African agricultural exports generated \$10.7 billion in earnings during 2019 as compared to the 2018 export value (SARB 2019).

- *Inflation (CPI)*

Inflation, as represented by consumer price index) is another economic variable that plays an important role in any country's economic growth and economic development. Inflation level or inflation rate determine the rate at which a country's economy is developed and can grow. Inflation is inversely correlated to labour market. Thus, high rate of inflation implies low rate of employment, low productivity and decline in output level (Habanabakize, 2021). As aforementioned, this variable was used as a control variable. By definition, a control is any variable that's held constant in a research study. It's not a variable of interest in the study, but it's controlled because it could influence the outcomes. Therefore, based on the role played by inflation rate on the South African economy, this variable was added to the explanatory variables, yet kept as a control one.

4.4 METHODOLOGICAL APPROACHES AND MODELS SPECIFICATION

Various approaches are mostly employed when scholars analyse or assess any form of relationship that may exist between two or more economic and financial variables (Habanabakize, 2020:132). Nonetheless, the effectiveness of each approach depends on many factors that include the data sample size, the nature of the considered date, type of relationship assessed and tools (software) employed. In this regard, the Ordinary Least Squares (OLS) is sometimes criticised for producing weak results, which may lead to erroneous conclusions (Mina, 2011:202-218). To rectify those issues that may result from the use of the OLS approach, scholars introduced some other sophisticated and rigorous approaches able to produce robust results. Those approaches or models include Markov switching model, both linear and nonlinear Autoregressive Distributed Lag (ARDL, NARDL) models and the Vector Autoregressive (VAR) model.

It is also important to highlight that the sophisticated models may also have weaknesses as discussed in further sections. For instance, the VAR model produces effective results only when applied to large sample size and variables with the same integration order (Engle & Granger, 1987:252). Using sophisticated econometrics approaches help reach solid results and eliminate different econometric problems such as autocorrelation, heteroscedasticity, multicollinearity and unit root with data under consideration (Arodoye & Iyoha, 2014:127- 129). For the same reason, the ARDL model was selected to assess the impact of agricultural employment, gross value added and exports on both the South African economic growth and economic development. The core reason for model selection was based on the used sample size as the ARDL model produces accurate results when applied to a small data sample (Habanabakize, 2020: 540). According to Enders (2004:294-352), it is imperative to ensure variables' stationarity before conducting any form of econometric analysis. Regarding this statement, stationarity and unit root tests precede many analysis conducted in this study.

4.4.1 Stationarity and unit root tests

The validity of time series analysis is contingent on the study variables. As such, each form of analysis or regression can produce sound results if only stationary variables are analysed, otherwise, wrong results are generated (Brooks, 2014:354). Additionally, to findings accuracy, stationarity tests help determine an appropriate model for data analysis (Enders, 2008:348). In other words, it is a useful procedure to establish whether all variables are integrated at level, first difference, second difference or a mixture of them. According to Cheremza and Deadman (1992:128), an integration order is represented as follows:

$X_t \approx I(d)$ where d designates the order of integration and (X_t) represents the series under consideration. Integration order designates how many unit roots are inherent to the analysed variable (series), that is, the required number of operations that can bring a series to a stationary state. Thus, if $d = 0$, the variable or series (X_t) is integrated of order zero or at a level and it is written as $I(0)$ meaning that it is stationary in levels. Conversely, if $d \geq 1$, the variable (series) (X_t) either integrated of order one, order two or higher and it is written as $I(1)$ or $I(2)$ or higher. In other words, the series (X_t) is not stationary in levels.

Several approaches, in econometrics, can be used when testing or detecting the presence of a unit root within a series. Gujarati and Porter (2009:754-759) and Brooks (2014:362-3365) argue that Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) are mostly employed when testing for unit root. These tests are popular owing to their nature and straightforwardness (Johansen, 1988: 231–254). All these mentioned three tests are somehow linked. The ADF comes in to rectify the weaknesses of the DF and the former reaches similar results as the one produced through the PP test (Habanabakize, 2019). However, the ADF and PP unit root tests are criticised to produce unsound results when applied on a small sample as they are very sensitive to sample size (Gujarati, 2009:754-759; Brooks, 2014:362-3365). To

ensure that the ADF and PP results are accurate, the researcher is supposed to also perform a stationarity test using the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) approach and then compare the results (Brooks (2014:365). In that case, the KPSS result will be considered as a confirmatory test towards the ADF and PP results (Deb, 2004:210). Following this argument, the current study also employed these three tests to ensure the soundness of the outcome.

4.4.1.1 Augmented Dickey-Fuller (ADF)

The ADF unit root is estimated as follow:

$$\Delta Y_t = \alpha_1 + \alpha_2 t + \rho Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-1+i} + e_t, t = 1, \dots, n. \dots \dots \dots (4.1)$$

In Equation 4.1, the series to be tested is represented by Y_t ; the constant term or intercept is denoted by α_1 while the considered trend is denoted by t . According to Dickey and Fuller (1979:427) while the unit root is tested under the following assumption or hypothesis:

$H_0: \rho = 0 \rightarrow$ suggestion that the coefficient of Y series has a unit root.

$H_1: \rho < 0 \rightarrow$ suggestion that the coefficient of Y series has no unit root.

The null hypothesis is rejected if the coefficient of the series under consideration is less than zero. Failing to reject the null hypothesis implies that the tested variable comprises a unit root. Thus, it is not stationary. The variable has to be different until it reaches the stationary state. The process of unit root testing can take three different approaches: it either comprise testing simple unit root, consider both drift and deterministic time trend or consider unit root with a sole drift (Xu & Sun, 2010:7-9). The following equations display all these approaches:

Test that considers only a simple unit root

$$\Delta y_t = \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + u_t \dots \dots \dots (4.2)$$

Test that considers a unit root with drift

$$\Delta y_t = \beta_0 + \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + u_t \dots \dots \dots (4.3)$$

Test that considers

Test that considers both drift and time trend

$$\Delta y_t = \beta_0 + \varphi^* y_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + \beta_1 t + u_t \dots \dots \dots (4.4)$$

The three equations are used to test the subsequent hypotheses:

$H_0: \varphi^* = 0 \rightarrow$ the series does possess a unit root.

$H_1: \varphi^* < 0 \rightarrow$ the series does possess a unit root.

The unit root testing under the ADF approach is very sensitive to lag selection as the use of an insufficient number of lags may lead to a rejection of true H_0 whilst the use of excess number lags lessens the potency of the test through the reduction of degrees of freedom (Habanabakize, 2019:134; Torres-Reyna, 2013:9).

4.4.1.2 Phillips and Peron (PP) unit root test

Although the Phillips and Perron (PP) (1988) unit root test is more likely to produce similar results to the Augmented Dickey-Fuller (ADF) unit root test, the two tests differ when dealing with serial correlation. The ADF, when dealing with correlation error, adds lagged difference terms while PP unit root test does not add them (Gujarati & Porter, 2008:758). Additionally, the PP test in dealing with serial correlation utilises the Newey–West (1987:81). In this regard, the PP unit root test is more preferable to the ADF unit root test as the former test considers the structural break within the economic variables (Phillips & Perron, 1988:81). The procedure of the PP test is described as follows:

$$y_t = \alpha y_{t-1} + \delta x_t + u_t \dots \dots \dots (4.5)$$

$$\Delta y_t = \theta_0 + \delta y_{t-1} + u_t \dots \dots \dots (4.6)$$

Both intercept and trend in Equation (3.4) are represented by θ_0 and t respectively. The tested hypotheses are the following:

$$H_0: \delta = 0$$

$$H_1: \delta < 0$$

The null hypothesis with $\delta = 0$ suggests that the series (variable) has unit root; and the alternative $\delta < 0$ suggests that the series (variable) is stationary or has no unit root. Although these two-unit root tests (ADF & PP) are mostly used in literature, they are criticised for being important in making decision and their results are criticised to be influenced and by the size of the tested sample (DeJong *et al.*, 1992; Habanabakize, 2019:7; McCarthy, 2015:5; Schwert, 1989:17). To overcome the ADF and PP shortcomings, the stationarity test proposed by Kwiatkowski, Phillips, Schmidt and Shin (KPSS) was also employed.

4.4.1.3 Kwiatkowski, Phillips, Schmidt and Shin (KPSS) stationarity tests

As stated above, this study employed the KPSS stationarity test as an alternative to both ADF and PP tests to rectify weaknesses associated with these tests. The KPSS null hypothesis differs from those of ADF and PP while in the ADF and PP tests, the null hypothesis suggests that y_t has a unit root, in KPSS the variable

y_t is hypothesised to be stationary (Brooks, 2014:365). Additionally, the KPSS results are considered accurate irrespective of the study’s sample size (McCarthy, 2015:5). The test is estimated as follows:

$$y_t = \delta_0 + \delta_{1t} + u_t \dots\dots\dots(4.7)$$

$$u_t = u_t - 1 + \varepsilon t \sim iid (0, \sigma_\varepsilon^2) \dots\dots\dots(4.8)$$

In Equation 4.6, the intercept and trend are represented by δ_0 and t respectively whilst u_t represents the error term. The null hypothesis suggests that both error term and variance are zero. The following are the KPSS tested hypotheses:

$$H_0 : \sigma_\varepsilon^2 = 0$$

$$H_1 : \sigma_\varepsilon^2 \neq 0$$

The variable is stationary if $\sigma_\varepsilon^2 = 0$, alternatively, the variable is not stationary (has a unit root) if $\sigma_\varepsilon^2 \neq 0$.

4.5 THE AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) MODEL

Different methods can be used to conduct the co-integration among variables. These models include the Autoregressive Distributed Lag (ARDL) model, Regime switching models and Vector Autoregressive (VAR) model. The Autoregressive Distributed Lag (ARDL) introduced by Pesaran and Pesaran (1997:7) and improved by Pesaran *et al.* (2001:91) was chosen to assess the long-run relationship (cointegration) among variables.

The ARDL model is utilised to establish both short-run and long-run between variables under consideration. This model has enormous benefits when compared to other econometric models that may determine a relationship between two or more series. These advantages or benefits includethat the ARDL model is adequate for a small sample and it can be applied on a mixture of variables provided none of them is integrated at the second order (Dube & Zhou, 2013:203; Pattichis, 1999:1063). Additionally, the ARDL model allows the use of a varying optimum number of lags. In other words, within the same model, each variable can have its lags length. Furthermore, the model reduces the autocorrelation and endogeneity problem through its ability of distinguishing between an independent and dependent variable (Mobin & Masih, 2014:15). Besides the aforementioned advantages of the ARDL model, this model can produce short run and long-run estimations simultaneously. The ARDL model, however, cannot be estimated on multiple equations or applied on variables that are integrated at the second order, I (2).

Owing to the aforementioned advantages associated with the ARDL model, this model was employed in this study to determine the effect of agricultural employment, gross value added and exports on both economic growth and economic development. The followings 4.9 and 4.10 are the simple equations estimated in this study:

$$GDP_t = f(AGEMP_t, AGVA_t, AGEXP_t, CPI_t) \dots \dots \dots (4.9)$$

$$EDI_t = f(AGEMP_t, AGVA_t, AGEXP_t, CPI_t) \dots \dots \dots (4.10)$$

Where,

GDP_t = Gross domestic product over time t

EDI_t = Economic development Index over time t

$AGEMP_t$ = Agricultural employment over time t

$AGVA_t$ = Agricultural gross value added over time t

$AGEXP_t$ = Agricultural exports over time t

CPI_t = Consumer price inflation over time t

All the study variables were transformed into a natural logarithm to determine the effect of independent variables on the dependent variable and the responsiveness of the dependent variable to shocks in independent variables. The two ARDL models estimated for the study are shown in equations 4.11 and 4.12 respectively below:

Model one (GDP per capita as dependent variable)

$$\begin{aligned} \Delta LGDP_t = & \alpha_0 + \\ & \sum_{j=1}^k \beta_j \Delta LGDP_{t-j} + \sum_{j=1}^k \gamma_j \Delta LAGEMP_{t-j} + \sum_{j=1}^k \delta_j \Delta LAGVA_{t-j} + \sum_{j=1}^k \tau_j \Delta LAGEXP_{t-j} + \sum_{j=1}^k \vartheta_j \Delta LCPI_{t-j} + \\ & \varphi_1 LGDP_{t-1} + \varphi_2 LAGEMP_{t-1} + \varphi_3 LAGVA_{t-1} + \varphi_4 LAGEXP_{t-1} + \varphi_5 LCPI_{t-1} + e_t \dots \dots \dots (4.11) \end{aligned}$$

Model two (Economic development index as dependent variable)

$$\begin{aligned} \Delta LEDI_t = & \alpha_0 + \sum_{j=1}^k \beta_j \Delta LGDP_{t-j} + \sum_{j=1}^k \gamma_j \Delta LAGEMP_{t-j} + \sum_{j=1}^k \delta_j \Delta LAGVA_{t-j} + \sum_{j=1}^k \tau_j \Delta LAGEXP_{t-j} + \\ & + \sum_{j=1}^k \vartheta_j \Delta LCPI_{t-j} + \varphi_1 LGDP_{t-1} + \varphi_2 LAGEMP_{t-1} + \varphi_3 LAGVA_{t-1} + \varphi_4 LAGEXP_{t-1} + \varphi_5 LCPI_{t-1} + e_t \\ & \dots \dots \dots (4.12) \end{aligned}$$

Where $LGDP$ is the natural log of gross domestic product per capita; $LAGEMP$ is the natural log of agricultural employment; $LAGVA$ is a natural log of the agricultural gross value added; $LAGEXP$ is the natural log of agricultural exports and $LCPI$ is the natural log of the consumer price index. $\beta_j, \gamma_j, \delta_j, \tau_j$ and ϑ_j represents the coefficients of short-run associations between the variables. On the other hand, the long-run relationship is indicated by the coefficients $\varphi_1, \varphi_2, \varphi_3$, and φ_5 while the error correction term is represented by e_t and the Δ denotes changes.

To establish the long-run relationships, the subsequent assumptions or hypotheses are formulated:

H₀: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$: (long-run relationship exists between variables).

H₁: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq 0$: (long-run relationship does not exist between variables).

The ARDL model employs the Wald test to determine whether variables under consideration co-integrate in the long-run or not (Hababakize, 2020: 545). The conclusion on the presence or absence of long-run relationship among variables is made based on the comparison between the critical values introduced by Pesaran *et al.* (2001:300) and the F-statistics. The critical values are divided into two categories. The first category exhibits lower bound critical values and suggests that variables under the study are integrated at levels I(0). The second category exhibits the upper bound critical value and suggests that variables under the study become stationary after the first difference. In case the F-statistics falls below the lower bound, the null hypothesis is not rejected and it can be concluded that variables under the study have no long-run relationship among them. In contrast, if the F-statistics appears to be higher than the upper bound critical values, the null hypothesis is rejected, meaning that a long-run or co-integration exists among variables. However, if none of the aforementioned cases exists, it means that the F-statistics falls between the two critical values unless further information is provided, no conclusion is made.

In case the long-run relationship is found among variables, the next step is establishing the error correction model (ECM). For the two models used in this study, the following equations 4.13 and 4.14 are the estimated error correction model:

$$\Delta LGDP_t = \alpha_0 + \sum_{j=1}^k \beta_j \Delta LGDP_{t-j} + \sum_{j=1}^k \gamma_j \Delta LAGEMP_{t-j} + \sum_{j=1}^k \delta_j \Delta LAGVA_{t-j} + \sum_{j=1}^k \tau_j \Delta LAGEXP_{t-j} + \sum_{j=1}^k \vartheta_j \Delta LCPI_{t-j} + \omega_1 ECT_{t-1} + e_t \dots\dots\dots (4.13)$$

$$\Delta LEDI_t = \alpha_0 + \sum_{j=1}^k \beta_j \Delta LGDP_{t-j} + \sum_{j=1}^k \gamma_j \Delta LAGEMP_{t-j} + \sum_{j=1}^k \delta_j \Delta LAGVA_{t-j} + \sum_{j=1}^k \tau_j \Delta LAGEXP_{t-j} + \sum_{j=1}^k \vartheta_j \Delta LCPI_{t-j} + \omega_2 ECT_{t-1} + e_t \dots\dots\dots (4.14)$$

Where the error correction term is represented by ECT while ω_1 and ω_2 are the coefficients of error correction terms for model one and model 2 respectively. When two or more variables are co-integrated or have a long-run relationship, it is assumed that they may also have a causal relationship. This justifies why, after testing for both short and long relationships, the causality test is also performed. The Toda-Yamamoto approach is employed in this study.

4.6 TODA-YAMAMOTO GRANGER CAUSALITY

Toda-Yamamoto is an econometric approach introduced by Toda and Yamamoto (1995) to determine a causality association that may exist between variables. This approach is preferred to Granger causality test as it produces robust results irrespective of the model used to test for cointegration between variables and the variables integration order (Giles & Mirza, 1999:4). By considering that all variables as are integrated

at levels and fit in the standard VAR, the Toda-Yamamoto approach minimises threats that may be caused by variables integration order (Ahmed, 2015:41).

Through the standard VAR, the Toda-Yamamoto approach combines two types of lag selection ($k+d_{max}$). Where the letter k denotes the lag length selected for the VAR system and d_{max} represents the augmented number of lags within the same VAR system. To conclude, when using the Toda-Yamamoto approach, the VAR system includes the extra lag to make it $k+1$ and the process is repeated until the maximum number of lag $k+d$ is reached (Habanabakize, 2019:139). The Toda-Yamamoto, which is also known as Granger non-causality test, employs an adapted Wald (MWald) test without any limitation on the original VAR (k) parameters. When estimating the augmented VAR ($k+d_{max}$), the Granger non-causality test includes an asymptotic χ^2 distribution. It is imperative to remember that in the procedure of testing for the Ganger non-causality (Toda-Yamamoto test), the first step is the selection of the lag length (k) and then the establishment of the variable integration order (d) followed by the maximum lag length ($(k+d_{max})$) of the model (Awokuse, 2003:130). The Toda-Yamamoto is preferred for causality tests, especially when the ARDL is used to test for cointegration (Zachariadis, 2006:12-13). For the same reason, this approach was selected for the current study and the following equations 4.15 to 4.19 are estimated for the study.

$$\begin{aligned} \Delta LGDP_t = & \alpha_0 + \sum_{i=1}^K \beta_i \Delta LGDP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LGPD_{t-i} + \sum_{i=1}^K \beta_i \Delta EDI_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LEDI_{t-i} + \\ & \sum_{i=1}^K \delta_i \Delta AGEMP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \delta_i \Delta LAGEMP_{t-i} + \sum_{i=1}^K \sigma_i \Delta LAGVA_{t-i} + \sum_{j=K+1}^{K+d_{max}} \sigma_i \Delta LAGVA_{t-i} + \\ & \sum_{i=1}^K \gamma_i \Delta LAGEXP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \gamma_i \Delta LAGEXP_{t-i} + \sum_{i=1}^K \gamma_i CPI + \sum_{j=K+1}^{K+d_{max}} \gamma_i \Delta CPI_{t-i} + \varepsilon_t \dots \dots \dots (4.15) \end{aligned}$$

$$\begin{aligned} \Delta LAGEMP_t = & \alpha_0 + \sum_{i=1}^K \beta_i \Delta LAGEMP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LAGMP_{t-i} + \sum_{i=1}^K \delta_i LGDP + \\ & \sum_{j=K+1}^{K+d_{max}} \delta_i \Delta LGDP_{t-i} + \sum_{i=1}^K \beta_i \Delta EDI_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LEDI_{t-i} + \sum_{i=1}^K \sigma_i \Delta LAGVA_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \sigma_i \Delta LAGVA_{t-i} + \sum_{i=1}^K \gamma_i \Delta LAGEXP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \gamma_i \Delta LAGEXP_{t-i} + \sum_{i=1}^K \vartheta_i \Delta LCPI_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \vartheta_i \Delta LCPI_{t-i} + \varepsilon_t \dots \dots \dots (4.16) \end{aligned}$$

$$\begin{aligned} \Delta LAGVA_t = & \alpha_0 + \sum_{i=1}^K \beta_i \Delta LAGVA_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LAGVA_{t-i} + \sum_{i=1}^K \delta_i \Delta AGEMP_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \delta_i \Delta LAGEMP_{t-i} + \sum_{i=1}^K \sigma_i \Delta LGDP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \sigma_i \Delta LGDP_{t-i} + \sum_{i=1}^K \beta_i \Delta EDI_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LEDI_{t-i} + \sum_{i=1}^K \gamma_i \Delta LAGEXP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \gamma_i \Delta LAGEXP_{t-i} + \sum_{i=1}^K \vartheta_i LCPI_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \vartheta_i \Delta LCPI_{t-i} + \varepsilon_t \dots \dots \dots (4.17) \end{aligned}$$

$$\begin{aligned} \Delta AGEXP_t = & \alpha_0 + \sum_{i=1}^K \beta_i \Delta LAGEXP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LAGEXP_{t-i} + \sum_{i=1}^K \delta_i \Delta AGEMP_{t-i} + \\ & \sum_{j=K+1}^{K+d_{max}} \delta_i \Delta LAGEMP_{t-i} + \sum_{i=1}^K \sigma_i \Delta LAGVA_{t-i} + \sum_{j=K+1}^{K+d_{max}} \sigma_i \Delta LAGVA_{t-i} + \sum_{i=1}^K \gamma_i \Delta LGDP_{t-i} + \end{aligned}$$

$$\sum_{j=K+1}^{k+d_{max}} \gamma_i \Delta LGDP_{t-i} + \sum_{i=1}^K \beta_i \Delta EDI_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LEDI_{t-i} + \sum_{i=1}^K \vartheta_i \Delta CPI_{t-i} + \sum_{j=K+1}^{K+d_{max}} \vartheta_i \Delta LCPI_{t-i} \varepsilon_t \dots (4.18)$$

$$\Delta LEDI_t = \alpha_0 + \sum_{i=1}^K \beta_i \Delta EDI_{t-i} + \sum_{j=K+1}^{K+d_{max}} \beta_i \Delta LEDI_{t-i} + \sum_{i=1}^K \sigma_i \Delta LGDP_{t-i} + \sum_{j=K+1}^{k+d_{max}} \sigma_i \Delta LGDP_{t-i} + \sum_{i=1}^K \delta_i \Delta AGEMP_{t-i} + \sum_{j=K+1}^{K+d_{max}} \delta_i \Delta LAGEMP_{t-i} + \sum_{i=1}^K \sigma_i \Delta LAGVA_{t-i} + \sum_{j=K+1}^{k+d_{max}} \sigma_i \Delta LAGVA_{t-i} + \sum_{i=1}^K \gamma_i \Delta LAGEXP_{t-i} + \sum_{j=K+1}^{k+d_{max}} \delta_i \Delta LCPI_{t-i} + \sum_{i=1}^K \vartheta_i \Delta LCPI_{t-i} + \varepsilon_t \dots (4.19)$$

Where k is optimal lag, td_{max} is maximum lag length, e_t is the error term and $\alpha_0, \beta_i, \delta_i, \sigma_i, \gamma_i$ and ϑ_i denote the estimated coefficients. Given the importance of lags in the Toda-Yamamoto approach, lag selection precedes causality tests.

4.7 LAG LENGTH SELECTION

As mentioned in the previous section, the lag length needs to be selected to ensure accurate research outcomes (Brooks, 2014). Although there are over five criteria used to determine optimal lags, the most used are Schwarz-Bayesian information criteria (SIC) and the Akaike information criteria (AIC). The mathematical representation of the two criteria is expressed as follows in equations 4.20 and 4.21 respectively:

$$AIC = -2\ln(LH) + 2k \dots (4.20)$$

$$SIC = -2\ln(LH) + k\ln(n) \dots (4.21)$$

In these two equations (4.20 and 4.21), n and k denote regression, the number of observation and model parameters respectively while the maximum likelihood is denoted by LH . Although Brooks (2014:189) states the similarities between all criteria, the SIC is chosen over the AIC when the study is conducted on a small sample as the AIC may produce spurious results when applied to a small sample. Since the current study does not include a large sample, the SIC is used for lag selection.

4.8 DIAGNOSTIC TESTS

The reliability of the study model and its results are established through residual diagnostic checks. The most employed tests are Jarque-Bera normality test, heteroscedasticity test, parameters stability test and the serial correlation test. The stability test measures whether variables are stable or not and it is conducted on assumption that parameters are perfectly stable, lying between two critical bounds (Brooks, 2014:232). The stability test is conducted using the cumulative sum of recursive residuals (CUSUM) (Pesaran & Pesaran, 1997:19). By using the likelihood, the study ensures that none of the undesirable data features such

heteroscedasticity and serial correlation prevails. Tintner (1965:33) designates the serial correlation as a correlation of lags between two distinctive series or variables.

The null hypothesis suggests that series are not serially correlated while the alternative, undesirable one, implies that series are serially correlated. The Lagrange Multiplier (LM) is then used in this study to detect the absence or presence of correlation. Besides the serial correlation, the study tested whether the series under consideration are homoscedastic or heteroscedastic. The null hypothesis for heteroscedasticity is similar to the one of serial correlation. The desirable outcome would suggest a failure to reject the null hypothesis, implying that the fluctuation in the variance of the error term is constant irrespective of the magnitude of dependent variable (Gujarati & Porter, 2008:65). Each of the aforementioned variables is concisely discussed below.

4.8.1 Normality test

The Jarque-Bera (JB), an asymptotic normality test based on OLS residual, computes the kurtosis and the skewness measures of the OLS residuals (Adenomon & Ojo, 2019:12). The conclusion on normal distribution is reached through the assistance of the test statistic shown in equation 4.22:

$$JB = n \left[\frac{s^2}{6} + \frac{(k-3)^2}{24} \right] \dots\dots\dots (4.22)$$

Where:

n = sample size

s = skewness coefficient

k = kurtosis coefficient

The null hypothesis is that the residuals are normally distributed. With a sufficiently low p-value (0.05) of the JB, the normal distribution hypothesis is rejected and with the high p-value (0.65,) the normality assumption is not rejected since there is rational cause for the acceptance of the null hypothesis in that the error term followed a normal distribution (Adenomon & Ojo, 2019:13).

4.8.2 Serial correlation (LM test)

When conducting a time series analysis, it is necessary to ensure date the employed data series is not influenced by external factors, meaning that the used variables are not interdependent (Janacek & Swift, 1993:161). Thus, a time series is expected to have serial correlation if its current error term includes the previous or lagged errors (Hunter *et al.*, 2017:138; Wooldridge, 2012:412). In other words, the value of the current data set depends on its lagged values. This data independence is detected through the use of the Lagrange Multiplier (LM) test. Additionally, research can easily determine the presence of serial correlation

by checking the value Durbin-Watson (DW) statistics or the Ljung-Box Q statistic. The Ljung-Box Q statistic represented by Ljung and Box (1978:299) is expressed in equation 4.23 as follows:

$$Q_k = n(n + 2) \sum_{i=1}^k \frac{r_i}{(n-i)} \dots\dots\dots (4.23)$$

In equation 4.24, n and k denote the sample size and lag length respectively while the r_i is the size of autocorrelation. The larger the Q_k , the high is the likelihood of having no autocorrelation within the study variables. Thus, a large Q_k indicates the accuracy of the employed model. Furthermore, the Breusch-Godfrey (LM) test is also used to assess autocorrelation within the study model. The conclusion on the LM test is made based on the following assumptions or hypotheses:

H_0 : Data is not serially correlated

H_1 : Data is serially correlated

The test for serial correlation is mathematically expressed in equation 4.24 as:

$$Q_{LB} = T(T + 2) \sum_{j=1}^p \frac{r_j^2}{T-j} \dots\dots\dots (4.24)$$

Where the number of observations is denoted by the letter T, correlation order is represented by p and the magnitude of the correlation is denoted by r_j^2 . The H_0 is rejected in favour of H_1 if the study residuals are correlated, otherwise, the model is robust and the H_0 is not rejected.

4.8.3 Heteroscedasticity test

According to Hayakawa and Pesaran (2015:112), the heteroscedasticity exists in the model when the variance model error terms are not consistent or uniform. A data set can undergo heteroscedasticity owing to series' outliers or data manipulation through both interpolation and extrapolation. The presence of heteroscedasticity in the model can result in spurious conclusions. The following are the assumptions used when testing for heteroscedasticity.

H_0 : Residuals are homoscedastic.

H_1 : Residuals are heteroscedastic

Failing to reject the null hypothesis (H_0) suggests that the used model is robust and accurate, otherwise, the model residuals are heteroscedastic and, thus irrelevant.

4.8.4 Stability tests

To ensure better results, this study employed stability tests to determine consistency within the study parameters (Seddighiet *al.*, 2000:82). Different residual tests can detect the model's stability and these include the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squared residuals (CUSUMQ) tests, which plot residuals around zero suggesting standard errors at each data point (Brooks, 2014:233). As for other residuals tests, the H_0 for CUSUM and CUSUMQ suggests that the model parameters are stable while the H_1 suggests that the model parameters are not stable (Brooks, 2014:234).

H_0 : Parameters are stable (desirable)

H_1 : Parameters are not stable (not desirable)

4.9 CHAPTER SYNOPSIS

The core aim of the study is to determine the effect of agricultural economic components (employment, gross value added and exports) on both the South African economic growth and economic development. Through this process, the study determines the responsiveness of economic growth and economic development to changes in the aforementioned agricultural components. To achieve the mentioned objective, this chapter provided the nature, period and the source of employed data. The data used is an annual time series running between 1994 and 2019. Thus, the study is conducted on 26 annual observations. The chapter also presented and discussed various econometric approaches used to assess the stability of the variables together with both the long and the short-run relationships.

The ARDL model was selected as a suitable model for the cointegration of tests firstly because the study sample size is small and secondly because the regression focuses on a simple equation. Following the bound test, the error correction model (ECM) assesses the short term relationship among the variables and the speed of adjustment that follows a shock in the independent variables. Additionally, before the discussing the significance of lag selection, the chapter discusses the Toda-Yamamoto Granger non-causality test for causality. The last section of approaches and model discussion focuses on various residual diagnostic tests employed in this study. These tests are conducted to validate the used model to determine the relationship between agricultural economic components (employment, gross value added and exports) and the South African economic growth and economic development levels. The next chapter is dedicated to the application of strategies and models discussed in this chapter with the purpose of achieving the empirical objectives set out for the study.

CHAPTER 5

EMPIRICAL ESTIMATIONS, RESULTS AND DISCUSSION

5.1 INTRODUCTION

In the previous chapter, the researcher focused on the presentation and description of different econometric and statistical techniques and models, which are subject to the study. The aim was to create a solid foundation and framework to prepare for adequate empirical or practical analysis of the series under consideration. The current chapter, provides various econometric estimations and results from the application of approaches, methods and models as highlighted in Chapter 4. The first section of this chapter consists of a preliminary analysis including a graphical representation of the time series used in the study. The graphical analysis aims at providing an overall view of variables trends considered over the timeframe. Subsequently, a pairwise correlation between the study variables was undertaken to establish movements and alterations experienced by the variables during the study period. Additionally, the two significant econometric tests, unit root and stationarity tests were ran in order to establish the variable integration order and to ensure that the model selected to test for both long-run and short-run relationships is accurate.

Results from both the unit root and stationarity tests suggested that the accurate and appropriate econometric model to determine long-run and short-run relationships is the autoregressive distributed lag (ARDL) model. The study uses the latter to determine whether employment, exports and gross value added from the agricultural sector in South Africa have any influence on the level of economic growth (GDP) in the country. After establishing the long-run and short-run relationship patterns, the chapter proceeds to establish the existence of causal relationships between the dependent and independent variables and among dependent variables themselves. Given the likelihood of abating erroneous or spurious findings resulting from inappropriate models, various diagnostic and residual tests were run to confirm and validate both employed models and their results. Comparing findings and empirical objectives is significant for determining whether the objectives of the study were achieved or not before conclusions on the chapter are drawn.

5.2 PRELIMINARY ANALYSIS

5.2.1 Graphical (trends) analysis

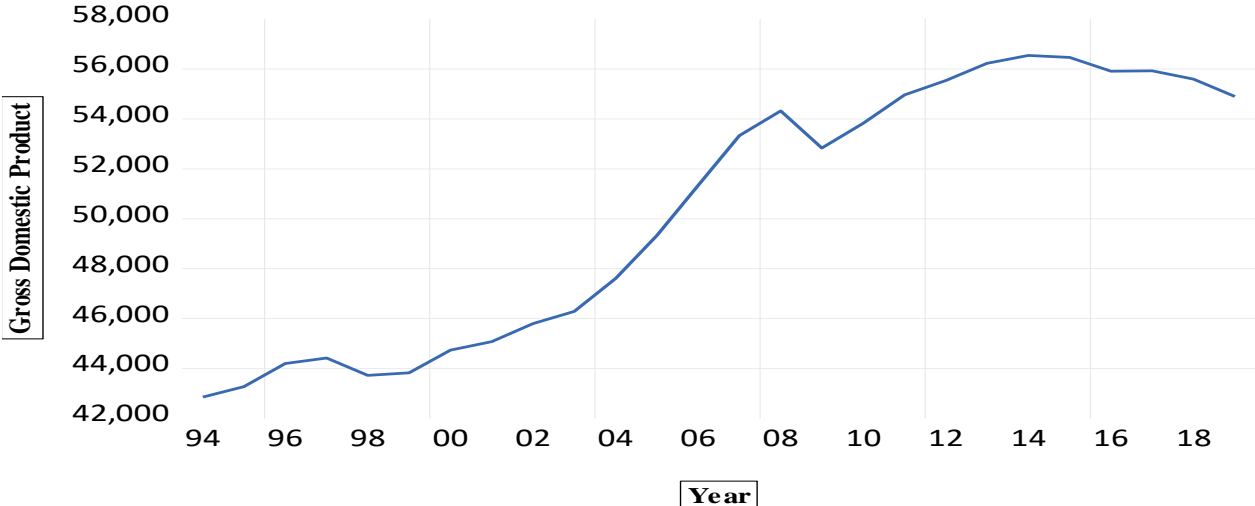
The overview of movements occurring between variables during the selected duration of the study was established through graphical representation. According to Habanabakize (2017:58) and Lütkepohl and Krätzig (2004:40), graphical representation plays an important role in providing variables outlier deficiencies, structural breaks and heterogeneous fluctuations. In addition, the graphical analysis is useful to complete before running stationarity and unity roots tests as it may assist in selecting a suitable model for analysis of the long-run. Graphical analysis for all study variables was employed to analyse trends

experienced by each variable over the selected period. The diagnosis of deficiency likelihood for each variable is displayed in Figure 5.1 to Figure 5.5 for the period between 1994 and 2019.

5.2.1.1 *Gross domestic product (GDP)*

Looking at the graphical representation in Figure 5.1, economic growth in South Africa followed an upward trend since 2015. However, between 2008 and 2009, the gross GDP experienced a significant decline, the main cause of which was the global financial crisis from which the agricultural sector was not spared (Moyo, 2015:126). Nonetheless, the spillover effects of the crisis did not last for long because agricultural GDP per capita regained momentum from 2009 to 2016 and picked up. However, there was another contraction in GDP per capita between 2016 and 2019 that resulted in a significant decline in both the agricultural and non-agricultural sector’s total production (Greyling *et al.*, 2014:2; Stats SA, 2017:3).

Figure 5.1: National gross domestic product per capita (1994 – 2019)

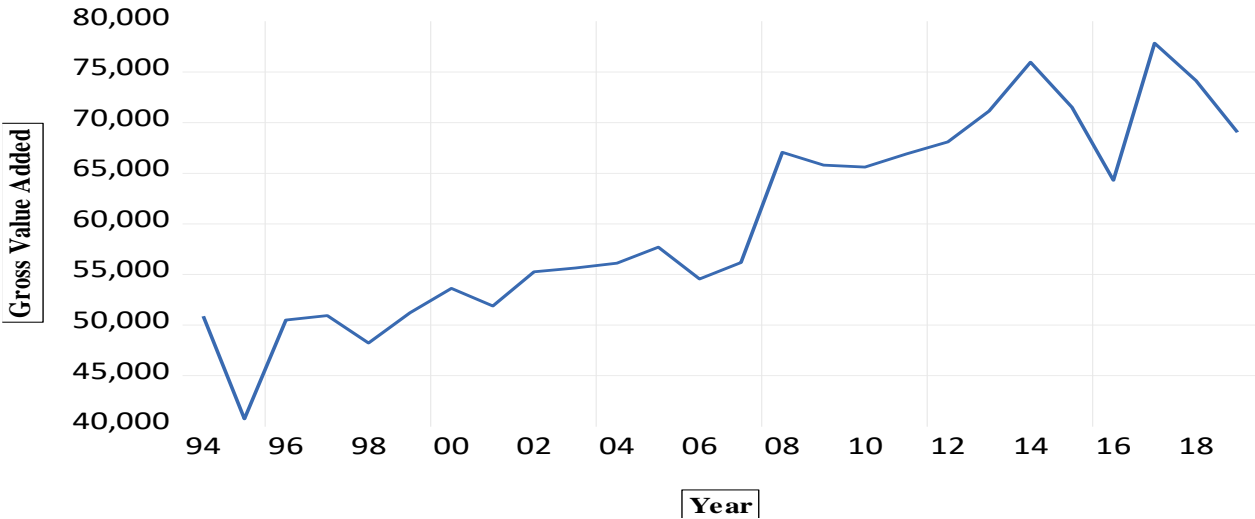


Source: Own compilation from the study sample

5.2.1.2 *Agricultural value added or output*

The study employed graphical analysis to assess trends in agricultural output or GVA. As depicted by Figure 5.2, the output levels in the agriculture sector had been undergoing vicissitudes resulting from four major contractions. Consequently, sectoral output dropped drastically between 1994 and 1995, 2014 and 2016 and between 2017 and 2019. These contractions resulted from over usage of inputs, alteration of South African trade policies and climate changes such as the drought experienced between 2015 and 2018 and significant decreases in rainfall (Conradie *et al.*, 2009:11; GreenCape, 2020:12; Greyling, 2012:26).

Figure 5.2: Agricultural gross value added (1994 – 2019)

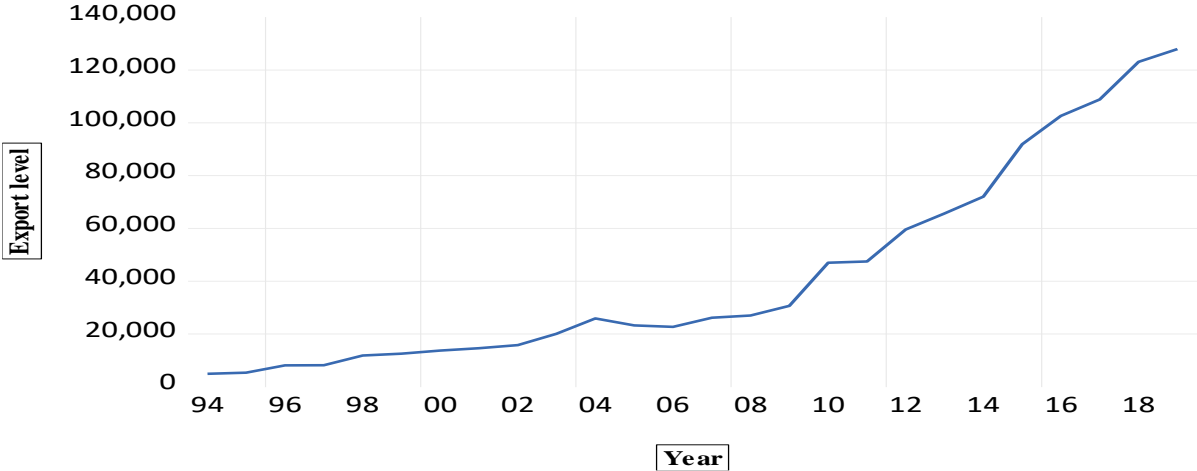


Source: Own compilation from the study sample

5.2.1.3 *Agricultural exports*

Figure 5.3 displays a graphical representation of exports from the agricultural sector in South Africa. Contrary to GDP and the output represented in Figures 5.1 and 5.2, exports in the agricultural sector experienced an upwards growth trend between 1994 and 2019, acknowledging agricultural exports as one of the sources of income in South Africa during the study period (IDC, 2019:17). This agricultural export growth resulted from the role played by non-traditional trade partners to the agricultural sector (Daya & Steenkamp, 2014:1). This confirms structural theories that sectors are interdependent and that they were moving together during the study period where after a shock in any sector, the sectors re-establish stable long-run equilibrium (Subramanian, Saghaian, Maynard & Reed, 2009:171).

Figure 5.3: Agricultural exports (1994 – 2019)

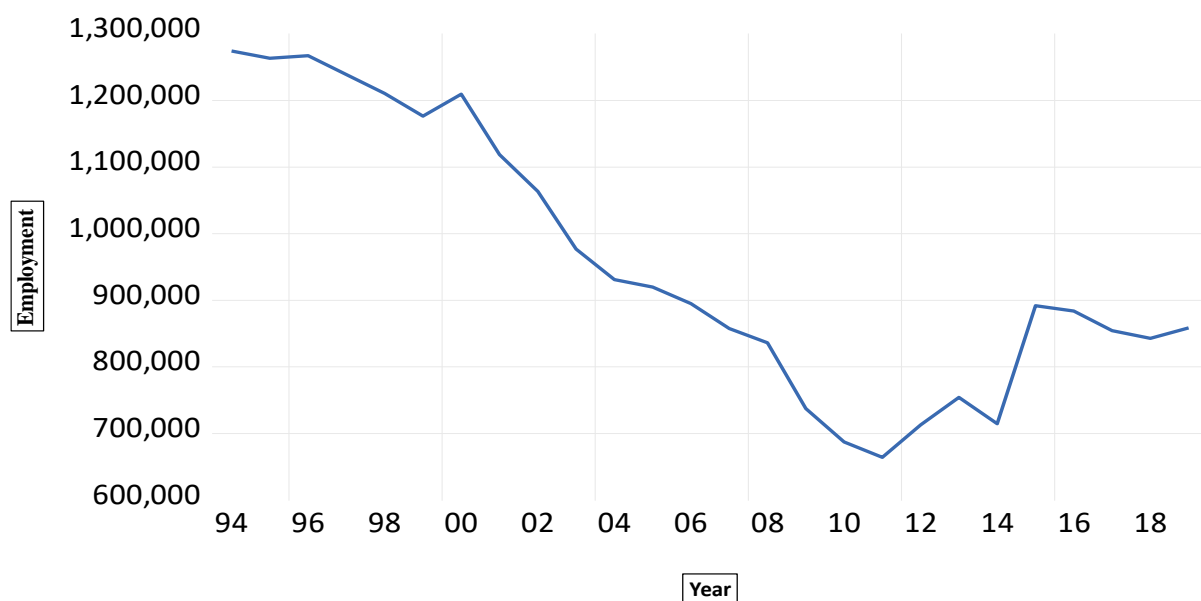


Source: Own compilation from the study sample

5.2.1.4 Employment in the agricultural sector

Figure 5.4 represents employment trends in the agricultural sector in South Africa. As shown by figures from 1994 to 2011, the agricultural sector experienced a significant decrease in employment levels. However, employment levels started to increase from 2011 to 2013 and then dropped again. Between 2014 and 2016, the agricultural sector enjoyed employment growth that did not last for a long time as the decline started again by the end of 2016. Although there were various reasons or causes of the aforementioned crisis, the major factors were the repercussions of the apartheid regime, exclusion policies where the majority of black people did not have access to jobs, increased capital intensive mode of production within the sector, 2008 financial crisis and the minimum wage introduction (Altman,2003:158; Borat *et al.*, 2015:2-10).

Figure 5.4: Employment in agricultural sector (1994 – 2019)

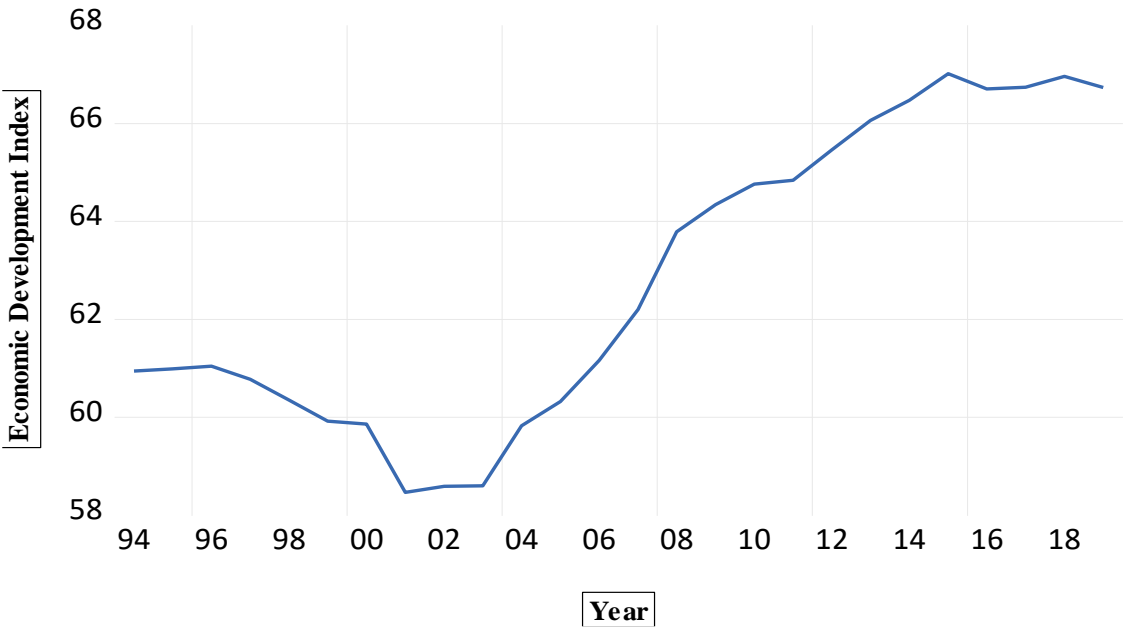


Source: Own compilation from the study sample

5.2.1.5 Economic development index (EDI)

Depicted trends in Figure 5.5 indicate that between 1994 and 1996, the economic development index was constant in South Africa. At that stage, the country was experiencing the advent of democratic events and introduced policies not fully implemented yet. However, from 1996 to 2001, with the exception of the year 2000, there was economic development decline in South Africa followed by a stagnant state between 2001 and 2003. Nonetheless, the country experienced significant economic development growth for eleven years between 2004 and 2015. However, an ongoing slight declining trend started at the end of 2015, some causes of which included sluggish economic growth, high and growing unemployment rate, growth in inflation, demographic and exchange rates (Faure, 2017:10; Rodrik, 2008:1).

Figure 5.5: Economic development index (1994 – 2019)

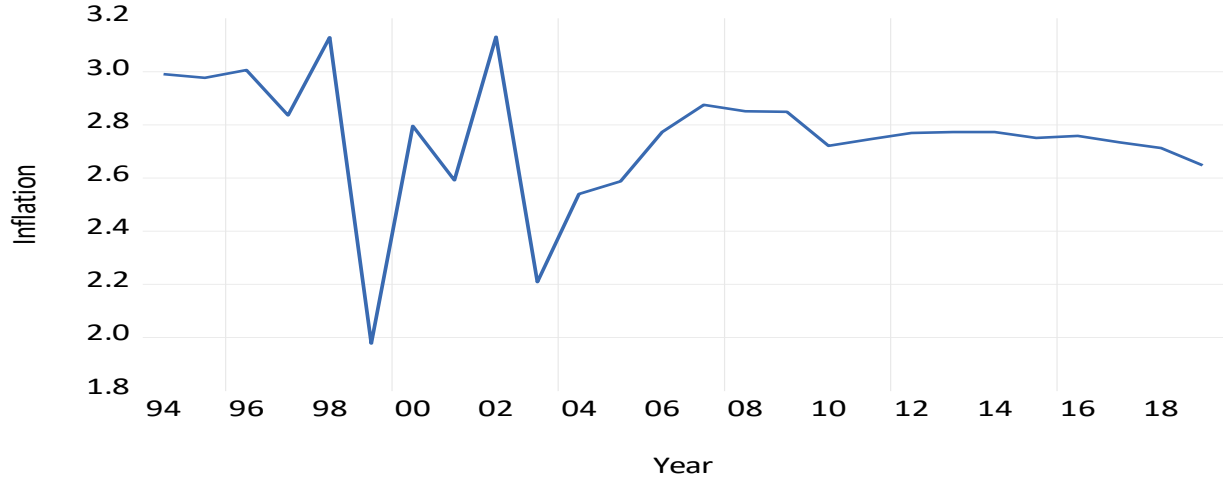


Source: Own compilation

5.2.1.6 Consumer price index (CPI)

Depicted trends in Figure 5.5 indicate that between 1994 and 1996 inflation was almost constant at 3 percent and it declined to 2.9 in 1997 to grow to 3.1 percent in 1998. Between 1997 and 1998, the south African economy experience it lowest inflation rate. Nonetheless, since the of 1999 to 2002 with exception of 2001, the coutry experienced a sharp increase in inflation rate. From 2009, the South African iflation fluctuated between 2.8 percent and 2.6 percent. Thsesre trends indicates that inflation rate in south Africa is not highh and could not be the major issue of economic growth.

Figure 5.6: Consumer price inflation (1994 – 2019)



Source: Own compilation

5.2.2 Pearson correlation analysis

Correlation analysis is one of the simplest and easiest methods to present the magnitude of relationships that may exist between two economic, financial and statistical variables X and Y (Hababakize & Muzindutsi, 2015:652). The value of correlation (r) between two variables falls between -1 and + 1. In other words, +1 represents the highest positive correlation while -1 represents the lowest correlation between variables (Simon & Goes, 2011:1). A correlation (r) of zero value suggests that two variables have no relationship. The value from zero indicates how negative or positive two variables are associated.

Table 5.1 displays correlation coefficients between the two dependent variables and their explanatory variables. Findings in the table indicate that a strong negative correlation exists between the two dependent variables namely per capita LGDP and LEDI. Nonetheless, the dependent variables are negatively and strongly correlated with agricultural employment. Contrary to employment level, other independent variables are positively correlated with LGDP and LEDI. Since all coefficients differed from zero and their coefficients were statistically significant, irrespective of positive or negative changes in their movement, the study variables were connected. As discussed in trend analysis, the table 5.1 confirms that inflation rate is not statistically significant to influence any of the study variables.

Table 5.1: Pearson correlation analysis results

Variable	LGDP	LEDI	LAGEMP	LAGEXP	LAGVA	LCPI
LGDP	1.0000 -----					
LEDI	0.682111 (0.000*)	1.0000 -----				
LAGEMP	-0.802563 (0.000*)	-0.706215 (0.000*)	1.0000 -----			
LAGEXP	0.722399 (0.000*)	0.841136 (0.000*)	-0.792204 0.000*	1.0000 -----		
LAGVA	0.695917 (0.000*)	0.417744 (0.0337**)	-0.710288 (0.000*)	0.704744 (0.000*)	1.0000 -----	
LCPI	-0.023774	0.099343	0.106808	-0.172792	-0.251807	1.0000
	0.9083	0.6292	0.6035	0.3986	0.2146	-----

Note: () shows the p-values whilst *: ** indicates the significance at a 1% and 5 % significance level respectively

Source: Own compilation from the study sample

Correlation exists not only between the dependent and independent variables; it also exists amongst the explanatory variables. As illustrated in Table 5.1, the GVA and exports correlate negatively to agricultural employment whilst a strong positive correlation exists between the GVA and agricultural exports. This implies that the higher the export quantity demanded abroad, the larger the quantity produced and vice versa. These results are in line with findings from the study commissioned by WaCipamba (2015) whose findings suggested a positive relationship between export and output implying that, should South Africa implement policies that support exports, the agricultural sector output will increase, *ceteris paribus*.

5.2.3 Descriptive statistics

Besides the correlation analysis, the descriptive statistics analysis is also a considered preliminary analysis, helping to uncover different properties of times series data in the study. Table 5.2 displays the descriptive statistics values for economic growth, agricultural employment, agricultural exports, per capita and agricultural GVA. Besides agricultural employment mean and median values moving around 13.7, the mean of other variables of the study fluctuates between 10.1 and 10.9. Additionally, over 25 years between 1994 and 2019, the GDP experienced a slight growth only as reflected by the difference of 0.277 between the minimum and maximum. This insignificant growth in GDP is associated with low growth in agricultural GVA as the difference between the maximum and minimum value of agricultural GVA is only 0.32. Similarly, the difference between maximum and minimum of agricultural employment and agricultural exports over 25 years is minimal. This implies that the agricultural sector did not perform well since 1994. The value of the standard deviation in the table is tiny for all variables under consideration suggesting the absence of major changes in the agricultural sector. The statistics and probability values of the Jarque-Bera test are 3.26 and 0.196 respectively suggesting that all data series under consideration are normally distributed. A variable is normally distributed if its Jarque-Bera statistics test outcome is around three and its Jarque-Bera probability value is higher than 0.05 (Brooks, 2014:209).

Table 5.2: Results for descriptive statistics

Series/Variable	LGDP	LEDI	LAGEMP	LAGEXP	LAGVA	LCPI
Mean	10.82128	4.138918	13.74855	10.24395	10.89668	2.750127
Median	10.86052	4.121935	13.70284	10.16640	10.93610	2.771024
Maximum	10.94286	4.204986	14.05780	11.75947	10.96293	3.131137
Minimum	10.66544	4.068441	13.40633	8.488835	10.61467	1.977547
Std. Dev.	0.105404	0.048535	0.210567	0.979529	0.073732	0.245719
Skewness	-0.223180	0.086501	0.105828	-0.036952	-2.403689	-1.326162

Series/Variable	LGDP	LEDI	LAGEMP	LAGEXP	LAGVA	LCPI
Kurtosis	1.323498	1.465082	1.781789	1.970918	9.286533	5.686252
Jarque-Bera	3.260720	2.584727	1.656240	1.153177	67.85066	15.43833
Probability	0.195859	0.274621	0.436870	0.561812	0.000000	0.000444

Source: Own compilation from the study sample

Skewness and Kurtosis are additional tests used in econometrics to validate Jarque-Bera results (Coakes & Steed, 2007:485). A series with Skewness and Kurtosis values of zero has perfect distribution (Pallant, 2016:30). Nonetheless, given the absence of a fixed measurement of a deviation from a normal distribution, Hair, Black and Babin (2010:68) asserted that the skewness value of a time series should fall between -1 and $+1$ and kurtosis between -3 and $+3$. Considering both the skewness and kurtosis values in Table 5.2, the study series meets all the requirements for perfect distribution. As a result, the study sample data or series is normally distributed with exception of LGVA and LCPI.

5.2.4 Stationarity and unit root tests

5.2.4.1 *The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests*

From the graphical analysis performed in section 5.2, it proved that variables under consideration have upwards and downwards trends, meaning that their variance is not stable. It could, therefore, be concluded based on the outcome of graphical analysis and descriptive statistics results that the study variables might have unit roots. However, it would be irrational to perform regression analysis without first ensuring the stationarity of variables. Hence, the unit root test in this section assisted not only with the removal of the unit root from the series under consideration but also to determine an appropriate model for cointegration and error correction analysis. In other words, a model is used in determining the existence or absence of long-run and short-run relationships amongst variables. Both the ADF and PP were engaged in testing for existence or non-existence of unit root among variables and the results are shown in Table 5.3. Based on the outcome of the test presented in the Table, all variables integrated of the first order $I(1)$ except for LAGEXP do not have a unit root at the level. Consequently, the integration order of variables under consideration was a mixture of both $I(0)$ and $I(1)$.

Table 5.3: ADF and PP unit root test results

Variable	Model specification	Levels		1 st difference		Integration order
		ADF	PP	ADF	PP	
LGDP	Intercept	0.4837	0.4878	0.0029*	0.0029*	$I(1)$

Variable	Model specification	Levels		1 st difference		Integration order
		ADF	PP	ADF	PP	
	Intercept & trend	0.9752	0.9732	0.0057*	0.0057*	
LEDI	Intercept	0.6757	0.4372	0.0755	0.0587	I(1)
	Intercept & trend	0.1236	0.2436	0.0023*	0.0001*	
LAGEMP	Intercept	0.5452	0.5444	0.0023*	0.0023*	I(1)
	Intercept & trend	0.9612	0.9562	0.0063*	0.0063*	
LAGEXP	Intercept	0.7373	0.7025	0.0000*	0.0000*	I(1)
	Intercept & trend	0.1368	0.7025	0.0001*	0.0001*	
LAGEXP	Intercept	0.0370**	0.1608	0.1010*	0.0000*	I(0)
	Intercept & trend	0.5245	0.0265**	0.0463**	0.0000*	
LCPI	Intercept	0.0097*	0.0001*	0.0000*	0.0000*	I(0)
	Intercept & trend	0.0455**	0.0000*	0.0000*	0.0000*	

Note: *, ** denote significant p-value at a 1% and 5% percent significance level respectively.

Source: Own compilation from the study sample

5.2.4.2 Kwiatkowski-Phillips-Schmidt-Shin (KPSS) stationarity test

While the ADF and PP tests are conducted to establish the existence of unit root for the series on the study data under consideration, the KPSS test is applied in testing whether or not variables are stationary. With ADF and PP, the null hypothesis has to be rejected to consider a variable suitable for analysis. The variable is appropriate for regression if the null hypothesis cannot be rejected in KPSS test. Presumably, KPSS tests generate solid results as compared to both ADF and PP (Brooks, 2014:362) and they are confirmatory tests. In consideration of deterministic trends, the results in Table 5.4 indicate a mixture of integration order. Both dependent variables (LGDP and LEDI) together with LCPI, LAGEMP and LAGVA are stationary at a level while LAGEXP becomes stationary after the first difference. Therefore, the KPSS results confirm that variables in the study are a mixture of I(0) and I(1). Given that the sample size for the study is small and that some variables are I(0), others are I(1), the ARDL model is the best econometric approach for both short-run and long-run relationship analysis (Meyer & Habanabakize, 2018:781). Given that the null hypothesis for unit root suggests that a variable has a unit root while the stationarity (KPSS) test suggests that a variable is stationary, these two tests may provide contradictory results.

Table 5.4: Stationarity test results

Variable	Model specification	Levels	1 st difference	Integration order
LGDP	Intercept	0.7003	0.2488*	I(0)
	Intercept & trend	0.1271*	0.1485	
LEDI	Intercept	0.620147*	0.204923*	I(0)
	Intercept & trend	0.135922*	0.13735*	
LAGEMP	Intercept	0.5812	0.2798*	I(1)
	Intercept & trend	0.1519	0.1153*	
LAGEXP	Intercept	0.7559	0.2307	I(0)
	Intercept & trend	0.08038*	0.113*	
LAGVA	Intercept	0.5508	0.2207*	I(1)
	Intercept & trend	0.2125	0.2132*	
LCPI	Intercept	0.206650	0.051566*	I(0)
	Intercept & trend	0.098818*	0.046250*	

Note: *, ** denote stationary at a 1% and 5 % level of significance, critical values are 0.463000 with intercept (constant) and 0.146000 with intercept and trend

Source: Own compilation from the study sample

Now that the order of integration for the study variables and the appropriate model for variables relationships were determined, the next section deals with lag length selection to ensure employment of optimum lag for each model. Lag selection is important because using a large or small number of lags may have a negative implication on findings (Habanabakize, 2019:135).

5.3 ARDL BOUNDS TESTING AND ERROR CORRECTION MODEL RESULTS

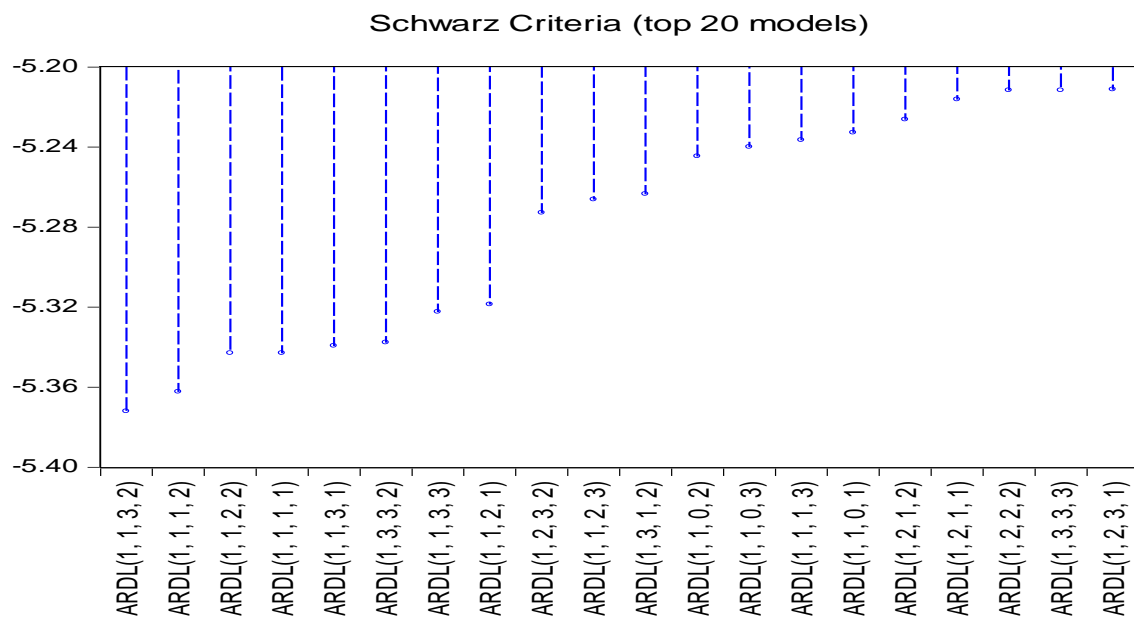
As part of the analysis the study ensued to determine both the long-run and short-run dynamics between the performance of the agricultural sector and both economic growth and economic development. In doing so, the analysis as shown in Chapter 4 was directed towards the estimation of two different models. Model one in this regard used GDP per capita (economic growth) as dependent variable whilst model two made use of the economic development index (EDI) as the dependent variable. Results regarding ARDL and ECM analysis are thus shown in the sub-sections below.

5.3.1 Model 1 – Agricultural performance and economic growth

5.3.1.1 Lag length selection and best model specification

As mentioned in the previous paragraph, lag length selection plays a significant role in time series analysis. Even though it requires precaution, ignoring lags may end in bias results while using excess lags may also impede on prediction and forecasting (Habanabakize, 2016:52; Torres-Reyna, 2013). Although there are many criteria used for lag selection (AIC, SIC, HQC, FPE and BIC), it is imperative to consider the one compatible with the study and its sample size. For a small sample as in the case of this study, the appropriate criterion is the Bayesian information criterion (BIC) (Brooks, 2014:275). The ARDL model used in the E-Views software will generate a maximum of 20 models from which the best model selected will be the one that includes a minimum number of optimal lags. As displayed in Figure 5.6, the best model selected for the current study was the ARDL1,1,3,2. This implies the use of one lag on both LGDP and LAGEMP and the use of two and three lags on LAGEXP and LAGVA respectively.

Figure 5.6: Lag selection



Source: Own compilation from the study sample

5.3.1.2 Bounds testing for cointegration

The result of unit root and stationary tests depicted that the study data sample has a mixture of variables that are either I (0) or I (1) and therefore, the conclusion from these tests was that the appropriate model for the cointegration test is the ARDL. The latter employs bound testing to determine whether the variables have a long-run cointegration (Habanabakize & Muzindutsi, 2017: 229). The result from bound testing, in Table 5.5, suggests a rejection of the null hypothesis of no cointegration as the calculated value of F-statistics (7.965867) exceeds all values of the upper bounds. Therefore, a cointegration or long-run

relationship exists between GDP per capita, agricultural employment, agricultural exports and agricultural GVA.

Table 5.5 ARDL-Bound testing results

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	7.965867	3
Critical value bounds		
Significance	Lower bounds I(0)	Upper bounds I(1)
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Authors' compilation from the study sample

5.3.1.3 Long-run results

The previous section and results in Table 5.6 confirmed the existence of a long-run relationship amongst variables. However, they did not quantify the effect of independent variables on the dependent variables. Thus, the focus of this section is to provide quantitative figures, the impact of explanatory variables on the explained variable and the responsiveness of the latter on the long-term changes in explanatory variables. Considering the results displayed in Table 5.7, the gross value added has the highest influence on GDP per capita in the agricultural sector in South Africa. This is because a one percent increase in LAGVA leads to an approximate increase of 0.562 in the per capita GDP while a one percent increase in LAGXP results in a 0.006 increase in LGDP. Considering the consumer price index findings suggesting that high inflation rate causes a decline in the share of the agricultural sector in GDP as one percent increase in the CPI causes a 0.23526 percent GDP to decline.

Table 5.6: ARDL long-run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Probability
LAGEMP	-0.173863	0.055279	-3.145202	0.0163**
LAGEXP	0.006252	0.011926	0.524176	0.6163
LAGVA	0.561562	0.214434	2.618808	0.0345**

Variable	Coefficient	Std. Error	t-Statistic	Probability
LCPI	-0.023526	0.047227	0.498155	0.6252
C	7.069631	2.738878	2.581214	0.0364**

Note: ** denotes significance at a 1% and 5% significance level respectively

Source: Own compilation from the study sample

Contrary to agricultural value added and agricultural exports that cause a positive change in the per capita GDP in the agricultural sector, an inverse relationship exists between per capita GDP and agricultural employment. Thus, a one percent increase in LAGEMP causes LGDP to decline by 0.174 percent. These results show how important the production growth in the agricultural sector is to the country's economy. However, given that an increase in agricultural employment leads to low per capita GDP, one can see that labour intensiveness is no longer a strong production factor in the South African agricultural sector.

5.3.1.4 Short-run dynamics and error correction model (ECM)

Although the study established the long-run relationship between dependent and independent variables, it is still significant to examine if explanatory variables also have a short-term impact on the dependent variables. Similarly, it is imperative to establish the time required for the short-term changes in independent variables, to impact the dependent variables. That is the determination of the speed of adjustment on long-run equilibrium. The latter is determined using the error correction model (ECM) estimation (Brooks, 2014:376). However, the two core conditions to qualify the ECM in estimating materialisation of long-run equilibrium are that the error term coefficient has to be significant and negative (Mukhtar & Rasheed, 2010:54). If the error term coefficient is not significant, it means it has no equilibrating effect and being positive implies that the model is explosive. The results in Table 5.7 depict an error correction term (ETC) of -0.233105 that satisfies the aforementioned conditions. The ETC is negative and significant with values indicating about 23 percent model changes corrections yearly and that it takes approximately four years and three months for the model to reach full equilibrium ($1/0.233105$).

Table 5.7: Short-run dynamics and ECM results

Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LAGEMP)	-0.007988	0.039112	-0.204241	0.8416
D(LAGEXP)	-0.006415	0.028574	-0.224512	0.8261
D(LAGEXP(-1))	-0.007050	0.021314	-0.330748	0.7465
D(LAGEXP(-2))	-0.027424	0.018667	-1.469154	0.1675
D(LAGVA)	-0.083909	0.057972	-1.447402	0.1734

Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LAGVA(-1))	0.089438	0.060174	1.486328	0.1630
D(LCPI)	-0.005999	0.012685	0.472902	0.6427
CointEq(-1)	-0.233105	0.097998	-2.378674	0.0348**

Note: **denotes significance at a 5% level of significance

Source: Own compilation from the study sample

Considering the short-term effect of agricultural employment, exports and GVA on GDP per capita, the results show that changes in all independent variables should have had a negative impact on per capita GDP in the agricultural sector. However, none of the coefficients is statistically significant to influence the short term GDP per capita within the agricultural sector. This implies that it takes longer for the selected independent variables to have a significant effect on GDP per capita in the agricultural sector.

5.3.1.5 Stability and residual diagnostic test for ARDL 1,1,3,2.

Having reported the long-run and short-run results together with the error correction outcome, it is necessary to report on the stability and residuals diagnostic results that prove the robustness of the model and the accuracy of findings. This section presents and discusses the outcomes of the serial correlation, heteroscedasticity and stability tests. The tests were performed to evade conventional econometric concerns such as normality, heteroscedasticity, instability and serial correlation that may impede the essentiality of the stochastic properties (Takaendesa, 2006:100). It is important to note that the underscored ARDL1,1,3,2 model has passed all performed tests specified by their probability values in Table 5.8. The null hypotheses were set as follows: series are normally distributed, no heteroscedasticity, no serial correlation and the study parameters are stable. None of these null hypotheses were rejected and this implies that the (ARDL1,1,3,2) model was appropriately identified.

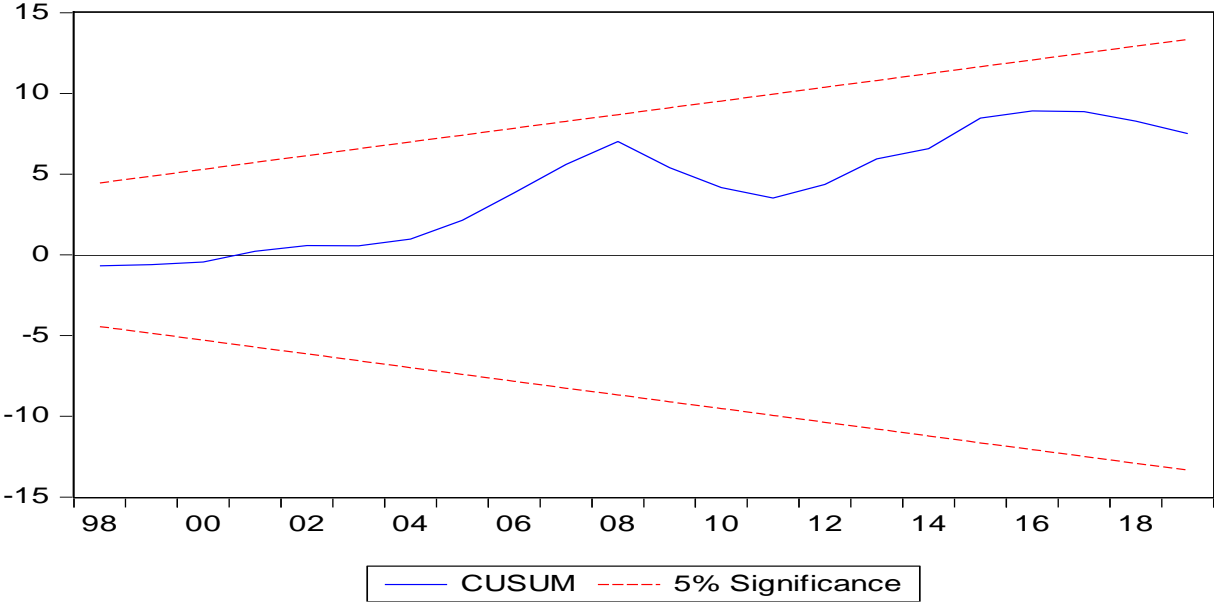
Table 5.8: Stability and residual diagnostic results

Test	H_0	P- value	Decision
Jarque-Bera (JB)	Residuals are normally distributed	0.426	Do not reject H_0
LM	No Serial correlation	0.085	Do not reject H_0
White	No Heteroscedasticity	0.112	Do not reject H_0
Ramsey RESET	Stability in parameters	0.489	Do not reject H_0

Source: Own compilation from the study sample

Additional to the Ramsey stability tests, Cumulative sum of Recursive Residuals (CUSUM) tests were run to avoid model misrepresentations (Strazicich, 2004:132; Zanini *et al.*, 2000:11). Figure 5.7 displays the CUSUM results. It is imperative to note that the red lines indicate the critical region at a five percent significant level and the blue lines, the CUSUM stability. Since the blue line lies between the critical region, it can be deduced that the (ARDL1,1,3,2) model is stable and stability exists within the model parameters.

Figure 5.7: Results of CUSUM test



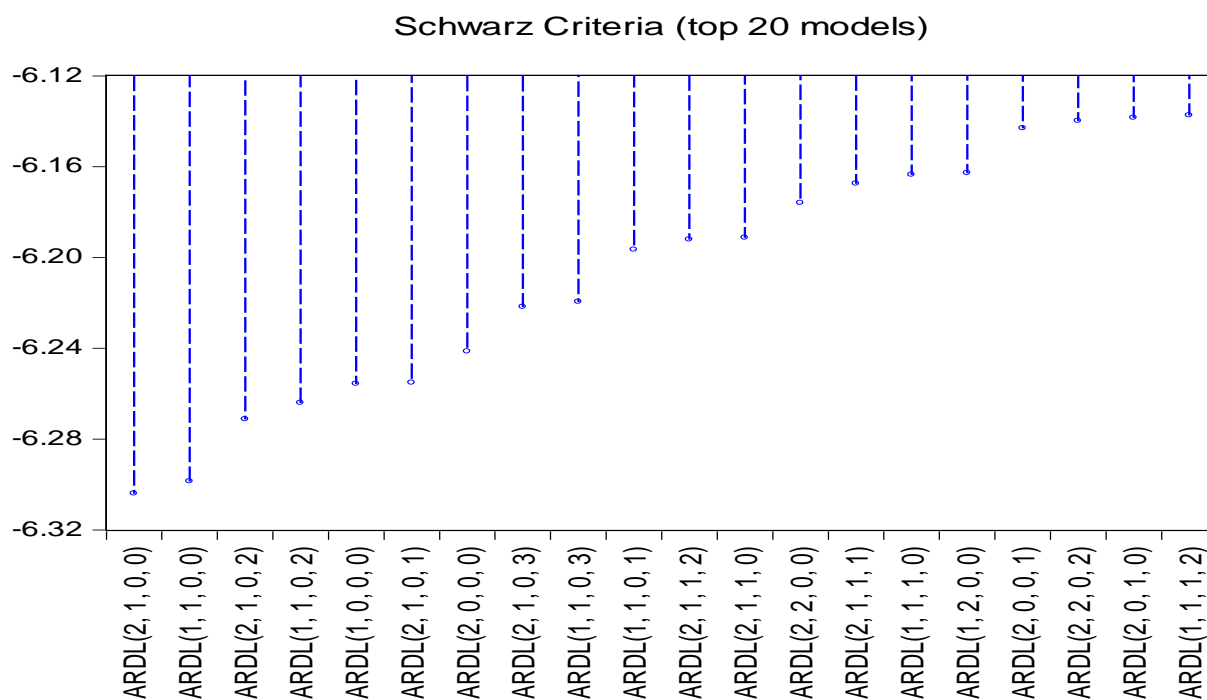
Source: Own compilation from the study sample

5.3.2 Model 2: Performance of the agricultural sector and economic development

5.3.2.1 Lag length selection and model specification

The optimum number of lags was selected using the most common criteria namely the Akaike information criterion (AIC) criterion, Bayesian information criterion (BIC), Final Prediction Error (FPE) criterion, Hannan–Quinn information criterion (HQC) and the Schwarz information criterion (SIC) criterion. However, the decision to choose was based on the Schwarz information criterion (SIC) criterion because of its power to produce accurate results when applied to a small sample. The criteria suggested 20 top models and the ARDL 2,1,0,0 selected as the best (*see* Figure 5.8). Therefore, the regression analysis included two lags for the economic development index (EDI), one lag for agricultural employment and zero lag for both agricultural exports and agricultural gross value added.

Figure 5.8: Model 2 lag selection



Source: Own compilation from the study sample

5.3.2.2 Bounds testing for cointegration

From the unit root and stationary tests results, the underpinned variables are a mixture of I (0) and I (1). Therefore, the suitable model selected for regression analysis was the ARDL model. This model employs bound testing to assess the presence or absence of long-run relationships amongst variables. Table 5.9 displays the outcome of bounds testing. In the table, the computed F-statistics value of 11.80350 is higher than all the upper bounds values of 3.2 at 10 percent, 4.08 at 5 percent and 4.66 at one percent level of significance respectively. The conclusion based on tabulated results is that a cointegration or rather a long-run relationship exists between economic development, agricultural employment, agricultural exports and the agricultural GVA.

Table 5.9 ARDL-Bound testing results for model II

Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	11.80350	3
Critical Value Bounds		
Significance	Lower bounds I(0)	Upper bounds I(1)
10%	2.37	3.2

5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Source: Own compilation from the study sample

5.3.2.3 Long-run results

Although the results in Table 5.9 suggest a long-run relationship between the variable of interests, they do not reflect what extent changes in independent variables influence the dependent variable's behaviour. For this reason, Table 5.10 displays the long-run coefficients. As shown in the aforementioned table, all independent variables (agricultural employment, agricultural exports and agricultural GVA) have a positive relationship with economic development. In other words, a one percent increase in agricultural employment leads to a 2.609648 increase in the economic development index while a one percent increase in agricultural GVA causes the economic development index to increase by 3.11501. Additionally, growth in agricultural exports positively affects economic development. That is, economic development index increases by 1.615767 in the long-run, because of a one percent increase in agricultural export levels. Taking into consideration the effect of all independent variables on economic development, the agricultural GVA has more power to influence changes in economic development as compared to agricultural employment and agricultural exports.

Table 5.10: The ARDL (2,1,0,0) long-run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Probability
LAGEMP	2.609648	2.293370	-1.137910	0.3067
LAGEXP	1.615767	1.402635	1.151951	0.3014
LAGVA	3.11501	10.81884	-1.119807	0.3137
LCPI	-3.511581	43.31431	-0.081072	0.9366
C	156.5731	135.9659	1.151562	0.3016

Source: Own compilation from the study sample

5.3.2.4 Short-run dynamics and error correction model (ECM)

The ARDL model established the short-term effects of explanatory variables on the dependent variable. Considering both T-statistics and probability values, all independent variables are statistically significant to influence the short-term behaviour of economic development. In contrast to the long-run results, the short-run test outcome in Table 5.11 indicates that both agricultural employment and agricultural GVA has

a positive influence on the economic development index while agricultural export growth leads to a declining short-run economic development index.

Given that both long-run and short-run relationships exist between economic development, agricultural employment, agricultural exports and agricultural GVA, the author determined whether the used model is explosive or if short-run shocks revert to long-run equilibrium. The explosive nature of the used model was determined through the error correction model. As indicated by the error correction term (ECT) and its probability value, the model is not explosive. In other words, the ECT is negative and statistically significant. Based on the ECT coefficient in the table, only 8 percent of shocks in the model require correction or adjustment every year. To determine the time it takes for the model shocks or disturbances to revert to the long-run equilibrium, a unit was divided by the ECT coefficient. Thus, $1/0.082520 = 12.1183$. This result indicates that it takes approximately 12 years for the model to recover from short-term disturbances.

Table 5.11: Short-run dynamics and error correction model (ECM) results

Variable	Coefficient	Std. Error	t-Statistic	Probability
D(LED1(-1))	-0.328315	0.121586	-2.700262	0.0428**
D(LAGEMP)	0.016987	0.011211	1.515236	0.1901
D(LAGEMP(-1))	0.135530	0.022596	5.997868	0.0018*
D(LAGEMP(-2))	0.138314	0.023054	5.999453	0.0018*
D(LAGEXP)	0.084753	0.008955	9.464341	0.0002*
D(LAGEXP(-1))	-0.026805	0.007909	-3.389342	0.0195**
D(LAGEXP(-2))	-0.022084	0.004925	-4.484583	0.0065*
D(LAGVA)	-0.183209	0.030708	-5.966102	0.0019*
D(LAGVA(-1))	0.700609	0.078329	8.944414	0.0003*
D(LAGVA(-2))	0.337462	0.043622	7.736072	0.0006*
D(LCPI)	0.006181	0.006952	0.889067	0.3901
CointEq(-1)*	-0.082520	0.008556	-9.644545	0.0002*

Note: *, ** denote significance at a 1% and 5% significance level respectively

Source: Own compilation from the study sample

5.3.2.5 Stability and residual diagnostic test for ARDL (2,1,0,0) model

To assess the validity of the employed model, a different method of residual diagnostics is used. The Jarque-Bera (JB) test was run in the determination of the normal distribution of residuals. The Lagrange Multiplier (LM) test was also run to detect serial correlation within residual; white test was used to assess if residuals

are homoscedastic and the Ramsey RESET was used to ensure that the model parameters are stable. Additionally, the CUSUM test measures the stability of coefficients. Since, probability values displayed in Table 5.12 support the rejection of all null hypotheses, the conclusion is that all residuals are free of serial correlation, are homoscedastic and normally distributed. The model parameters and coefficients are also stable. Consequently, the performed ARDL (2,1,0,0) model is robust and all findings are valid.

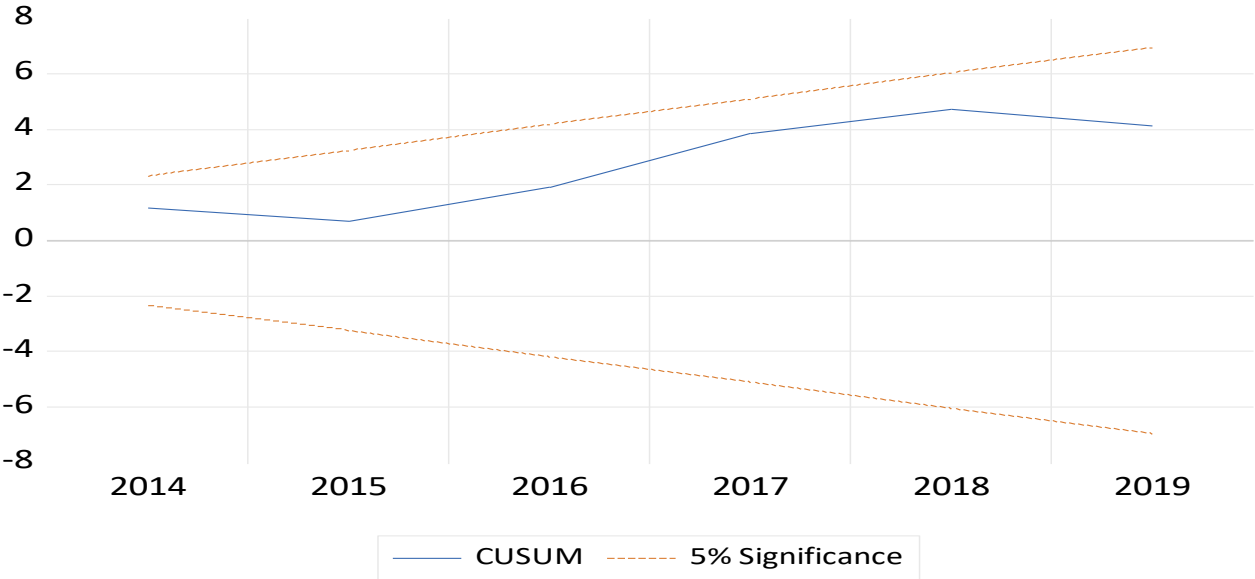
Table 5.12: Stability and residual diagnostic results

Test	H_0	P-value	Decision
Jarque-Bera (JB)	Residuals are normally distributed	0.862	Do not reject H_0
LM	No Serial correlation	0.084	Do not reject H_0
White	No Heteroscedasticity	0.057	Do not reject H_0
Ramsey RESET	Stability in parameters	0.652	Do not reject H_0

Note: The significance or insignificance of probabilities in this table is based on 5% criteria

Source: Own compilation

Figure 5.9: CUSUM test results



Source: Own compilation from the study sample

5.4 TODA-YAMAMOTO CAUSALITY ANALYSIS RESULTS

Having analysed and ascertained the existence of a long-run relationship among the underpinned variables, the next step is to determine the existence of a causal relationship between explanatory and dependent variables. However, as elucidated in chapter four, with the application of the ARDL model on variables to investigate integration, it is not advisable to detect causation between variables using the rational Granger

causality test (Habanabakize *et al.*, 2019:7). The Toda-Yamamoto, through the Modified Wald test (MWALD), is the appropriate approach to causation assessment. The null hypothesis for causality assumes the absence of causality and the alternative suggests that causation exists between two variables under consideration. Table 5.13 shows the Toda Yamamoto tests results.

Table 5.13: Toda-Yamamoto Granger non-causality results

Excluded Variable	Dependent variables					
	LGDP	LAGEMP	LAGEXP	LAGVA	LCPI	LEDI
LGDP	.....	17.67736 (0.0001*)	6.689777 (0.0353**)	11.35589 (0.0034*)	1.618305 (0.4452)	1.982542 (0.3711)
LAGEMP	0.497565 (0.7797)	.....	0.086183 (0.9578)	0.041685 (0.9794)	0.147828 (0.9288)	0.061603 (0.9697)
LAGEXP	4.863140 (0.0879)	0.375939 (0.8286)	.....	3.151600 (0.2068)	1.678763 (0.4320)	0.237202 (0.8882)
LAGVA	13.40790 (0.0012*)	5.438525 (0.0659)	8.624497 (0.0134**)	.....	8.364789 (0.0153**)	63.70771 (0.0000*)
LCPI	1.065715 (0.5869)	0.157957 (0.9241)	1.674045 (0.4330)	0.804225 (0.804225)	.....	5.930031 (0.0516)
LEDI	1.982542 (0.3711)	0.061603 (0.9697)	0.237202 (0.8882)	63.70771 (0.0000*)	13.77920 (0.0010*)	.....

Note: () shows the p-values whilst *, ** denote significance at a 1% and 5% significance level respectively

Source: Own compilation

5.5 DISCUSSION OF RESULTS

With the employment of the ARDL model and other econometric and statistical approaches, the relationship between per capita GDP and independent variables was established. This section discusses study findings; the implication of shocks in independent variables on dependent variables and compares the findings from this study to empirical findings of other studies.

5.5.1 The relationship between the agricultural sector and economic growth

5.5.1.1 Agricultural employment and per capita GDP

The findings of the study revealed the existence of an inverse long-run relationship between GDP per capita and employment in the agricultural sector. It was determined that a one percent increase in employment levels causes GDP per capita to decline by approximately 0.174 percent. This means that human factors, as

means of production in the agricultural sector, do not increase the contribution in the sector towards national economic growth. One reason for an inverse relationship between employment and GDP in the agricultural sector in South Africa is that most employees within the sector are less skilled workers whose productivity is insignificant enough to increase GVA levels (Netshivhodza, 2017:92). With technological improvements in all economic sectors, increasing the number of farmworkers would render the sector less competitive. Additionally, the high minimum wage requested by workers' unions and the minimum wage legislation are other factors reducing employment levels not in the agricultural sector only but other economic sectors as well. (Bureau for Food and Agricultural Policy (BFAP). 2018:3). This finding might be shocking, however, because of demographic changes, there is a disconnect between economic growth and agricultural employment in South Africa (Bhorat *et al.*, 2015:5). The finding contrasts the outcome of a similar study (Greyling, 2012) in which agricultural employment had a positive and significant relationship with GDP where a one percent increase in agricultural employment contributed about 15.98 percent growth in GDP.

Again, the results may also reflect Engel's Law in operation and South Africa is reaching a tipping point in agricultural transformation where the agricultural workforce is leaving the agricultural sector in numbers, consequently reducing the absolute size of the agricultural workforce (Bezemer & Hazell, 2006:1). Furthermore, for the short-run analysis, the results indicated that agricultural employment has no significant impact on per capita GDP. Since the agricultural sector seasonally employs some workers, especially during the harvesting season, its contribution to GDP remains minimal and thus its impact too.

5.5.1.2 *Agricultural exports and per capita GDP*

As export levels play an important role in economic growth in South Africa, so does the agricultural export concerning per capita GDP. The assessment of the long-run relationship to determine the effect of agricultural exports on per capita GDP suggested a linear positive relationship between the two variables. Thus, a one percent increase in agricultural exports causes the per capita GDP to increase by 0.006252 percent. Irrespective of the positive influence of agricultural exports on per capita GDP, the magnitude of influence is too small. This result may indicate that the agricultural share of total export is very negligible compared to contributions from other sectors. The findings of this study resemble those of Toyin (2016:129) and Greyling (2012) whose findings suggest the absence of causality between agricultural exports and GDP. Those findings also indicated that it is difficult for agricultural exports in South Africa to improve due to inability to satisfy the national domestic consumption with large quantities of imports reducing agricultural exporting objective to the achievement of a positive trade balance only. Consequently, the impact of agricultural exports on per capita GDP growth will remain low until focus changes and agricultural policies are improved.

Nonetheless, the causality analysis of this study indicated that bidirectional causation exists between agricultural exports and per capita GDP. A conclusion drawn from these results is that increasing agricultural GVA can assist in solving the concern of low agricultural exports faced by the sector and the

entire country. The outcomes of similar studies carried out on the impact of agricultural exports on economic growth differ from country to country as in the case of South Africa where a positive relationship exists between the two variables. In other countries, an inverse relationship exists and in others, no relationship exists between the variables (Faridi, 2012; Sanjuán-López & Dawson, 2010; Verter & Bečvářová, 2016). Furthermore, a relationship type may also depend on the type, quality, input cost and productivity of a particular crop in a country (Gilbert, Linyong & Divine, 2013).

5.5.1.3 *Agricultural gross value added (GVA) and per capita GDP*

As discussed in section 5.2.3, the mean and level of agricultural output (GVA) had been a driving force behind agricultural employment and agricultural exports contribution to per capita GDP. Similar to agricultural export, agricultural GVA has a positive long-run relationship with per capita GDP and is the most influential variable as compared to other variables of the study. A one percent increase in gross value added leads to an approximately 0.56 percent increase in per capita GDP. Irrespective of whether labour or machinery is used, a high level of output improves the per capita GDP. Not only does GVA influence GDP in the long-run, it is also significant in causing GDP per capita changes in the short-run as indicated by Toda-Yamamoto results in Table 5.10. Following these results, GVA might be a proposed solution not only for per capita GDP growth but also for agricultural employment and agricultural exports growth, both of which may also contribute positively to the per capita GDP improvement.

Some studies (Pfunzo, 2017; van Arendonk, 2015) were conducted to determine linkages between agricultural GVA and per capita GDP and economic growth in general. Findings from these studies revealed that increasing agricultural productivity and output levels would lead not only to economic growth but also to economic development and therefore, improved living standards.

5.5.2 **The relationship between the agricultural sector and economic development**

Through the diagnostic and stability tests, the established ARDL (2,1,0,0) model is proven to fit the study and to produce sound and accurate results. In this section, the focus is on the discussion of findings obtained from the second model of the study namely model II. The discussion highlights the implications of the explanatory variable on the dependent variables and a comparison of these findings to the existing literature.

5.5.2.1 *Agricultural employment and economic development index*

The results from the regression analysis suggested that an inverse relationship exists between the economic development index and agricultural employment as a one percent increase in agricultural employment causes the economic development index to increase by 2.609648 percent. This implies that when the labour market can absorb the labour force, the country experiences development. As economic development refers to wealth creation, income from jobs or employment plays a significant role in wealth creation for individuals, households and countries in general. Both employment for salary and self-employment aims

to generate income and this income can be the source of wealth (Bögenhold *et al.*, 2001:88), which is the pillar of positive development. These findings of a positive relationship between employment and economic development are in line with the findings of Galenson (1963:518), Renkow (2003) and Saviotti and Pyka (2004).

In the South African context, the unemployment rate is drastically increasing. For example, in the second quarter of 19, the South African unemployment rate reached was at 28.47 percent from 26.91 percent in the first quarter of 2018 (Stats SA, 2019:1). This high rate of unemployment impedes economic development and one solution should be to increase and support small and medium businesses through entrepreneurship development (Makaringe & Khobai, 2018:13). Entrepreneurial development will assist not only in job creation but also in poverty alleviation and enhance economic growth, the source of economic development in South Africa (Francke & Alexander, 2019:9).

5.5.2.2 *Agricultural exports and economic development*

The agricultural sector contributed about \$10.7 billion, approximately 10 percent to GDP, causing the economy to rebound from a low base to positive growth of 3.1 percent during the last quarter of 2017 (SARB, 2019). This illustrates the significant effect of agricultural exports towards economic development. In support of this information, the findings of this study, as discussed in section eight, revealed that a linear and positive relationship exists between the economic development index and agricultural exports. A one percent increase in agricultural exports results in a 1.615767 percent increase in the economic development index. According to the findings in this study, the short-term effect of economic development on agricultural exports was supported by the existence of causality between the two variables. This suggests that if policymakers and authorities in South Africa aim to enhance economic development, they should first improve agricultural productivity and agricultural exports.

5.5.2.3 *Agricultural gross value added (GVA) and economic development*

Besides agricultural employment and agricultural exports, agricultural GVA is another variable that plays a significant role in any country's development. This study finding indicated that if agricultural value-added increased by one percent, economic development as measured through the economic development index will increase by 3.11501 percent. In other words, a small increase in agricultural productivity can cause a high increase in economic development in South Africa. It would not matter whether the output growth is produced using human capital or machinery. Either way, an increase in output causes improvement in economic development. The impact of agricultural GVA on economic development is not only limited to the long-run improvement; the short-term positive agricultural GVA growth also leads to positive economic development growth.

Other studies analysed the effect of agricultural GVA on economic development too and discovered that besides the direct impact of agricultural output on economic development, the latter has an indirect influence on the former too (Christensen& Yee, 1964:1059; Douglas, 2010:3825; Izuchukwu, 2011:199). For instance, the impact of agricultural employment and agricultural exports on economic development depends on the agricultural GVA levels. Furthermore, agricultural GVA is a raw material in other economic sectors such as the manufacturing, business, retail and transport sectors. Hence, improving agricultural output also improves the performances of these sectors and therefore, economic development as a whole.

5.6 CHAPTER SYNOPSIS

Chapter 5 aimed at establishing empirical results or findings of the effects of independent variables namely agricultural employment, agricultural exports and agricultural GVA on the dependent variables, which are economic growth (GDP) and economic development. To achieve these objectives, the chapter was subdivided into two sections focussing on the two models. The first model analysed the impact of agricultural employment, agricultural exports and agricultural gross value added on economic growth (GDP) while the second model determined the impact of agricultural employment, agricultural exports and agricultural GVA on economic development.

The first part of this chapter was devoted to the application of econometric and statistical models and approaches proposed in chapter 4 whose objectives were to determine cointegration between per capita GDP and economic development (dependent variables) and explanatory variables namely agricultural employment, agricultural exports and agricultural gross value added. Before preliminary analysis, the process started with a concise introduction and then the assessment of the impact of independent variables on the dependent variables followed. After completion of graphical trend analysis, correlation analysis results indicated a per capita GDP positively correlating to both agricultural exports and agricultural GVA. Additionally, a negative correlation exists between agricultural employment and economic development. In contrast to the correlation results, the long-run coefficients obtained from the ARDL model indicated a positive long-run relationship between economic development and all explanatory variables. In other words, positive changes in agricultural employment, agricultural exports and agricultural gross value added leads to positive changes in economic development.

Although strong, a negative correlation exists between agricultural employment and per capita GDP. The ARDL long-run coefficient confirmed correlation results where both agricultural exports and agricultural GVA have a positive impact on per capita GDP while long-term changes in agricultural employment lead to a decline in GDP per capita. Despite the existence of a long-run relationship between the variables, analysis of short-term dynamics indicated that none of the independent variables has an impact significant enough to affect changes in per capita GDP. However, a causality relationship exists between independent and dependant variables. The latter justifies the theory suggesting that if one or more variables are

cointegrated, there is a probability of causation among the variables. To ascertain the validity of applied models, different diagnostic and stability tests were completed and passed. Therefore, selected models and approaches are robust and the outcome is valid. The next section focused on the relationship between economic development, agricultural employment, agricultural exports and agricultural GVA.

Analogous to the effect of long-run relationship, analysis of short-term dynamics indicated that all independent variables are statistically significant to influence changes in economic development. However, there is unidirectional causality existing between agricultural employment and economic development. This also explains the declining agricultural contribution with per capita income growth. To ascertain the validity of applied models, different diagnostic and stability tests were completed and passed. Therefore, selected models and approaches are robust and the outcome is valid. The subsequent chapter focuses on the overall summary of the study and recommendations.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

The agricultural sector plays a critical role in the economic growth and development of countries; this is especially true in developing countries, whose large unskilled labour can be absorbed by the sector. Since South Africa struggles with high inequality, unemployment, poverty rates and overall low living standards, it became imperative that research into the potential of the agricultural sector on economic growth and development in South Africa be commissioned. Global literature on the impact of the agricultural sector on economic growth and development was reviewed using primary and theoretical objectives listed in Chapter 1 of this study as the basis of the review. It was discovered that the agricultural sector, with its complex structures and forward and backward linkages, has the potential to contribute to economic growth, reduce inequality, unemployment and poverty as well as contribute towards economic development and improve the living standards of world populations (Chapter 2:Section 2.2.4). A myriad of researchers has undertaken similar studies within different countries as evidenced by the available literature. All the studies were motivated by challenges similar to the case of this study. However, the focus has mainly been on a few variables, specifically agricultural GVA, agricultural employment, economic growth and economic development. Few studies of this nature were conducted in South Africa and none used a variable mixture as used in this study with the agricultural sector represented by agricultural employment, agricultural exports and agricultural GVA against GDP and economic development as represented by the economic development index (EDI) against per capita GDP. The economic development index (EDI) is represented by the percentage of people living below the upper bound poverty line (UBPL), human development index (HDI) and the employment rate. This means that empirical literature is scarce in this area of study in South Africa. Hence, this study aimed at filling this obvious gap in the literature regarding agriculture-led growth and development within the South African context.

In addition to the primary and theoretical objectives reviewed as mentioned above, the study also reviewed empirical literature relevant to agricultural employment, agricultural exports, agricultural GVA, economic growth and economic development. Global, regional and local performances of the agricultural sector as well as policies aimed at improving agricultural sector performance in South Africa were reviewed. In finalising the study, econometric estimation model and methodology to be used were adopted and employed. Chapter 6 therefore, seeks to list a summary, achievements, conclusions as well as table recommendations towards improvement of the agricultural sector performance in South Africa.

6.2 SUMMARY OF THE STUDY

Section 6.2 presents the processes followed in conducting the study. Chapter 1 is the foundation of the study that provides the background and context within which the study is set. More specifically, it presents the problem statement, ethical considerations, objectives and the significance of the study. Following on from this and with the purpose to achieve the respective objectives, Chapters 2 and 3 summarise the agricultural sector's performance and trends within a global and regional context. In addition, the literature surrounding the study topics as well as a review of various agricultural policies were included. Thereafter, the adopted methodological framework was outlined in Chapter 4 while the empirical results, their associated interpretations as well the discussions surrounding them were captured in Chapter 5. Lastly, the overall summary, achievements, conclusions and suggested recommendations of the study are all presented in this chapter, Chapter 6.

6.2.1 Summary of theoretical and empirical literature of the study (Chapter 2)

As highlighted in the previous section, Chapter 2 presented the theoretical and empirical literature of the study. The chapter first defined and contra-distinguished key concepts in detail to provide a broader and clear understanding of the study topic and its focus. Secondly, the determinants of economic growth and economic development were reviewed; relevant economic growth and economic development theories from the classical, neo-classical and new growth theorists were studied. These theories indicated that the agricultural sector stimulates economic growth in developed countries and contributes to community development through technical progress. Agricultural development led the industrialisation process of the currently developed countries through the green revolution.

Furthermore, the developing countries benefit from the agricultural sector structural transformation process whereby labour is transferred from agriculture, the low productivity into manufacturing, a high productivity sector leading to economic growth and employment creation with the agricultural continuing to absorb unemployed labour. Subsequently, empirical literature on the potential of the agricultural sector towards economic growth and economic development generation as well as relationships between the agricultural sector, economic growth and economic development were reviewed. Different arguments emanated from this body of knowledge. Some reviewed empirical literature authenticated agriculture as an engine of growth and development; while others contrasted the view. Even the authentication was conditional in that the impact of the agricultural sector on economic growth and development depends on the status of development of countries. The main findings to come from all these studies are that (i) increased food production plays a key role in stimulating economic development in low income countries (LDCs), (ii) the transfer of labour from the agricultural sector into leading sectors of the economy is a driving force behind the economic growth process in middle income countries (MICs).

6.2.2 Summary of agricultural sector trends and performance (Chapter 3)

In Chapter 3, the agricultural sector trends and performance were reviewed from global, regional and local perspectives from 1994 to 2019. Figures, graphs and tables were used in the trend analysis. Annual percent GDP contributions from agricultural exports and agricultural GVA as well as agricultural employment contribution to total employment were presented. Poverty and poverty reduction levels, improvements in employment rates and HDI statuses of countries were also presented. Policies relevant towards inducing agricultural performance in South Africa were also reviewed and presented in Chapter 3. The key highlights from the chapter were that the agricultural policies' focus of developed countries is about optimum production factor utilisation, agricultural efficiency, farm income for maintenance of rural community and natural resource conservation.

The best practice to benchmark against is decentralised planning, participation and development process ownership by communities themselves (Chapter 3: Section 321). Agricultural policies in developing countries are pro-poor and mainly focus on national food security, poverty reduction, employment and economic growth and development. In South Africa, the current agricultural policy focus is on the transformation of the agricultural sector based on the Broad-Based Black Economic Empowerment (BBBEE) scorecard flowing from the Reconstruction and Development Programme that seeks to increase participation of the previously disadvantaged people in the mainstream economy through the land reforms policy by redistributing 30 percent of land from white farmers to black farmers (Boudreaux, 2010:16). Generally, all the developing countries are seeking to improve the capabilities and assets of the poor.

6.2.3 Summary of the methodology of the study (Chapter 4)

The methodology adopted in the study to analyse the impact of the agricultural sector (agricultural employment, agricultural exports, agricultural GVA) on economic growth and development (% people living below UBPL, HDI and employment rates) was presented and discussed in Chapter 4. Annual secondary data with 25 annual observations was selected dependent on the availability of data from the SARB, World Bank's world development indicators (WDI) and Quantec. Variables of interest included GDP (economic growth) and EDI (economic development), which are all dependent variables and agricultural employment, agricultural exports and agricultural GVA, which are all independent variables. The data covers the period between 1994 and 2019. The study followed a functionalist approach, which is related to the quantitative research methods that mainly focus on interrogation of large data samples using statistical tests and seeking to provide practical solutions to practical problems. The ARDL model and econometric techniques were adopted to determine the responsiveness of GDP and EDI to changes in agricultural employment, agricultural exports, agricultural GVA in the study within South Africa and the ARDL and ECM models were employed to validate the accuracy and quality of results. In short, Chapter 4 presented data origin, variable specification, sample size and methodology including employed econometric estimation techniques adopted by the study.

6.2.4 Summary of results / empirical findings of the study (Chapter 5)

Chapter 5 presented and discussed results obtained from all employed econometric techniques for the determination of the impact of the agricultural sector on economic growth and development in South Africa. Since the integration order of the study variables under consideration was a mixture of both $I(0)$ and $I(1)$, the use of the ARDL model was justified and therefore adopted in analysing the data. The results affirmed that the agricultural sector still has the potential to increase economic growth and development in South Africa. The findings of the study indicated that increasing agricultural productivity will increase per capita GDP in the long-run. A long-run relationship was depicted between agricultural exports, agricultural GVA, agricultural employment and per capita GDP. Agricultural GVA has much more influence on economic growth followed by agricultural employment and lastly agricultural exports (Chapter 5: Section 5.3.1).

However, the adoption of productivity-enhancing technology coupled with agricultural employment will increase agricultural productivity and contribute to employment creation in the sector. Nonetheless, an increase in GVA in the long-run has the potential to increase both the levels of agricultural employment and agricultural exports (Chapter 5: Section 5.5.2). In addition, graphical presentation confirmed structural theories that economic sectors are interdependent (Chapter 5: Section 5.2.1) meaning that, when any sector of the economy is exposed to shocks, all sectors move together towards the re-establishment of stable long-run equilibrium. Hence, there is a need for an integrated policy that will address agricultural performance and performances of related sectors simultaneously. Despite the existence of a long-run relationship between the variables, analysis of short-term dynamics indicated that none of the independent variables has a significant impact enough to affect changes in per capita GDP.

The cointegration test results reveal a positive long-run relationship between the economic development index and all independent variables namely agricultural employment, agricultural exports and agricultural GVA. Agricultural (GVA) had been a driving force behind agricultural employment and agricultural exports contribution to per capita GDP in South Africa. Consequently, an increase in agricultural exports causes the per capita GDP to increase (Chapter 5: Section 5.5.1). Furthermore, regression analysis suggested the existence of a positive relationship between agricultural employment and economic development whereby, increase in employment causes an increase in the economic development index (Chapter 5: Section 5.5.2). Since, the agricultural GVA has much more influence on economic development followed by agricultural employment and lastly agricultural exports, increasing agricultural productivity and agricultural GVA levels would not only increase economic growth but also to economic development and subsequently to employment creation, poverty reduction and finally to improved living standards. It is significant to note that residual and stability diagnostics tests were performed and confirmed that selected models and approaches are robust and the outcome is valid.

6.3 ACHIEVEMENT OF THE STUDY'S OBJECTIVES

Note should be taken that all listed primary and secondary objectives of the study have been achieved. A summary of how the set objectives were achieved is provided in this section. Table 6.1 below presents the objectives of the study as listed in Section 3 of Chapter 1.

Table 6.1: Objectives of the study

Study objectives	
Primary objectives	The primary objective of this study is to analyse the impact of the agricultural sector on economic growth and development in South Africa.
Theoretical Objectives	<ul style="list-style-type: none"> ▪ Provide definitions of key concepts relating to agriculture, economic growth and economic development; ▪ Review agricultural, economic growth and development theories and theoretical relationships among variables; ▪ Analyse global, regional and local agricultural trends and performance; ▪ Review agricultural performance policies in South Africa.
Empirical Objectives	<ul style="list-style-type: none"> ▪ Determine the long-run impact of agricultural employment, agricultural exports and agricultural (GVA) on economic growth and development in South Africa; ▪ Determine the short-run impact of agricultural employment, agricultural exports and agricultural (GVA) on economic growth and development in South Africa; ▪ Analyse the causal effects between agricultural employment, agricultural exports agricultural (GVA) and economic growth and development in South Africa; ▪ Formulate recommendations for improved growth and development pertaining to the agricultural sector, economic growth and development in South Africa.

Source: Author's own compilation

6.3.1 Primary objective of the study

The primary objective of the study was to analyse the impact of the agricultural sector on economic growth and development in South Africa. This objective was achieved through several theoretical and empirical objectives as explained in the subsequent sections.

6.3.2 Theoretical objectives

Theoretical objectives as listed in Table 6.1 were all achieved in Chapters 2 and Chapter 3 of the study. Section 2.2.1 and Section 2.2.2 of Chapter 2 achieved the first theoretical objective by defining and discussing key concepts relating to the agricultural sector (agricultural employment, agricultural exports, and agricultural GVA), economic growth and economic development. There is generally a lack of consensus on definitions. Even though distorted, complex and highly context-dependent, rural employment contribution remains a significant variable and performance measure whereby production increases due to

labour productivity, increases income and improves the living standard of labour force, which boosts economic growth (Chapter 2, Section 2.2.4). Furthermore, Sections 2.3.1 and 2.3.2 of Chapter 2 achieved the second theoretical objective of the study where the dynamics of the agricultural sector (agricultural employment, agricultural exports and agricultural GVA), economic growth and economic development theories from classical, neo-classical and new growth theorists were reviewed and discussed. Theories presented details of how agriculture-led growth and development are generated and as such, formed the needed framework or the foundation of the study. Subsequently, Sections 2.4 of Chapter 2 achieved the third theoretical objective of the study where empirical findings linking the agricultural sector (agricultural employment, agricultural exports and agricultural GVA) to per capita GDP and the respective dimensions of economic development were reviewed and presented. Furthermore, Section 3.4 of Chapter 3 reviewed major economic policies and their impact on agricultural sector performance, economic growth and economic development in South Africa and achieved the fourth and last theoretical objective of the study.

6.3.3 Empirical objectives of the study

The three empirical objectives listed in Table 6.1 were achieved in Chapter 5. The first, the second and the third empirical objectives of the study were attained in Section 5 of Chapter 5 where through the correlation matrix and econometric models, it was revealed that increase in agricultural exports and agricultural GVA cause per capita GDP to increase in the long-run (Chapter 5: Section 5.5.1). However, increasing agricultural GVA will enhance both agricultural export performance and agricultural employment solving the concern over low exports in the country. Independent variables in the short-term do not affect significant changes in the per capita GDP. On the other hand, agricultural employment, agricultural exports and agricultural GVA are positively correlated to economic development. In this case, agricultural GVA has more influence as compared to agricultural employment and agricultural exports to cause changes in economic development. The results also hold in the short-run. The fourth and last empirical objective of the study will be achieved in Section 6.4 of Chapter 6 of the study, which will present recommendations regarding the improvement of the agricultural sector performance in South Africa.

6.4 RECOMMENDATIONS

Amidst low economic growth, low development, failure to create employment, high poverty rates and low living standards in South Africa, the study showcased that the agricultural sector still has the potential to assume a growth leading rather than a growth permissive role in the South African economy (Setshedi, 2019:1). Even though the agricultural sector is the lowest performing sector of the economy in South Africa, the sector has the potential to absorb high numbers of both skilled and unskilled labour force especially considering the creation of opportunities for unemployed youth (Altieri, 2018:67).

Poor rural infrastructure especially transport, funding and education, deteriorating trade terms, lack of access to farming technologies and skills to operate such technology, unfavourable policies, poor planning,

poor health and the negative impact from climate change also contribute to the challenges faced by the agricultural sector. In addition, weak links among growth, wages and poverty were also the discovered impediments. In recent years, economies in Africa are experiencing GDP growth faster than population growth but it does not translate into poverty reduction, employment creation and development.

Reviewed empirical literature analysis, positive study findings from theoretical and empirical objectives analysis and persistent low performance of the agricultural sector suggests that measures in the form of recommended strategies will assist in improving competitiveness and performance of the agricultural sector. The improvements will assist towards poverty reduction employment creation, improved economic performance and economic development in South Africa. Therefore, eight strategies are recommended for agricultural sector development:

6.4.1 Formulate and implement favourable, inclusive and effective agricultural policies

Policies are a critical means when implementing political decisions and are a means of government intervention. In South Africa, the agricultural sector has a central role to play in building a strong economy while reducing poverty and inequality by increasing employment opportunities and incomes of the poor as well as nurturing the country's natural and inheritance resources. Hence, policy directive and focus is needed to regulate agriculture and promote sector performance. This study discovered that increasing agricultural productivity and agricultural output (GVA) will enhance the sector's contribution to both economic growth and economic development in South Africa (Chapter 5: Section 5.5.1 and 5.5.2, respectively). Formulated policies are to coordinate and collaborate with policies of those industries that have a direct impact on the agricultural sector's performance such as trade, finance, food security, water, environment, jobs and entrepreneurship development towards meeting developmental goals of the South African economy (Blanco, 2018:6). Integration of all these activities, especially trade, finance and food security in an agricultural policy, will enhance investment, profitability, lower technical and financial constraints and provide a stable environment and therefore encourage sector productivity growth and capital formation (UNCTAD, 2001:48). It is worth noting that for agricultural productivity-enhancing measures to be effective, several interventions need to be implemented simultaneously and not in isolation in a manner that they complement the other for maximum benefits.

6.4.2 Improve essential infrastructure investments and resources

The agricultural sector in South Africa is dominated by smallholder farmers (Karugia, Massawe, Guthiga & Macharia, 2013:22). High dependence on rain-fed agriculture by smallholder farmers together with extreme climate change effects leave the agriculture sector in South Africa vulnerable to impulses of weather. The agricultural sector bounced back in 2016 and lifted the South African economy out of the recession in 2017. High yield was attributed to favourable climate, especially good rains. There is, therefore, a need to invest in irrigated agriculture. Investment in information and communications technology (ICT) is encouraged.

Contrary to mainstream economics, the adoption and use of productivity-enhancing technologies increase employment through sufficient demand elasticity (Bessen, 2019:34). The internet of things (IoT) and effective early warning systems will also help dampen the effects of extreme weather events (Bamigboye & Ademola, 2018:212). Poor transport, funding and education are also cited as major impediments contributing to low levels of both agricultural performance and industrialisation (Wall 2007:27). Therefore, it is recommended that besides transport, education, funding and other extension services, water, electricity, onsite and offsite infrastructure and storage facilities, market access and insurance services be provided to farmers towards the improvement of quality of extension services accessed by smallholder farmers. The latter is the vehicle through which sustainable agricultural productivity can be achieved (Myeni, Moeletsi, Thavhana, Randela & Mokoena, 2019:13).

6.4.3 Up-skill and educate farmers towards building farmers' capabilities

The South African government should put in place measures to educate and enlighten the smallholder farmers on the need to practise mechanised farming and adopt new farming technologies towards improved productivity. Using modern farming methods will increase agricultural production and farmer's income, which in the long-run, will increase the revenue accruing to both farmers and the government as well as reduce the rate of poverty (UNCTAD, 2001:88). Investments in agricultural research and development (R&D) should be increased and sustained in South Africa if higher levels of agricultural productivity are to be achieved and sustained. Research and development offer an opportunity to achieve yet unexploited technical change to drive productivity towards the unachieved potential. In the short run, the public sector must continue to play a significant role in funding agricultural research.

6.4.4 Enhance agricultural extension services and information dissemination

As part of strategies promoting the agricultural sector and encouraging competition in agriculture, the government in South Africa has designed programmes to assist smallholder farmers with farming inputs including funding and extension services. While the government's effort is acknowledged, the programmes are ineffective and their impact is minimal due to lack of participation by farmers, incompetency of extension officials to effectively train farmers and to disseminate information. Adoption and uptake of new farming technologies by rural farmers remain a barrier due to low literacy levels of farmers and lack of technical skills by extension officials (Assefa & Van den Berg, 2010:221). This study recommends continued professional development for extension officials and training and skills development measures for farmers. Practical training will yield better results than theoretical training. In this case, the government may also consider revitalising old agricultural colleges and bringing agriculture back into the school curriculum. This study has also discovered that extension services are essential to farmers and as such farmers are willing to pay for extension services. This study, therefore, recommends that agricultural extension services be outsourced to private companies for efficiency. Outsourcing will contribute to

agricultural employment creation in the private sector and thereby also assisting in reducing government payroll size.

6.4.5 Improve trade terms and increase export capacity

The result of weak infrastructure, low productivity and weak trade facilitation requires attention in addressing the export supply constraints, export competitiveness and export diversification, which requires policies that go beyond liberalisation to the actual realisation of the potential for trade expansion and process integration. International trade or openness is significant to the economy of developing countries as well as the South African economy. Empirical results revealed that agricultural exports have a predictive ability on both the economic growth and development in South Africa. It is believed that an increase in exports generate an increase in GDP, since both foreign and domestic demands are components of the GDP as defined in the national income accounting (UNCTAD, 2001:204). Increasing agricultural productivity will satisfy domestic demand and high consumption imports will be traded off for imports of production assets. Increased export capacity will render the country self-sufficient (Bakari, 2017:2). The general neglect of the agricultural sector especially export growth is cited not as an impediment to employment creation, economic growth and development only, but also as keeping South Africa at a developing country status. For productivity gains from policy reforms to be fully realised, the reform agenda must be sustained and all remaining barriers especially trade restrictions among trading partners should be minimised.

6.4.6 Land redistribution and ownership

Land ownership provides collateral and enables farmers to acquire loans, which they could use to invest on their farms and adopt modern farming methods. The communal land ownership by smallholder farmers limits financial investment in agriculture as a result of huge uncertainties associated with this kind of land ownership (Myeni *et al.*, 2019:11). It is recommended that the land reform processes be prioritised for the benefit of smallholder farmers and improved agricultural performance. The slow progress of land reform and its tedious practices undermine food production and threaten national food security due to declining commercial production as a result of uncertainty and security issues while new land beneficiaries are not yet significantly contributing to national food supply and stocks.

6.4.7 Encourage entrepreneurship in the agricultural sector

The cost of doing business in South Africa is deterring the establishment of SMMEs(NPC, 2017:8). The cost of compliance often exceeds the benefits of registering new companies. Entrepreneurs and informal-sector workers are subjected to non-support, policy vacuums, inconsistent, non-integrated, uncoordinated and incoherent, policy measures from different spheres of government, coupled with under capacitated agencies and policy directorates (Fourie, 2015:408). Public procurement meant to bring black entrepreneurs into the mainstream economy is also subject to abuse by politically connected individuals and has become

a target for wealth creation for Black Economic Empowerment (BEE) moguls, contributing to the same non-transformed and colonial-type economy. Creating an enabling environment will encourage the establishment of new and contribute to effective production in existing agricultural enterprises. Supplementing existing incentives schemes and inaugurating special incentives for all predominant agricultural sectors in South Africa will lure entrepreneurs who will assist in growing the economy as well as employment creation as suggested by the empirical findings of the study.

6.4.8 Promote domestic investment

Domestic savings and investment in different economic sectors weaken unemployment by stimulating economic growth and development. Lack of internally sourced capital impedes efforts by governments to allocate targeted investments. Since foreign direct investments in South Africa flow to the high productive manufacturing sectors only while the low productive agricultural sector struggles to attract resources, this study recommends that the South African government supports domestic investments in the agricultural sector by creating opportunities, conducive investor climate and coherent policy framework for all investors. Domestic investments will not create employment only but will also support rapid capital accumulation and growth.

6.5 LIMITATIONS OF THE STUDY AND FURTHER RESEARCH

The first limitation of the study was that unavailability of data commanded the use of the data sample employed in this study for cointegration analysis. Although it is significant to include a large number of observations when conducting a time series analysis, unavailability of monthly and quarterly data dictated the use of annual data with observations limited to 25 annual observations only since the study avoided using pre-1994 data, which could result in spurious findings. The second limitation was that the agricultural sector's performance measurement and indicators are complex and multidimensional, therefore, opportunities for using other indicators and a different variable mix exist. However, for this study and the achievement of the respective objectives, only three agricultural sector variables namely agricultural employment, agricultural GVA and agricultural exports were employed against economic and economic development in this study. The third limitation was that other dimensions of the EDI may also have been included in the study to assess their responsiveness to changes in variables representing the agricultural sector. The last limitation of the study is that environmental factors such as soil, climate, land soil and water, which also have a significant impact on the agricultural sector productivity were excluded in the study. However, for future studies, all variables that were excluded in the study may be incorporated depending on data availability.

The current study has established that variables of interest representing the agricultural sector have an impact on South African economic performance. The study finding suggests the existence of a long-run relationship between dependent and independent variables. In other words, economic growth and development will respond positively to the improvement of the agricultural performance in South Africa. The impact of the agricultural performance in the short-run is limited since positive changes that occur in the South African agricultural sector do not have the power to effect changes on economic growth in the short-run. However, short-run changes in chosen variables have a positive impact on economic development. This means that inclusive and sustainable agricultural policies, together with effective strategies, are required to support the agricultural sector to induce improvement in the more qualitative nature of economic development.

In addition, the long-run negative impact of agricultural employment on per capita GDP as indicated by empirical results of the study requires the adoption of productivity-enhancing technology, which when coupled with agricultural employment, will increase agricultural productivity and contribute to employment creation in the sector. Findings from this study revealed that improving agricultural productivity and agricultural GVA will effect more powerful changes to the economic development and therefore improve living standards. Subsequently, agricultural employment and agricultural exports towards both economic growth and economic development will also be improved. Agricultural exports were found to be contributing less to economic growth in South Africa due to low agricultural productivity failing to satisfy domestic consumption and causing the country to import large quantities of food. This compels the government to reduce agricultural export objective in South Africa to the attainment of a positive trade balance only. Consequently, the status quo will not change until there is a commitment from the government to improve agricultural policies to be export oriented.

As highlighted in this chapter, the ARDL and ECM models were employed in the study to achieve empirical findings and ensure the accuracy and reliability of the study results. Furthermore, the residual tests were homoscedastic and serially correlated as reflected by stability diagnostic tests implying that all models were stable. Therefore, the empirical findings of the study do not only fill the gaps in the existing literature on the impact of the agricultural sector on economic growth and development only but also recommend specific areas of the agricultural sector, which needs attention and precise measures to be taken to enhance agricultural sector performance taking into consideration the current fiscal resource constraints. Discovered policy implication gaps are also highlighted towards the improvement of policy frameworks in South Africa.

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ANNEXURE A: LETTER FROM THE LANGUAGE EDITOR

LANGUAGE EDITING CERTIFICATE

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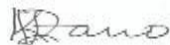
SACE REGISTERED

05 December 2021

TITLE: An analysis of the impact of the South African agricultural sector on economic growth and development

This serves to confirm that I edited substantively the above document including a Reference list. The document was returned to the author with various tracked changes intended to correct errors and to clarify meaning. It was the author's responsibility to attend to these changes.

Yours faithfully



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