The relationship between financial inclusion and agricultural development in Southern Africa Development Community (SADC)

by

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Declaration

I, Nomfundo Noncedo Langwenya declare that this dissertation, which I submit for the MSc Degree in Agricultural Economics at the University of Pretoria, is my own work and has not previously been submitted for a degree to this or any other university or institution of higher learning.

Signature:……

Date: ……

Acknowledgments

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Words fail to express my sincere appreciation to my uncles for their support throughout my academic career. Thank you for always reminding me that I can be the best I can possibly dream to be. Mam Zethu, thank you for always reminding me that the world is my oyster. Aunt Pretty, thank you for your words of encouragement whenever I felt like giving up. Ziyanda, thank you for believing in me.

Dedication

This research work is dedicated to God first and to my late mother. May her soul continue to rest in peace.

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Abstract

An inclusive financial system has been widely recognized by most policy makers around the world and is becoming a priority in policy making globally. An inclusive financial system is one that creates economic opportunities along with ensuring equal access to them. Agriculture, on the other hand, continues to be renowned as an engine for growth in many poor economies and thus the importance of financial inclusion for agricultural development cannot be ignored. This research work sought to examine the relationship between financial inclusion and agricultural development in Southern African Development Community (SADC). The main objective of the study was to establish the relationship between financial inclusion and agricultural development in the SADC region.

The study determined the level of financial inclusion in the SADC region by calculating the index of financial inclusion. The index gathers information from the World Bank G20 financial inclusion indicators using methodological inputs from the research works of Sarma (2008). An agricultural development index was also calculated to determine the level of agricultural development in the SADC region using secondary data from the African Development Bank, an open Africa database.

To determine the relationship between financial inclusion and agricultural development, secondary data were extracted from the African Development Bank's open data for Africa database. These data were analyzed using descriptive statistics, correlation and regression analysis. Excel software was used to transform the variables into a format suitable for analysis, after which STATA version

14 was used to provide the basis of analysis and the findings of the study. For the basis of analysis and because of the unavailability of data on agricultural development measured as a single number, the Agricultural Production Index (API) was used as a proxy for agricultural development. A period of ten years was covered, from 2005 to 2014, for all 15 SADC countries and the panel fixed effects regression model was confirmed by the Hausman test as appropriate for the study.

The regression analysis established that the usage of financial services (amount of bank loans as a proportion of total deposits) has a statistically significant relationship with agricultural development. The number of bank branches (per 1000 km^2) and ATMs (per 100 000 people) have a positive relationship with agricultural development and thus an increase in access to financial services is associated with an increase in agricultural development in the SADC region. Therefore, this study confirmed the hypothesis that agricultural development and financial inclusion are positively related. Hence, high financial inclusion is associated with high agricultural development in the SADC region.

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List of acronyms and abbreviations

ADI	Agricultural Development Index
AFDB	African Development Bank
FAO	Food and Agricultural Organization
GDI	Growth Development Index
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Index
HPI	Human Population Index
IFAD	International Fund for Agricultural Development
IFI	Index for Financial Inclusion
IMF	International Monetary Fund
SADC	Southern African Development Community
UNDP	United Nations Development Program
UN	United Nations

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CHAPTER 1
INTRODUCTION

1.1 Background

The Southern African Development Community (SADC) was established in 1992. Comprising of 15 countries (Namibia, South Africa, Zimbabwe, Zambia, Swaziland, Mozambique, Tanzania, Lesotho, Madagascar, Angola, Seychelles, Botswana, Mauritius, Malawi and the Democratic Republic of Congo), it was formed partly with the aim of creating intergovernmental relations among its member states. It was hoped such relations would help in the eradication of poverty, promote equitable growth of the economy and ensure socio-economic growth, as well as promote efficient production systems among the countries. A map showing the 15 SADC countries is shown in Figure 1.1.

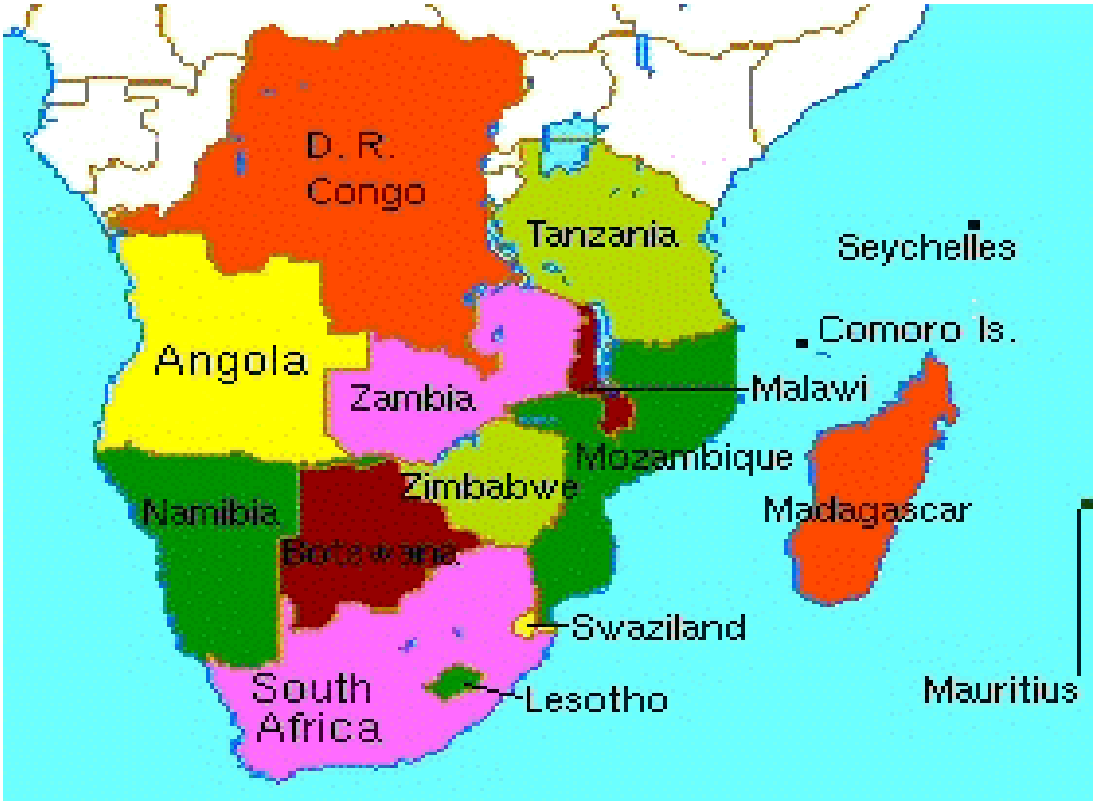

Figure 1.1: *Map showing SADC member countries*

Source: *SADC (2015)*

The agriculture sector features highly in the economy of the SADC region. As a region with mostly developing countries, agriculture is without doubt the main source of livelihood for about 70% of

the population SADC (2015), providing food and income. It contributes between 4% and 27% to the gross domestic product (GDP) (SADC, 2015), and accounts on average for about 66% of the value of intra-regional trade and 13% of total earnings (CCARDESA, 2015). This proves that agricultural performance in the SADC strongly influences the rate of growth of the economy, the labor force, food security, poverty rates and the stability of the economy.

The concentration of poor people in Southern Africa is among the highest in the world. Growth in the rural economy is low and, if this continues, insufficient growth will in the long term undoubtedly result in extreme, widespread food insecurity and poverty in the region. The region's agricultural sector is performing far below its potential (SADC (2015); Finmark Trust (2016). Given the region's land base, the International Fund for Agricultural Development (IFAD) reported that about 85% of the population live on land that has medium to high potential for increased productivity (FAO, 2015).

These people living on this land are smallholder with limited farming skills, lack of access to financial services, lack of access to markets and the necessary information on markets and other resources that are crucial for growth in agriculture. It is the unavailability and limited use of this resource (land) that leads to low production and low incomes in agriculture, which in turn limit the inclination of smallholder farmers to invest more in agriculture. Some of the land cannot be used as collateral in countries such as Swaziland, where land ownership is dualistic in nature. Title Deed Land (TDL) is land owned by individuals and Swazi Nation Land (SNL) is public land held in trust for the people by the king), and countries such as South Africa where there are unresolved issues of land tenure reform (FAO, 2015).

According to Bhatia and Rai (2008), the agricultural development is an endless process of improving the production of crops and livestock. Agricultural development, according to these authors (Bhatia & Rai, 2008), indicates the existence of agricultural and technological infrastructural facilities for enhancing agricultural produce. However, constraints on agricultural development are multiple and well recognized (Awotide, Abdoulaye, Alene, & Manyong, 2015). Some are exogenous, brought about by policies and practices beyond farmers' control, including market structures, research and development support and deprivation of access to financial services. Some of these constraints are endogenous. While most rural economically active people

engage in small-scale farming, many lack the technical and managerial skills to undertake anything but subsistence farming (Awotide et al., 2015).

The continuously rising costs of production and consumer prices often rising more rapidly than the price of farm produce, is one of the many factors adversely affecting these small-scale producers in increasing their farms' productivity and growth. The instability of product prices and erratic climatic conditions continuously expose farmers to immense income risks and sometimes loss of the very few assets they own (Awotide et al., 2015). These circumstances seriously affect the adoption of improved agricultural technologies and financial investments in the growth and development of agriculture. It is in this context that the significance of financial inclusion becomes clearest, to cover farmers' annual, medium-term and long-term needs.

Sarma and Pais (2011) define financial inclusion "as a process that ensures the ease of access, availability and the usage of formal financial system for all members of an economy." According to the authors, a financial system for all has the ability to boost economic growth efficiently and thus eradicate poverty and lower the level of food insecurity. For these reasons, most countries have financial inclusion as a policy priority. According to Moloi (2009), financial inclusion is an important element of development, without which the stability of inclusive economic growth is impossible.

However, whether development leads to financial inclusion or financial inclusion leads to the development of the economy has still not been ascertained. Chances are good that the direction of causality is reciprocal and separating these things would cause problems, according to (Yorulmaz, 2012). Schumpeter (1912) and Hicks (1969) found that a developed financial structure that allows financial inclusion for all segments of the population results in economic growth. However, Robinson (1952) and Levine (1997) have it the other way round; these authors believe that growth of the economy promotes a financial system for all. According to Robinson (1952) and Levine (1997), a growing economy leads to more people wanting to use formal financial services and this growth in demand leads to more development of the financial system.

Initiatives to boost financial inclusion are being led by governments, financial regulators and the banking industry (CCARDESA, 2015). Even though access to credit is over-emphasized as far as financial inclusion is concerned for smallholder farmers, using formal financial services is not only about access to credit, but also about the delivery of all financial services and products

(transactional, savings, credit and insurance) that are available, affordable and accessible to all segments of the population (CGAP, 2015).

1.2 Problem statement

The key objective in development is poverty reduction; that is, finding solutions that could move people out of poverty. Financial exclusion has negative, interrelated social and economic impacts, hence the recent accelerating interest in financial inclusion to enhance economic development (Ambarkhane, Singh, & Venkataramani, 2016). Access to and use of formal financial services as a policy objective may stimulate development, growth and poverty reduction (Yorulmaz, 2012). (Dixit & Ghosh, 2013) emphasize the need to understand that a mandate needs to be built with regard to inclusive finance in order to enhance development.

Various publications have sufficiently deliberated the association between financial inclusion and development. Sarma and Pais (2011), in their cross-country study on financial inclusion and development, found that although a few exceptions exist, there is a strong positive correlation between financial inclusion and human development. In line with those findings were those of Yorulmaz (2012) on financial inclusion and economic development in Turkey. The author's cross-country analysis found that, at macroeconomic level, a broader financial system results in economic growth. These results are similar to those of Giné and Townsend (2004).

However, not much discussion has taken place on the possible relationship between financial inclusion and agricultural development. Even though the significance of agricultural development is widely recognized, academic work on this complex concept has a shortfall on broad ways of measuring the extent to which it has been achieved in an economy. Instead, what has been done in previous studies (Anand & Chhikara, 2013; Blando, 2013; Kuri & Laha, 2011; Nanda & Kaur, 2016; Sarma & Pais, 2011), was to use a variety of development indices to rank countries according to their national performance. However, most research writings (Anand & Chhikara, 2013; Nanda & Kaur, 2016) only concentrate on specific development indicators for a particular framework, such as sustainable development, while the majority discuss human development. The study will fill the existing gap on the relationship between financial inclusion and agricultural development.

1.3 Objectives

The main objective of this study is to determine the relationship between financial inclusion and agricultural development in the SADC region.

The specific objectives are to:

a) Determine the level of financial inclusion in the SADC region;

b) Develop an index that will be used to determine the level of agricultural development in the SADC region; and

c) Identify the determinants of the relationship between financial inclusion and agricultural development in the SADC region.

1.4 Hypothesis

It is hypothesized that agricultural development and financial inclusion are positively related. This is based on the results of numerous studies that have found that certain elements of financial inclusion, such as access to and usage of credit, have a positive effect on agricultural production Kuri and Laha (2011) and Olaniyi (2017). Hence, SADC countries with higher levels of financial inclusion are expected to have a higher level of agricultural development.

1.5 Organization of the dissertation

Chapter 2 reviews the relevant literature on financial inclusion, the meaning and measurement of financial inclusion and the extent of financial inclusion in the SADC region. This chapter also considers how development and the current level of development in the SADC region are defined and measured in the literature. Lastly, the chapter provides a general understanding of the relationship between financial inclusion and development.

Chapter 3 looks at the dominance of agriculture in the SADC region, covering a brief overview of agriculture per SADC member state while focusing more on GDP – agriculture and annual real growth rates in the SADC (percentage), in each of the member states. The chapter continues to consider the need for agricultural development and determinants of agricultural development as identified in the literature. The possible causation between financial inclusion and agricultural development is also considered in this chapter.

Chapter 4 presents the methods and procedures that were used to meet the objectives of the study.

Chapter 5 The chapter discusses the levels of financial inclusion and agricultural development in the SADC region. SADC countries are ranked according to their levels of financial inclusion and agricultural development. The chapter concludes by comparing the index of financial inclusion and the agricultural development index (ADI).

Chapter 6 serves to identify the relationship between financial inclusion and agricultural development.

Chapter 7 summarizes the findings of the study, draws conclusions relevant to the research, makes recommendations and provides suggestions for future research.

CHAPTER 2
FINANCIAL INCLUSION AND DEVELOPMENT

2.1 Introduction

This chapter reviews the relevant literature on financial inclusion, the meaning and measurement of financial inclusion and the extent of financial inclusion in the SADC region. This chapter also considers how development and the current level of development in the SADC region are defined and measured in the literature. Lastly, the chapter provides a general understanding of the relationship between financial inclusion and development.

2.2 Meaning and measurement of financial inclusion

2.2.1 Financial inclusion/exclusion defined

Financial inclusion is an area of interest for most policy makers, academics and stakeholders globally. This growing interest in financial inclusion shows an increasing understanding of the transformative power it has in terms of economic and social development. It has emanated from the government, officials of finance and the banking industry as a whole (Sarma & Pais, 2011; Shahul, 2014). This reflects mounting acknowledgment that financial inclusion plays an important role in eradicating poverty and backing up sustainable and inclusive development (World Bank, 2014).

Existing literature has defined financial exclusion in many ways. Some scholars have viewed financial exclusion as an act making a certain group of people feel less important and not providing them with the same opportunities and benefits received by other members of society, "social exclusion". According to Massara and Mialou (2014), financial inclusion is "an economic state where individuals and firms are not denied access to basic financial services based on motivations other than efficiency criteria." Sarma and Pais (2011) express financial inclusion as a process that allows for the availability, access and usage of formal products and services of finance for all segments of the population.

According to Carbó, Gardener, and Molyneux (2005) the failure of some individuals to access financial services and products leads to their exclusion from the financial market. The authors also point out that the poorest members of society experience most financial exclusion. According to Koku (2015), financial exclusion is an all-encompassing word for the negative factors that prevent

the poor from accessing financial services. Living on the margins of society exposes mostly the poor to financial exclusion.

According to the World Bank (2014), financial exclusion can be categorized into voluntary and involuntary exclusion. People who intentionally decide not to participate in the financial market because of cultural or religious reasons are voluntarily excluded from the financial system (Massara & Mialou, 2014). This exclusion is said to be driven by lack of demand. According to the authors, there is little that can be done to address this form of exclusion because it is not a result of the failure of the market. However, to address this type of exclusion it would be best to provide knowledge and understanding of financial services and allow the penetration of other financial institutions with the expertise to provide financial products and services that will meet the demands of all consumers (Massara & Mialou, 2014).

Factors such as not having adequate income and credit markets' demand exceeding supply lead to the involuntary exclusion of some segments of the population. These are usually people and businesses that have no access to financial services as a consequence of the failure of government or the market. Therefore, according to the authors, financial inclusion should focus on the reduction of financial inclusion barriers that are caused by failure of the market or government (Massara & Mialou, 2014).

2.2.2 Dimensions and measurement of financial inclusion

Financial inclusion has many dimensions and according to Shahul (2014), achieving all the dimensions of financial inclusion is a universal goal. The method of accumulating information on financial inclusion involves multiple structure measurements. These include the identification of indicators that would give the best measure of the complex phenomenon. It is for this reason that literature has proposed different approaches, including using different financial inclusion dimensions and indicators for econometric estimations (Massara & Mialou, 2014; Sarma, 2008). However, academics encounter challenges in measuring financial inclusion. According to Shahul (2014), researchers need to acknowledge that financial inclusion theories, policies, supply, models and methods of implementation continuously evolve.

Financial inclusion meanings and measurements continually change from categorizing people and firms as financially included or not to examining financial inclusion as a phenomenon with

multiple dimensions (Triki & Faye, 2013). Academics and practitioners have agreed that financial inclusion incorporates three main dimensions, namely, outreach, quality and usage of services and products in finance (Tuesta, Sorensen, Haring, & Camara, 2015). The physical ability to reach a point of service easily is referred to as the outreach dimension.

According to the World Bank (2014), of the 2.5 billion of the population who do not have access to financial services all over the world, about 20% of the people give "the distance to a point of financial service" as a barrier to owning an account with a formal financial service provider (Demirgüç-Kunt & Klapper, 2012). Geographic and demographic penetration indicators are used to define this outreach dimension. The usage dimension is used to measure the use of financial services; the quality of the financial services is measured by the extent to which financial services and products meet the needs of their users (Demirgüç-Kunt & Klapper, 2013).

The Financial Inclusion Data Working Group of the Alliance for Financial Inclusion also settled on three elements of financial inclusion regarded as most important, with the purpose of providing complete understanding of inclusion. These dimensions, namely access, usage and quality, provide the ultimate direction for collecting the necessary information for measurement (Triki & Faye, 2013), as explained in Table 2.1. This justifies why most academic literature has referred to financial inclusion as the optimal combination of dimensions.

Table 2.1: *Key dimensions of financial inclusion*

1. ACCESS	The combination of both the availability and appropriateness of financial products and services;
2. USAGE	The frequency of interaction with the product or service
3. QUALITY	The combination of product fit, value add, convenience and risk

Source: *Adapted from Triki and Faye (2013)*

The objectives of financial stability are important and must be taken into consideration for policies to facilitate access for those individuals and firms that are still deprived of the use of and access to financial services (Hannig & Jansen, 2010). Measuring financial inclusion is meant to serve two objectives: measuring and monitoring levels of financial inclusion, expanding the knowledge and understanding of the elements that are linked with access to and usage of quality financial services

and products, and the roles played by policies in ensuring financial inclusion for all. These two goals have been separated by basic levels, as illustrated in Figure 2.1 (Hannig & Jansen, 2010).

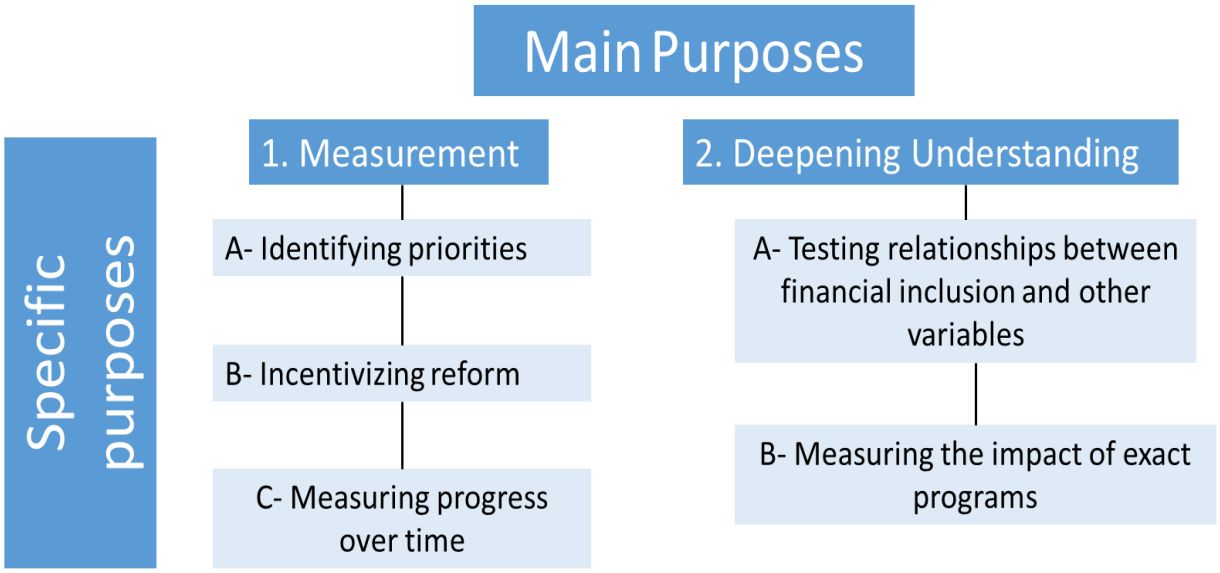

Figure 2.1: *Main purposes of the measurement of financial inclusion*

Source: *Hannig and Jansen (2010)*

Ambarkhane et al. (2016) argue that a vast amount of literature measuring financial inclusion has focused solely on using banking inclusion as analogous to financial inclusion. According to these authors, a majority of the indices that have been developed pay attention only to banking-related initiatives, whereas financial inclusion is not limited to only the banking sector, but also includes other services such as insurance, remittances, financial education and retirement funds (Ambarkhane et al., 2016). In their work, these authors developed a measure for financial inclusion grounded on the indicators of three dimensions, namely supply, demand and infrastructure, following a suggestion by Singh, Venkataramani, and Ambarkhane (2014). The approach by Ambarkhane et al. (2016) also incorporated the role of negative factors of financial inclusion, which they termed “drag factors”.

Literature makes it sufficiently clear that financial inclusion is a complex phenomenon, hence the development of numerous versions of the Index for Financial Inclusion (IFI), because it enables the capturing of information on multiple aspects of financial inclusion in a single number (Dixit & Ghosh, 2013; Koku, 2015; Sarma, 2008; Sarma & Pais, 2011).

Table 2.2: *Variables used in computing financial inclusion indices by various researchers*

Researchers	Variables used and findings
Beck, Kunt and Peria (2007)	(a) Access, (b) Actual use and possibility of use
Findings: To address the issue of qualitative use of financial services, the authors added the possibility of use and actual 'use' as an indicator. Their paper measured financial outreach across 99 countries and examined its determinants. They identified these as: (1) Geographic branch penetration: number of bank branches per 1 000 km^2. (2) Demographic branch penetration: number of bank branches per 100 000 people. (3) Geographic automatic teller machine (ATM) penetration: number of bank ATMs per 1 000 km^2. (4) Demographic ATM penetration: Number of bank ATMs per 100 000 people. The authors found that these indicators closely predicted the use of banking services.	
Sarma (2010)	(a) Availability (b) Penetration and (c) Usage
Findings: Sarma (2010) measured availability, penetration and usage as parameters of financial inclusion and calculated the IFI for 49 countries of the world. First, he calculated the indices for penetration, availability and usage. He found that most high-IFI countries were high-income countries belonging to the Organization for Economic Co-operation and Development, even though a few middle income countries were also found to have a high IFI. Out of nine medium-IFI countries, three belonged to the high-income category and five to the upper middle-income category. Most of the countries in the low-IFI category were low-income countries, but there were some exceptions. One high-income country and five upper-middle income countries were found to have a low IFI. In general, it was observed that high IFI corresponded with a high income level.	
Gupte, Vekataramani and Gupta (2012)	(a) Availability (b) Usage (c) Penetration (d) Cost and (e) Ease
Findings: Gupte, Venkataramani and Gupta (2012) used availability, usage, penetration as measures and added ease and cost. They found that inclusion of the ease and cost of transactions resulted in much higher IFI values for India in 2008 and 2009 compared to the corresponding estimates obtained using Sarma's (2008) methodology. This can be attributed to several initiatives taken by financial regulators, the government and banking industry in India. Therefore, this index will be more indicative of the extent of financial inclusion.	
Rahman (2013)	(a) Convenient accessibility (b) Responsible usage (c) Take-up rate and (d) Satisfaction level.
Findings: Rahman (2013) calculated the IFI for Malaysia, using convenient accessibility, responsible usage, take-up rate and satisfaction level as dimensions. The results showed that low-income customers had a lower score for IFI compared to the general population in Malaysia. The article claims that the index is useful to monitor the progress of policy initiatives for financial inclusion over a period of time.	

Source*: Ambarkhane et al. (2016)*

The IFI gives a more detailed measure of financial inclusion than a single indicator. Beck, Demirgüç-Kunt, and Honohan (2009) computed the IFI following the same methods used in calculating the common UNDP development indices such as the Human Development Index (HDI), Human Population Index (HPI), Growth Development Index (GDI) and the IFI, which had already been computed by (Sarma, 2008). Table 2.2 illustrates the different variables used in computing financial inclusion indices by various researchers. This is a summary compiled by the author, adapted from a table composed by Ambarkhane et al. (2016).

2.2.3 Overview of the level of financial inclusion in the SADC region

Tuesta et al. (2015), in a working paper on financial inclusion and its determinants in Argentina, emphasize the importance of understanding the difference between usage and access to formal financial services and their determinants. According to Camara, Peña, and Tuesta (2015), access to financial services is a vital condition for financial inclusion and is defined by the supply of "financial services" itself. Supply and demand are therefore the determinants of usage; there can be no usage if there is no demand and therefore availability of services (Tuesta et al., 2015). The authors also point out the importance of understanding the socio-economic elements that drive the usage of formal financial services and the extent to which this happens.

According to Zins and Weill (2016), distance or location is one of the determinants of the failure to achieve financial inclusion. This is because travelling long distances to access financial services is costly and difficult for many individuals. This justifies the findings of the Finscope consumer survey covering 12 countries of the SADC region. Finmark Trust (2015) reported that 45% of rural dwellers are financially excluded, as opposed to urban dwellers of whom only 23% are financially excluded, as shown by Figure 2.2. About 15% of rural dwellers in the SADC rely on informal finance, while only 7% of urban dwellers rely on informal financial services. This shows that there is still more work to be done in the region to get financial services to the rural poor.

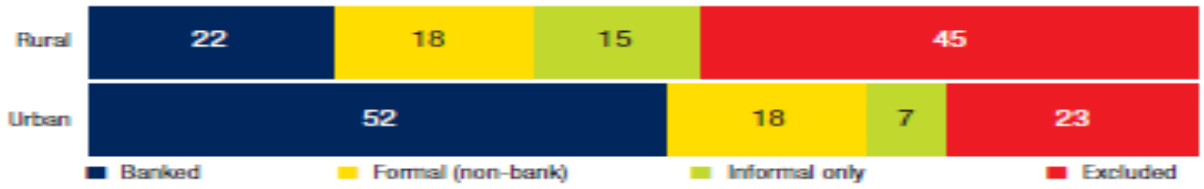

Figure 2.2: *SADC access strand by location*

Source: *Finmark Trust (2015)*

Education and location are the strongest factors affecting financial inclusion in the SADC region (Finmark Trust, 2015). Kiplimo, Ngenoh, Koech, and Bett (2015) also found that education level was statistically significant and had a positive effect on access to financial services in Kenya.

In line with the findings of Kiplimo et al. (2015) were those of Fungáčová and Weill (2015), who found that the educated have particular confidence in banks as regards ownership of an account. This suggests that variations in individuals' level of education leads to extreme deviations in the link between consumers' financial services and financial institutions. The authors' postulations are supported by information in Figure 2.3**,** which illustrates a major gap in financial inclusion between those with more than primary education and those with primary or less education in the SADC region. Therefore, the higher the level of education/financial literacy, the higher the access to and usage of quality financial services and products. Education and location were found to have the strongest effect on financial inclusion in the SADC region (Finmark Trust, 2015).

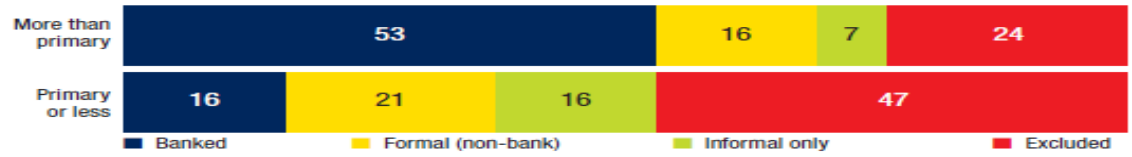

Figure 2.3: *SADC access strand by level of education*

Source: *Finmark Trust (2015)*

In total, 66% (83.5 million individuals) of adults in the region have access to formal financial products and services, as shown in Figure 2.4. The uptake levels across the product categories vary, with transactional and savings accounts being most widely used and insurance and remittances being least frequently used.

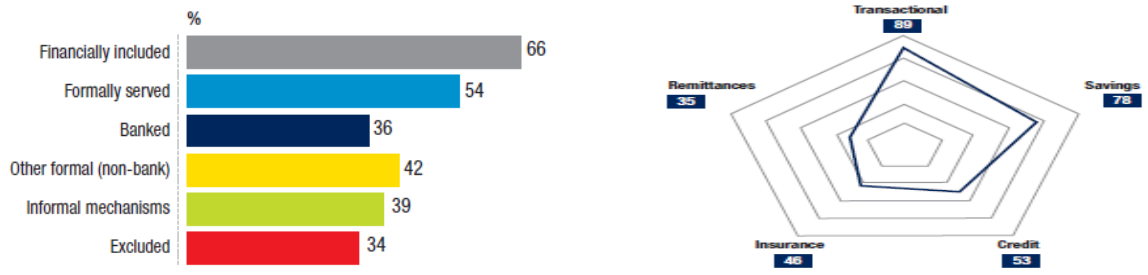

Figure 2.4: *Financial inclusion in the region and the axes that indicate the percentage of financially included adults using each product category in the SADC region*

Source: *Finmark Trust (2015)*

Levels of financial inclusion differ among the countries in the SADC from 90% in Mauritius and 86% in South Africa to 40% in Mozambique, as shown in Figure 2.5. Mozambique is indicated as the least financially included country in the SADC region, recording 60% financial exclusion, followed by the Democratic Republic of Congo and Malawi at 52% and 51%, respectively (Finmark Trust, 2015).

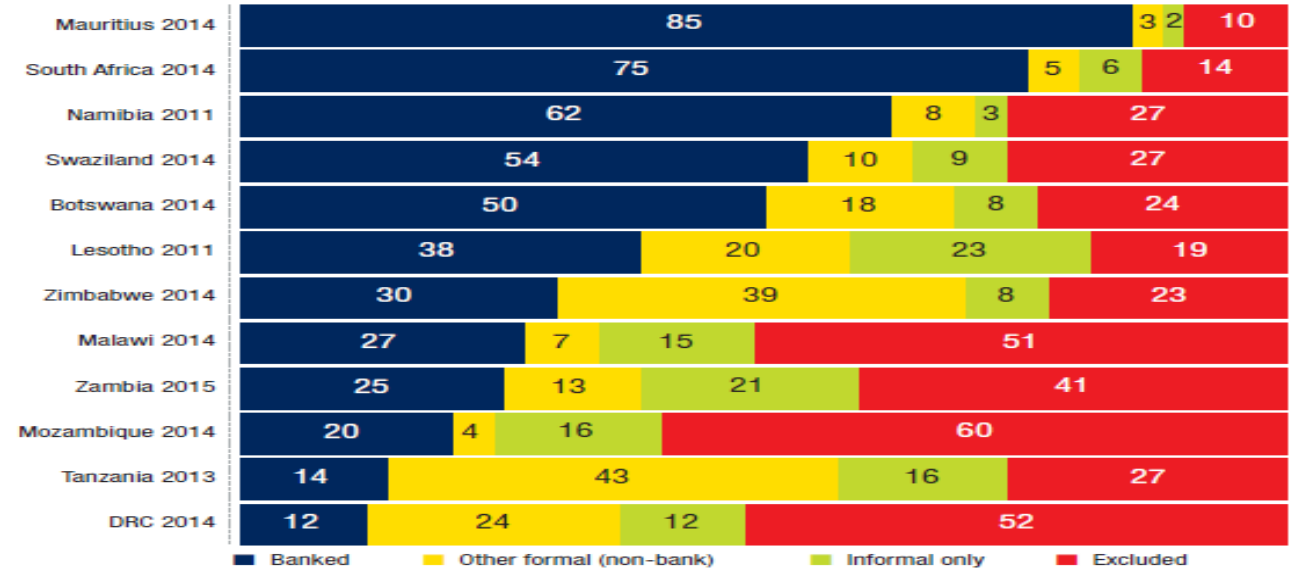

Figure 2.5: *SADC country comparison access strand*

Source: *Finmark Trust (2015)*

2.3 Meaning and measurement of development

2.3.1 Development defined

'Development' is a broad term with not just one but many subsets, e.g. rural development, sustainable development and human development. Rostow (1971) defines development as "a process of evolutional succession in stages, where human societies leave a rudimentary model until they arrive at a western industrialized civilization consumption model, which is considered unique and universal" (Soares Jr & Quintella, 2008, p. 4). There is a desire to live and develop, which makes development a commonly esteemed objective of entities (Singh, 2009). Because of its diversity, universal supremacy as a goal and its natural occurrence, numerous scientific studies and analyses have been done on this phenomenon.

Fofack (2014, p. 4) defines development as "an endogenous, multifaceted and continuous path-dependent process whereby a country's aspirational goals are constantly refined by all the different

actors (public and private) in a given society, taking into account the social fabric, the evolving stock of historical, cultural and institutional knowledge, as well as scientific and technological infrastructure." Therefore, the success of a development path in any open economy setting depends on the ability of a given society or country to keep up with local and global advancement in order to move towards its aspirational goals (Fofack, 2014).

Even though there isn't consensus on the meaning of this term, it is applicable to all levels, ranging from individuals to communities and nations as a whole (Singh, 2009; Soares Jr & Quintella, 2008). Under economic dominance, development is simply viewed as identical to economic development, which in turn is economic growth. Analysts such as da Veiga (2005) believe that the multidisciplinary concept of development is complementary to the unidisciplinary idea of economic development, while Soares Jr and Quintella (2008) argue that the terms growth and development do not mean the same thing, even though development can result from economic growth.

These views are similar to those of Streeten (1981), who observed that though economic growth remains unarguably an important aspect of development, there is a realization that economic growth is not always tantamount to development. It is essential that the growth of an economy is perceived as the scope of a social project connected to the well-being of a society in order for development to take place, because, according to Jacobs and Asokan (1999), development is a human process in the sense that it is human beings and not material factors that are catalysts for development. It is always people's awareness, aspiration and energy that drive the development process (Aziz et al., 2015).

Lewis (1995) has emphasized the negative relationship between the growth of an economy and development, with growth directly related with increased unemployment and inequality of income. Therefore, it is possible that as output grows, some people may be becoming poorer (Lewis, 1995); there is thus a risk of confusing economic growth and development (Boyd, 2007).

2.3.2 Measurement of development

Research on development indicators has heightened the need for a more holistic and comprehensive way of measuring development (Ray, 2008). This is due to the constantly changing landscape of the development framework itself; along with its policies and because of its different

and constantly evolving characteristics, people may perceive development differently (Aziz et al., 2015). The level of development of a place can be measured using multiple methods of measurement. These measures can be categorized as **social** – relating to the development of the people of the place; **economic**, relating to the finances and wealth of the place; and **political**, relating to the political systems and freedoms afforded by the place (Singh, 2009).

It is, however, difficult to balance these important measures, which explains why a country would be found with very high levels of wealth and economic development, but poor levels of political freedom and consequently poor political and social development. Before coming to conclusions on a place's level of development, it is therefore better to look at a number of different measures of development (Boyd, 2007). One of the most significant current discussions in measuring development is the choice of indicators. Gross national product (GNP) has always been regarded as the main indicator in measuring development. However, literature argues that the single GNP is insufficient to measure this complex concept because it does not take into account every aspect of people's lives, for instance social, environmental and political aspects. Good development indicators must give a precise, truthful measurement of development in general and the level of a country's performance as a whole (Aziz et al., 2015).

2.3.3 Development frameworks

It is important that the indices of development are analyzed according to different scopes (attributes and aspects of development). According to Ray (2008) and Aziz et al. (2015), in order to construct a comprehensive development index, economic, human, social and environmental concerns and other representative indicators must be selected carefully. There are three main development frameworks, namely, human development, social development and sustainable development frameworks, which are summarized in Table 2.3.

The human development framework is important because it affects the choice of performance indicators. This framework is multidimensional and holistic on its own, because it encompasses all aspects of well-being. One the most powerful measures, the HDI, resorts under this framework. This is an index that combines life expectancy, the GNI and an education index to give a value between 0 and 1, 1 being the most developed (Sarma & Pais, 2011).

Table 2.3: *Summary of development frameworks, their objectives and the indices for measurement*

FRAMEWORK	OBJECTIVE	INDICES
Human Development	To develop and maximize the potential of human well-being, to achieve self-actualization and to meet all the basic needs (physiological, safety, love, esteem) (Maslow, 1943)	• HDI • Physical quality of life index) • Meaning in life index • Gender-related development index
Social Development	To develop societies to be more equitable and inclusive for all members of a society; to improve the welfare and quality of life of individuals (Aziz et al., 2015; Ray, 2008).	• Multidimensional poverty index • Human poverty index • Social development index • Corruption perception index
Sustainable Development	To meet the economic, human and social needs of the present and sustain development as a whole to ensure future generations meet their own needs (Aziz et al., 2015)	• Sustainable net benefit index • Index of sustainable economic welfare

Source: *Author's compilation based on information from UNDP (2015)*

This measure is referred to as powerful because it is a combination of economic and social measures in one single number. Moreover, HDI is better than other development indices because it effectively facilitates the evaluation of the progress of countries, which allows inter-country comparison and inter-temporal comparisons of living levels (Doessel & Gounder, 1994). However, some scholars argue that the HDI is an imperfect measure of development because it omits some critical indicators such as gender, income or income inequality, respect for human rights and freedom (Schüler, 2006; Singh, 2009).

Davis (2004) defines the social development framework first as improvement in the welfare and quality of life of individuals and/or changes in societies that make development more equitable and inclusive for all members of a society. Among the social development indices is the human poverty index, which is an index of human deprivation and a non-income based measure of human poverty. It values and ranks countries according to the variation in the intensity of poverty across those countries.

However, measures of development tend to concentrate explicitly on the economic and social dimensions and to neglect the aspect of environment. Therefore, scholars have taken to the development of indices for sustainable development in order to fill the gap. Moffatt (2008), proposed a preliminary analysis of composite indicators of sustainable development for which he analyzed 13 composite indicators of sustainable development, using Spearman's rank correlation data for the original G7 nations for 2000. Numerous single and composite sustainability indicators are used, which include environmental, social, economic and sustainable development dimensions, among others the Environmental Sustainability Index and Direct Material Consumption Index.

2.3.4 Overview of the level of development in the SADC region

According to Fofack (2014), to improve the standards of living of the population sustainably, including the growth of an economy, science and technology, human resource development and utilization, human development has been made a priority in all development models, tools and instruments. Human resource development promotes the growth of an economy through productivity channels, but it is also an end in itself. Education levels and raising life expectancy (components of the HDI) better the standards living and contribute to the development of a more harmonious society, which enhances the core values of equity and fairness (Fofack, 2014).

Table 2.4 presents the level of human development in each of the SADC member states for the years 2010 to 2014. The HDI incorporates information on the different dimensions of human development in a single number lying between 0 and 1, where 0 denotes no human development and 1 indicates complete human development in each of the SADC countries.

As seen in Table 2.4**,** the HDI has been increasing over the years, although in some years the HDI was increasing at a decreasing rate. There are exceptions, however, for countries such as Seychelles, who's HDI showed a decline from what it was in 2011 when compared to 2014. Despite this decline, Seychelles ranks number 2 (HDI = 0.772) after Mauritius (HDI = 0.777) in the SADC region. The human development values lie between 0.416 and 0.777, with Mozambique having the lowest level of human development. This may be attributable to the low mean years of schooling (a very important component of the HDI) experienced in Mozambique.

Table 2.4: *Human Development Index in the SADC, 2010 - 2014*

Country	HDI Rank					HDI Value				
	2010	**2011**	**2012**	**2013**	**2014**	**2010**	**2011**	**2012**	**2013**	**2014**
Angola	146	148	148	149	149	0.486	0.486	0.508	0.526	0.532
Botswana	98	118	119	109	106	0.633	0.633	0.634	0.683	0.698
DRC	168	187	186	186	176	0.239	0.286	0.304	0.338	0.433
Lesotho	141	160	158	162	161	0.427	0.450	0.461	0.486	0.497
Madagascar	135	151	151	155	154	0.435	0.480	0.483	0.498	0.510
Malawi	153	171	170	174	173	0.385	0.400	0.418	0.414	0.445
Mauritius	72	77	80	63	63	0.701	0.728	0.737	0.771	**0.777**
Mozambique	165	184	185	178	180	0.284	0.322	0.327	0.393	**0.416**
Namibia	105	120	128	127	126	0.606	0.625	0.608	0.624	0.628
Seychelles	52	52	46	71	64	n. a	**0.773**	**0.806**	**0.756**	**0.772**
South Africa	110	123	121	118	116	0.597	0.619	0.629	0.658	0.666
Swaziland	121	140	141	148	150	0.498	0.522	0.536	0.530	0.531
Tanzania	148	152	152	159	151	0.398	0.466	0.476	0.488	0.521
Zambia	150	164	163	141	139	0.395	0.430	0.448	0.561	0.586
Zimbabwe	169	173	172	156	155	0.140	0.376	0.397	0.492	0.509

Source: *Adapted from SADC (2015)*

Table 2.5 presents a summary of the level of development in the SADC region using four of the 12 world development indicators used by the World Bank in analyzing the level of development in the world. The four indicators used in this summary are:

1) **Improved water source (percentage of population with access):** This refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on the premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs and rainwater collection). Mauritius continues to lead in this indicator, while Mozambique ranks lowest.

Table 2.5: *Summary of the level of development in the SADC region using four of the 12 world development indicators that were used by the World Bank.*

	Indicators			
	Access to an improved water source (% of population)	**Access to electricity (% of population)**	**Expenditure for R&D (% of GDP)**	**Adjusted net savings (% of GNI)**
Angola	49	32		-49.6
Botswana	96	56.5	0.3	24.5
Congo, Dem. Rep.	52	13.5		-16.4
Lesotho	82	27.8	0	
Madagascar	52	16.8	0	-3.4
Malawi	90	11.9		-15.5
Mauritius	100	99.2	0.2	-7.6
Mozambique	51	21.2		-5.1
Namibia	91	49.6		19.2
Seychelles	96	99.5		
South Africa	93	86	0.7	1.5
Swaziland	74	65		14.4
Tanzania	56	15.5	0.5	15.7
Zambia	65	27.9		6.6
Zimbabwe	77	32.3		-16.1

Source: *Author's own compilation based on data from the World Bank (2017)*

2) **Access to electricity (percentage of population):** This is the percentage of the population with access to electricity. Electrification data are collected from industry, national surveys and international sources. Seychelles takes the lead in this indicator. Unfortunately the

countries are not consistent in terms of these development indicators, e.g. a country such as Malawi with 96% access to water sources drops to 11.9% access to electricity.

3) **Research and development expenditure (percentage of GDP):** These are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. Research and development (R&D) covers basic research, applied research and experimental development. Because of the unavailability of data in this indicator, it is quite difficult to rank the countries. However, as it stands, South Africa ranks highest at 0.7%.

4) **Adjusted net savings, including particulate emission damage (percentage of GNI):** These are equal to net national savings plus education expenditure minus energy depletion, mineral depletion, net forest depletion, and carbon dioxide and particulate emissions damage. Almost all the SADC member states have negative adjusted net savings. Botswana ranks highest at 24.5%.

2.4 Link between financial inclusion and development

Access to and the use of quality financial services and products have several merits. Financial inclusion, according to Moloi (2009), is one of the important building blocks of development and the stability of inclusive economic growth is impossible without financial inclusion. Dixit and Ghosh (2013) define inclusive growth as broad-based, shared and pro-poor growth. Inclusiveness, in this context, is therefore seen as a process of including the excluded as agents whose involvement is important in the design of the process of development and not simply as welfare targets for development programs.

The key objective in development is poverty reduction; that is, finding solutions that could move people out of poverty. Financial exclusion on the one hand has negative, interrelated economic and social impacts, hence the recently accelerating interest in financial inclusion to enhance economic development. According to Yorulmaz (2012), achieving financial inclusion for all would result in both social and economic development, and this is a substantial part of what this thesis is testing. Governments need to understand that to bring about development, policies must be built with regard to inclusive finance (Dixit & Ghosh, 2013).

Whether development stimulates financial inclusion or financial inclusion stimulates the development of the economy has still not been ascertained. Chances are high that the direction of causality is reciprocal and separating these things would cause problems, according to (Yorulmaz, 2012). Schumpeter (1912) and Hicks (1969) found that a developed financial structure that allows financial inclusion for all segments of the population results in economic growth. However, Robinson (1952) and Levine (1997) have it the other way round; these authors believe that the growth of an economy promotes a financial system for all. According to Robinson (1952) and Levine (1997), a growing economy leads to more people wanting to use formal financial services and this growth in demand leads to more development of the financial system.

Most of the world's poor use informal financial intermediaries. It is argued by some analysts that this results in inefficient use of resources by the poor (Hannig & Jansen, 2010). According to Demirgüç-Kunt and Klapper (2012), efficient allocation of productive resources is facilitated by financial inclusion, thus resulting in reduced capital costs. However, there may be transaction costs on both the demand and supply side associated with financial inclusion and it is important to take these costs into consideration.

Sarma and Pais (2011) found that despite a few exceptions, the level of human development and that of financial inclusion are strongly positively related. In line with those findings were those of Yorulmaz (2012) on financial inclusion and economic development in Turkey. It was found that at macroeconomic level, a broader financial system results in economic growth, the same results that were found by (Giné & Townsend, 2004).

The level of human development and income as measured by GDP per capita are key factors for explaining the financial inclusion level in an economy, as found by (Ardic, 2011; Massara & Mialou, 2014; Sarma & Pais, 2011). According to (Dixit & Ghosh, 2013), financial literacy and level of awareness remain barriers to the use of financial services or products. Although some people are financially literate, they still cannot access and use formal financial services because of lack of collateral demanded by formal financial institutions. These kinds of obstructions in the financial system then widen income inequality and hinder development (Conroy, 2008).

National policies are at different stages of development and have been achieved by different means, but many countries now provide a framework for enhancing inclusive growth through financial inclusion. After Asia, the world's second fastest growing region is now Africa (Triki &

Faye, 2013). However, the large gap in financial inclusion still needs to be addressed. According to the World Bank (2014), 2.5 billion people are still financially excluded in Africa.

The situation is worse in African developing countries, although the emerging progress cannot be ignored. For example, in South Africa, the proportion of adults with bank accounts has increased impressively. Six million bank accounts were opened in four years in the country (World Bank, 2014). However, an increase in bank account ownership does not ensure regular use of the accounts; only a few become active, while the rest lie dormant (World Bank, 2014).

2.5 Summary

The growing interest in financial inclusion shows increasing understanding of the transformative power it has in respect of economic and social development. Achieving financial inclusion is now a global objective. Financial inclusion definitions and measurements have evolved from categorizing people and businesses as either included or not, to viewing financial inclusion as a concept with many dimensions. The multidimensionality of financial inclusion is captured by the index of financial inclusion, which is considered a complex phenomenon because it incorporates a number of elements of financial inclusion in one number. This index encompasses the key dimensions of financial inclusion (quality, access and usage).

CHAPTER 3

AGRICULTURE AND AGRICULTURAL DEVELOPMENT IN SADC

3.1 Introduction

This chapter looks at the dominance of agriculture in the SADC region, covering a brief overview of agriculture per SADC member state while focusing more on GDP – agriculture and annual real growth rates in the SADC (percentage), in each of the member states. The chapter continues to consider the need for agricultural development and determinants of agricultural development as identified in the literature. The possible causation between financial inclusion and agricultural development is also considered in this chapter.

3.2 Dominance of agriculture in the SADC region

Contributing between 4% and 27% of GDP, agriculture is without doubt one of many important factors of social and economic development in southern Africa. About 70% of the region's population are dependent on agriculture for their livelihood (SADC, 2015). Social and economic growth, reduction of poverty, food security, gender equality and nourishment all make agriculture a crucial component of the region's overall development agenda.

Agriculture contributes, on average, about 13% to total export earnings and about 66% to the value of intra-regional trade in most southern African countries, making it the major source of trade (CCARDESA, 2015). For these reasons, the performance of agriculture has a strong influence on the economic growth rate, employment level and demand for other goods, economic stability, food security and overall eradication of poverty (SADC, 2015). However, the agriculture sector in the region is performing far below its potential (SADC (2015); Finmark Trust (2015), given the region's land base. More than 85% of the population live on land that has medium to high potential for increased productivity, but 27% of estimated maximum productivity is all that the region achieves (IFAD, 2015).

Most of the people living on this land are smallholder farmers practicing subsistence farming, who have to contend with a number of physical and socio-economic constraints (SADC, 2015), such as limited skills, financial exclusion, poor access to markets and market information and other resources that are crucial for growth in agriculture. For a long time, the southern African region has been enjoying the 'pride' of harboring great potential for agriculture. Development of that

potential to tangible products and outputs that can drive the socio-economic development of individuals and communities at large has eluded the region.

3.2.1 Brief overview of agriculture in the SADC

Table 3.1 presents data on agriculture's growth rates in the SADC for the time period 2010 – 2016 (data updated to 2016). There has been a decline in the annual growth rate in most SADC member states; however, some countries appear to have done exceptionally well in 2014, although it can be noted that the variability might have been strongly dependent heavily on rainfall. Statistics show the decline in agriculture's growth rate over the years, as presented in Table 3.1.

Table 3.1: *GDP - Agriculture, annual real growth rates in SADC (%)*

Country	2010	2011	2012	2013	2014	2015	2016
Angola	11.9	9.5	6.2	7.2	7	-6.8	-3.9
Botswana	8	10	7.9	9.5	6.8	2.1	6.6
DRC	2.5	3	7.1	8.4	8.6	6.7	-7
Lesotho	10.4	2.7	5.6	9	6.4	4.6	3.4
Madagascar	0.4	-0.4	1.9	2	2.3	2.7	3.7
Malawi	7.1	2.4	18.2	-0.4	10.5	8.2	4.6
Mauritius	5.3	5.1	4.4	4.2	4.9	4.6	4.3
Mozambique	10.3	8.4	11	6.6	8.4	6.6	5.4
Namibia	4.3	7.1	4	6.6	8	6	5.9
Seychelles	6.5	6.7	1.9	10	5.4	4.9	1.7
South Africa	2.3	3.9	2.7	2.5	2	1.8	1.3
Swaziland	1.6	2.1	1.9	8.8	4.7	-0.8	-2.1
Tanzania	7.6	8.3	7.4	7.4	7.3	7.1	7.8
Zambia	9.7	6.9	12.2	7.2	6.9	2.9	2.6
Zimbabwe	14.8	11.9	12.5	6.7	1.2	1.4	-5.5
SADC	6.8	5.8	6.9	6.4	6.0	3.5	1.9

Source: AFDB (2018)

Table 3.1 shows a decline in annual growth rate from 6.8% to 5.8% in SADC in years 2010 to 2011 respectively. Although the sector picked up from 5.8% to 6.9% annual growth rate in 2013, Table 3.1 shows a drastic decline in annual growth rate between the years 2013 to 2016 in SADC. The poor performance of the sector, therefore, represents an added challenge to the fight against poverty in the region, considering that many farmers in the region are small-scale farmers who continually need assistance in order to shift from subsistence farming to commercialization (FAO, 2014).

Table 3.2: *Agriculture, value added (% of GDP)*

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018
Angola	6.3	5.9	6.1	6.5	6	6.5	6.5	6.5	6.5
Botswana	2.8	2.8	3	2.5	2.3	2.4	2.4	2.4	2.4
DRC	22.6	22.2	22	20.9	20.1	20.1	20.1	20.1	20.1
Lesotho	8.3	8.4	7.2	8.1	7.3	7.2	7.2	7.2	7.6
Madagascar	28.1	28.3	28.2	26.4	26.5	25.7	25.7	25.7	25.7
Malawi	31.9	31.2	28.3	27.5	27.5	27.5	27.5	27.5	27.5
Mauritius	3.6	3.6	3.5	3.8	3.7	3.5	3.5	3.5	3.5
Mozambique	29.5	28.6	27.6	26.6	25.1	25.2	25.2	25.2	25.2
Namibia	9.3	8.9	8.7	6.9	7.2	6.5	6.5	6.5	6.5
Seychelles	2.7	2.6	2.5	31.2	2.9	2.9	2.9	2.9	2.9
South Africa	2.6	2.5	2.4	2.3	2.4	2.3	2.3	2.3	2.3
Swaziland	10.4	10.1	10.1	10	9.2	8.4	8.4	8.4	8.4
Tanzania	33.2	32.4	33.9	33	31.4	31.5	31.5	31.5	31.5
Zambia	9.9	10.2	9.7	8.6	7.3	5.3	8.3	5.3	5.3
Zimbabwe	13.4	11.8	11.4	10.4	12.3	11.8	11.3	11.8	11.8
SADC	14.3	13.9	13.6	14.9	12.7	12.5	12.6	12.5	12.5

Source: AFDB (2018)

Agriculture is an important livelihood activity for a significant proportion of the population for countries such as Lesotho, despite the fact that overall productivity of the sector and its contribution to the country's GDP remain low (FAO, 2016). The contribution of agriculture, hunting, forestry and the fishing sector to the nation's economy has been in relative yearly decline, as seen in Table 3.2. The limited use of improved agricultural inputs in countries such as

Mozambique is the reason for the decline in the agricultural annual growth rate as observed in Table 3.1, even though according to the Food and Agriculture Organization (FAO, 2016), agriculture is the main source of revenue for approximately 55% of the households in Mozambique. Recording 25.2% value added (as percentage of GDP) in 2016 (AFDB, 2016), proves that Mozambique is quite dependent on agriculture, hence the need for agricultural development. South Africa on the other hand seems to have the least annual growth rate and the lowest agriculture's contribution to GDP. This comes as no surprise as both manufacturing (secondary sector development) and services (tertiary sector) are becoming more important as the economy of the country (South Africa) develops. Overall, value added (as percentage of GDP) has been declining over the years (2010 to 2018) in SADC as observed in Table 3.2.

3.3 Agricultural development

Bhatia and Rai (2008) define agricultural development as an evolving process of improvement in the production of crops and livestock. According to these analysts, agricultural development cannot be predetermined. It indicates the availability of agricultural and technological infrastructural facilities for improving agricultural produce for a maximum number of people and in adequate measure (Bhatia & Rai, 2008). Balanced human resource development requires development in agriculture. In order to improve the productivity of various crops and thus the social and economic position of the people, agricultural developmental programs are a top policy priority in most countries.

The implementation of agricultural development programs differs from country to country, depending on the context, geography, community involvement and level of development in that particular region or country (World Bank, 2015). In most African countries, the progress and growth of agriculture determines rural development. Agricultural development plays a key role in poverty reduction, in the context of economic development and growth as a whole (Grace, 2016). It is a key domain for the universally agreed human rights framework, which includes the progressive realization of the right to food. Agricultural development is key to food security in several ways, contributing to the availability of food, access and stability and through the diversity of foods produced, to food utilization (Grace, 2016).

3.3.1 The need for agricultural development

A substantial percentage of households rely on subsistence or traditional agriculture in SADC. According to Anaeto et al. (2012), for national progress to take place, transformation in agriculture is very important. Agriculture is an important component of most rural economies, especially in developing countries, hence the extent of agriculture within an economy is sometimes used to define rurality (Nchuchuwe & Adejuwon, 2012).

For this reason, any successful rural strategy development has an agricultural development element, but they are not the same thing. While agricultural development focuses on refining the well-being of populations through persistent improvements in the agricultural sector's productivity, rural development focuses on refining the well-being of rural populations through sustained rural economy growth, which includes agriculture, but may not be its only element and not necessarily the most active (Anríquez, 2007).

According to Nchuchuwe and Adejuwon (2012), rural development is the bedrock of agriculture and agricultural development in developing countries in Africa, without which all efforts focused on agricultural development will be in vain. Agriculture contributes immensely to the African economy in many ways, hence its importance and the need for its development cannot be overlooked. Agricultural development is an essential part of the overall development of an economy. To a considerable extent, the growth of other sectors and the overall economy depends on the performance of agriculture (Tripathi & Prasad, 2010).

It is for these reasons that agriculture remains dominant and commonly referred to as "the engine for growth" in most agriculture-based developing countries and as a tool to reduce poverty in transforming countries. However, observations are that agriculture in developing countries is often the least productive sector because in some countries it is still seen as a traditional low-productivity sector (Dethier & Effenberger, 2012). According to Tripathi and Prasad (2010), the lack of a separate development strategy for agriculture is the main cause of failure for all development programs in agriculture.

Agriculture is an important driver of economic transformation in the SADC region and Africa as a whole. It is everyone's business: national independence depends on its development because it

enables the escape of the scourge of food insecurity that undermines sovereignty and fosters sedition (Pound, 2015); it is a driver of growth whose leverage is now acknowledged by economists and politicians; it is the sector offering the greatest potential for poverty and inequality reduction, as it provides sources of productivity from which the most disadvantaged people working in the sector should benefit (Mushendami, Biwa, & Gaomab II, 2008). A large percentage of the labour force are employed in agriculture and, through agricultural productivity growth and higher farm profits, the rural poor are able to improve their living standards (Nchuchuwe & Adejuwon, 2012).

Although not sufficient in itself, the development of agriculture is a necessary condition for improving food security. Basically, agriculture is an indirect element ensuring food security. Since it represents the poorest communities' main economic activity, its development provides resources that allow rural inhabitants to reduce variations in the quantities produced, to ensure surplus food that can cover households' occasional shortages and, most importantly, generate income so that they can buy diversified food and other basic goods (Siegel & Paul 2005). A combination of policies is, therefore, needed in the fight against hunger and malnutrition: policies that aim to develop agriculture (including land reforms) and non-agricultural activities, to strengthen household resilience and to reduce inequalities in health and trade, among others (Blein et al., 2013).

3.3.2 Determinants of agricultural development

Progress in the development of agriculture has been limited and the Green Revolution left Africa almost untouched (Voortman, Sonneveld, & Keyzer, 2003). The question raised in most literature is whether the poor performance is a question of poor policies, economic and technical barriers, or of cultural and attitudinal factors to development. The adoption of new technologies that use purchased inputs (such as improved seeds and inorganic fertilizers) to increase land and labor productivity is important for achieving the objective of agricultural development (Kirsten, 2009).

There are however factors that limit the acceptance of new technology in most rural societies that need it most. Smock (1969) believes that the impact of culture on development has been exaggerated by analysts, while Schultz (1975) argues that the principal determinant of whether a new agricultural practice will be adopted depends entirely on its economic return. Yudelman

(1964) argues that most Africans do not respond to price incentives, have few economic interests beyond the satisfaction of small subsistence needs, and because of their traditional outlook have little interest in increased productivity in agriculture.

It is quite obvious that adoption is one of the major factors/determinants of agricultural development and is mostly influenced by cultural and attitudinal factors rather than government policies. Adoption can be positively affected by farm size, credit accessibility, perceptions of farmers about the costs of the inputs and off-farm income, while incomplete exposure can affect adoption negatively (Simtowe, Asfaw, & Abate, 2016). Cultural factors, according to Smock (1969), can be both negative and positive in agricultural development.

Williamson's framework also makes important observations about the speed at which adoption takes place. According to Williamson (2000), changes in basic social and cultural foundations take place most slowly and are "embedded" most strongly in the institutions of a society. According to Simtowe et al. (2016), for some farmers the suggestion that they change certain farming habits is like suggesting that they disown their forebears and be unfaithful to their history.

Agricultural extension is one of the major factors of agricultural development (Anaeto et al., 2012). According to Anaeto et al. (2012), agricultural extension services involve all aspects of agriculture. Acceptance of cultural and technological changes at rural farm level determines the increase in agricultural productivity.

Agricultural development is based on high-yielding varieties, response to improved fertilizers and a package of improved practices (Tripathi & Prasad, 2010). Therefore, for farmers to respond positively to new ideas, they must have the knowledge and understanding of how best to apply the new ideas or practices to their farming activities. Extension is a weak instrument on its own, but it becomes more powerful when it is combined with price incentives, input supply and credit seed multiplication etc. (Anaeto et al., 2012). This comes as an improvement in the relationship between research-farmer-input linkages.

3.4 Possible causation between financial inclusion and agricultural development: A conceptual framework

Several attempts have been made to establish the causal relationship between financial inclusion and agricultural development (Onoja, 2017). Figure 3.1 outlines the possible causation and

relationship between financial inclusion and agricultural development. Agricultural growth is known to be determined by multiple factors such as increased use of agricultural inputs, technological and technical changes such as high-yielding seeds, application of chemical fertilizers, irrigation facilities, mechanization and the availability of institutionalized credit for purchasing these inputs etc. (Kuri & Laha, 2011). It has been emphasized that access to differential financial services plays an important role in explaining the observed differences in input use and productivity across agriculture.

Agricultural credit is one of the most crucial factors affecting agricultural productivity (Awotide et al., 2015). According to Laha and Kuri (2013) for smallholder farmers to shift from subsistence farming to commercialization, financial access has an important bearing on the choice of tenurial contracts, cropping patterns, fertilizer consumption, and irrigation intensity and thus, in turn, influences the productivity of agriculture, as depicted in Figure 3.1. According to Akhtar and Parveen (2014), there is multidimensional utility to accessing financial services, the most important determinant of value added in agriculture and hence ultimately playing the key role in agricultural development.

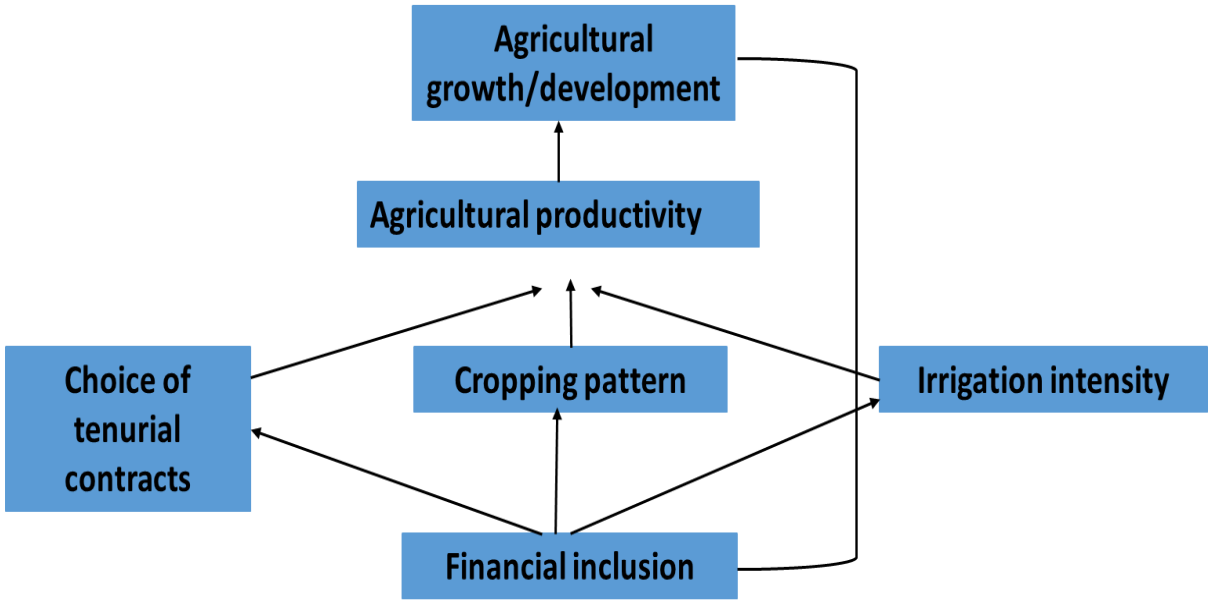

Figure 3.1: *Possible relationship between financial inclusion and agricultural development*

Source: *Author's own compilation based on ideas from Akhtar and Parveen (2014) and Laha and Kuri (2013)*

According to Kuri and Laha (2011), in order to improve agricultural productivity, it is important to strengthen irrigation intensity, choice of efficient mode of tenurial contracts, implementation of tenurial reform measures and diversified cropping patterns. All these combined lead to higher productivity in agriculture, thus leading to agricultural growth/development. However, it is still important to note that causality is a composite process; there might still be indirect channels through which one underpins the other, as shown by the arrow moving from agricultural development to financial inclusion in Figure 3.1.

This arrow (moving from agricultural development to financial inclusion) in Figure 3.1 suggests that agricultural development leads to financial inclusion in the sense that farmers with better farming systems are more likely to access and use quality financial services than farmers with poor farming systems. If it is true that agricultural development leads to financial inclusion, then the more agriculturally developed a country is, the higher the financial inclusiveness in that country. It is difficult to ascertain exactly the direction of causality.

3.5 Summary

About 70% of the region's population are still dependent on agriculture for their livelihood. Most of these people are smallholder farmers practicing subsistence farming, who have to struggle with a number of physical and socio-economic barriers such as lack of skills, failure to access financial services, difficulty in accessing markets and market information and other resources that are crucial for growth in agriculture. These challenges that smallholder farmers face may be the reason for the decline in the annual agricultural growth rate over the years.

Agriculture is the engine for economic transformation in the SADC region and Africa as a whole. National independence depends on agricultural development, because it enables escape from the scourge of food insecurity that undermines sovereignty and fosters sedition. Adoption of new farming techniques is one of the major factors/determinant of agricultural development and is mostly influenced by cultural and attitudinal factors rather than government policies. Therefore, increased agricultural productivity is determined by the level at which society adapts to technological and cultural changes at the rural farm level.

CHAPTER 4

METHODS AND PROCEDURES

4.1 Introduction

This section presents the methods and procedures that were used to meet the objectives of the study. It presents information from the focus area of the study to how the findings were analyzed.

4.2 Study area

The area of focus in this paper is the SADC region. SADC is an intergovernmental organization whose main goal is to promote sustainable and equitable economic growth and socio-economic development through efficient production systems, deeper cooperation and integration among its member states. Established in 1992, the SADC comprises 15 member states: Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe (SADC, 2015). However, because of data unavailability, the study could not include all 15 SADC member states in the two indices calculated in this study. Mozambique and Seychelles were omitted on IFI because of data unavailability in most of the indicators of financial inclusion used in the study. Seychelles was left out in the ADI because of data unavailability in most of the indicators used to create the ADI.

4.3 Data sources, analysis and methods

4.3.1 Determining the level of financial inclusion in the SADC region

The methods, delivery models, policies and processes of implementation of financial inclusion concepts constantly evolve. Hence, it is important that the policies for attaining financial inclusion for all also keep changing to adapt to the needs of the environment. In order to measure and rank the level of financial inclusion in the SADC region, an index is computed based on data availability. Using methodological inputs from the research work of Sarma (2008) and Blando (2013), the IFI proposed in this study is designed to fulfill the following criteria:

	Dimension	Indicators
1.	**Penetration**	- Account at a formal financial institution
2.	**Usage**	- Saved any money at a formal financial institution in the past year

	- Borrowed from a formal financial institution
	- Outstanding loans per 1000 adults
	- Main source of emergency funds (savings)
	- Made or received digital payments
	- High-frequency account use
3. Availability	- Number of bank branches and automatic teller machines (ATMs) per 100 000 people.
	- ATMs per 100 000 people
	- Mobile money transactions per 100 000 people.

This composite index gathers data on different dimensions of financial inclusion, such as penetration, availability and the use of quality financial products and services. Data were gathered from the World Bank (G20 financial inclusion indicators, to be specific). Ten selected indicators are used to define the SADC IFI in this study. These indicators are then divided between the three dimensions chosen for the study (penetration, usage and availability), added up and assigned different weights, as done by (Blando, 2013). The weights are calculated on the basis of the importance of the dimension in the financial sector. Tables 4.1 and 4.2 present the distribution of the indicators (the data are presented as percentages of the total population):

NB: The penetration dimension has only one indicator (ownership of a bank account in a formal financial institution), therefore was not sub-categorized or assigned any weight.

Table 4.1*: Usage dimension sub-categorized and assigned weights*

Weights	Category	Indicators
0.25	**Loans**	- Borrowed from a formal financial institution
		- Outstanding loans per 1000 adults
0.5	**Savings**	- Main source of emergency funds
		- Saved at a financial institution
0.25	**Withdrawals/ deposits**	- Made/received digital payments
		- High-frequency account use
1	**Total**	

Source: *Author's own compilation based on ideas from Sinclair (2001) and Blando (2013)*

These weights have been assigned following Sinclair (2001) who notes that savings are important in assisting individuals to have income available for future use. Following savings are loans; access to a loan is another variable that mostly draws poor people to join a formal financial service provider. Access to credit affords opportunities to people who lack resources to enroll at a university, start a business, or invest etc. (Blando, 2013).

Equally important are deposits and withdrawals. If a country presents high deposit levels, it means that these transactions can be tracked and proven, signifying active participation in a formal economy. If the number is low, then that would suggest that people still opt for informal financial services (Blando, 2013).

Table 4.2: *Availability dimension sub-categorized and assigned weights*

Weights	Category	Indicators
0.25	**ATMs**	- ATMs
0.5	**Bank tellers**	- Bank branches per 100 000 adults
0.25	**Mobile network transactions**	- Mobile money transactions per 100 000 adults
1	**Total**	

Source: *Author's own compilation based on ideas from Sinclair (2001) and Blando (2013)*

The availability dimension is built on three sub-categories, namely, ATMs, bank tellers and mobile network transactions. The sub-categories differ in weight, reliant on the data that are most relevant in determining the availability of the formal financial services and products in the countries concerned (Demirgüç-Kunt & Klapper, 2013).

This index gathers information on the three dimensions (penetration, usage and availability) in a single number lying between 0 and 1, where 0 indicates complete financial exclusion and 1 indicates complete financial inclusion in that particular country. A dimension index for each of these dimensions is first computed by using the following equation:

$$d_i = \frac{A_i - m_i}{M_i - m_i} \qquad \textbf{(Equation 1)}$$

Where A_i is the actual value of the dimension i, m_i is the minimum value of the dimension i and M_i is the maximum value of the dimension i. The maximum and minimum values are determined on a relative basis, i.e. maximum = highest value (for any indicator used in this analysis) obtained by one of the SADC countries and minimum = lowest value (for any indicator used in this analysis) obtained by one of the SADC countries. A numerical example is shown in example 1 below;

$$d_i = \frac{A_i - m_i}{M_i - m_i}$$

$$Usage\ i = \frac{51.9i - 8.6i}{82.2i - 8.6i}$$

$$= \frac{43.3}{73.6}$$

$$Usage\ i = 0.59 \qquad \textbf{(Example 1)}$$

The penetration dimension is simplest to calculate because it has only one indicator. The methodology to measure the usage and availability dimension with more than one indicator is also simple and clear. Once the subcategories have been established, as shown in Table 4.1 and Table 4.2, the next step is to take the averages (calculated using simple arithmetical basis) of each of the categories. The goal is to lessen the data from six numbers to three and work with these. After that, each number is multiplied by the weight given in Tables 4.1 and 4.2. The last step is to sum up all three subcategories to obtain a single value for each country and plugging those values in Equation 1. The same procedure applies to the availability dimension. Equation 2 is applied after calculating the individual dimensions value of each place:

$$\boldsymbol{IFI_i} = 1 - (\sqrt{[1 - P_{ij}]^2 + [1 - A_{ij}]^2 + [1 - U_{ij}]^2} / \sqrt{3}). \qquad \textbf{(Equation 2)}$$

Where dimension penetration is represented by P, dimension access by A and dimension usage by U. The IFI for country i_j is measured by the normalized Euclidean distance of the dimensions P, A and U. A normalized squared Euclidean distance gives the squared distance between two vectors where the lengths have been scaled to have unit norm. A numerical example is shown in example 2 below;

$$IFI_i = 1- (\sqrt{[1 - P_{ij}]^2 + [1 - A_{ij}]^2 + [1 - U_{ij}]^2} / \sqrt{3})$$

$$IFI_i = 1- (\sqrt{[1 - 0.58_{ij}]^2 + [1 - 0.06_{ij}]^2 + [1 - 0.62_{ij}]^2} / \sqrt{3})$$

$$IFI_i = 1- (\sqrt{1.69 + 0.87 + 0.14} / \sqrt{3})$$

$$IFI_i = 0.64$$ **(Example 2)**

The normalization in this case is done in order to make the value lie between 0 and 1 so that a higher value of the IFI represents high financial inclusion. According to Sarma (2008), the value of IFI above 0.5 shows a high degree of financial inclusion, between 0.3 to 0.5 shows moderate financial inclusion, while a value below 0.3 shows low financial inclusion. Country i in example 2 has IFI = 0.64, i.e. high degree of financial inclusion.

4.3.2 Computing an agricultural development index that will determine the level of agricultural development in the SADC region.

Agricultural development is an evolving process of improving the production of crops and livestock, it cannot be pre-determined. Agricultural developmental programs are implemented to improve the productivity of numerous crops, thus improving the social and economic position of the people in most developing countries. In most developing countries, rural development depends on the progress and growth of agriculture. Development is a process with many dimensions (Bhatia & Rai, 2008). Numerous indicators, when individually analyzed, do not provide a cohesive and easily coherent picture of reality, hence the necessity for building up a composite index of development that combines various indicators.

According to Soares Jr and Quintella (2008), the discussion of development requires a clear understanding of the multidimensional approach that considers focusing on the link between the more traditionally considered group of dimensions (social, economic and environmental), based on a principle that addresses the well-being of people as well as the environment. Analyses of the well-being of people and the ecosystem cannot be carried out separately because people live in and form part of the ecosystem, i.e. the well-being of the natural environment does not make sense without human dimensions (political, economic and social) and humanity's well-being cannot be separated from the environment (Soares Jr & Quintella, 2008).

Zhang and Yu (2017) divided agricultural development indicators into four levels, namely agricultural input level, agricultural output level and rural social development level. When selecting the indicators to be used in this development index, these levels were considered. The composition of this index is similar to the one used by the UNDP for the computation of the development well-known indices such as the HDI, HPI and GDI, the same method of composition used in the IFI in section 4.3.2. The following indicators are used for estimating the level of development in agriculture:

1. **Rural social development level**

(a) Labour force in agriculture as percentage of labor force: The labour force in agriculture are the people of working age who take part in any activity that involves the production of goods or provision of services for pay or profit, whether at work during the reference period or not at work owing to temporary absence from a job, or to working-time arrangements (AFDB, 2017)

2. **Agricultural output level**

(b) Agricultural production index (API): According to the (FAO, 2014), the practical levels of production in agriculture, in total volumes for each year compared to a base year, are shown by the indices of agricultural production. These production levels are based on the summation of price-weighted quantities of different commodities in agriculture produced after subtracting quantities used as inputs e.g. seed and feed that were calculated in the same way. According to van Arendonk (2015), agricultural productivity is crucial to development. It has a notable impact on the development of agriculture, hence it was incorporated into this index.

3. **Agricultural input level**

(c) Fertilizer consumption: This refers to the different fertilizers (N, P, K and compounds) used in agriculture by a country. July to June is the reference time for the application of fertilizer in every production year (AFDB, 2017). The intensification of agriculture is through the best use of land, water, machinery and fertilizer. Intensifying production by fertilizer leads to high productivity, therefore fertilizer usage has been selected as a proxy for agricultural development.

(d) Irrigated land as percentage of land area: This refers to the agricultural areas purposely watered and flooded controllably. Irrigation is an important input of agriculture. In countries where arable agriculture predominates, the success of agricultural development is closely linked with the development of irrigation (Mohanty, 1999).

These indicators may not fully indicate agricultural development, but together they form an interactive measure for agricultural development. The values of the variables are not appropriate for simple addition in combined analysis. Therefore, the values of indicators are transformed to dimensions using Equation 1. The transformation of values of the variables to dimension indices is carried out so that the values would lie between 0 and 1. After calculating the individual dimension values, Equation 3 is applied:

$$\mathbf{ADI} = 1\text{-}(\sqrt{}[1 - LF_{ij}]^2 + [1 - API_{ij}]^2 + \ldots\ldots + [1 - X_n]^2/\sqrt{}n). \quad \textbf{(Equation 3)}$$

Where dimension labor force is represented by LF, dimension agricultural production index by API and the rest of the dimensions represented by X in equation 3. The total number of dimensions in the equation is represented by n. The value of the ADI should be between 0 and 1 such that a value of 1 shows a high degree of agricultural development, between 0.3 and 0.5 shows moderate agricultural development, while below 0.3 indicates low agricultural development.

4.3.3 Specification of the model for determining the relationship between financial inclusion and agricultural development

It is still not clear whether agricultural development leads to financial inclusion or whether financial inclusion leads to agricultural development. To determine the possible impact of financial inclusion on agricultural development, a panel fixed effect regression equation was considered. A fixed effects regression is an estimation technique employed in a panel data setting that allows one to control for time-invariant unobserved individual characteristics that can be correlated with the observed independent variables. Panel data was used in this analysis hence the panel fixed effects model was the appropriate one to use.

Thus, the equation for the study is:

$$Y_{it} = \alpha_0 + \beta_1 X_{1,\,it} + \ldots + \beta_n X_{n,\,it} + \alpha_i + u_{it}, \quad \textbf{(Equation 4)}$$

where:

Y_{it} = the dependent variable, API used as a proxy for agricultural development because of the lack of an ADI (where i= country and t = time in years)

α_0 = is the constant and intercept of the equation

β_1 = is the regression coefficient or slope of the explanatory variables modeled

X_{it} = the independent variables

U_{it} = is the error term which represents the unexplained variation in the dependent variable.

Dependent variable

Because of data unavailability on agricultural development measured for the period 2005-2014, calculated and presented as a single number, the FAO agricultural production indices (API) will be used as a proxy for agricultural development for the purpose of analysis in this study. According to the EuropeanCommission (2016), a proxy serves to assess the same contextual aspect as intended by a given common context indicator, but for which data are not available

Explanatory variables

1. **Financial inclusion indicators**

Three indicators of financial inclusion will be used to represent financial inclusion in this model. The indicators were selected based on data availability from the period 2005 to 2014. These indicators are:

a) The number of bank branches per 1000 km^2 ($\mathbf{X_1}$)

b) ATMs per 100 000 people ($\mathbf{X_2}$)

c) The amount of bank loans as a proportion of total deposits ($\mathbf{X_3}$)

Prior expectations are that agricultural development and financial inclusion will move closely with each other. Countries with a high level of financial inclusion are expected to have high levels of agricultural development. These prior expectations are in line with the findings of Sarma and Pais

(2011), who concluded that countries with high levels of human development are also the countries with relatively high levels of financial inclusion. The analysts came to this conclusion after they found a statistically significant correlation coefficient of 0.74 between the IFI and HDI.

2. **Fertilizer consumption (X_4)**

This refers to the different fertilizers (N, P, K and compounds) used in agriculture by a country, measured in quantity. The time reference for fertilizer consumption is generally the crop year (July to June) (AFDB, 2017). The intensification of agriculture is through the best use of land, water, machinery and fertilizer. Prior expectations are that fertilizer consumption will have a positive, significant relationship with agricultural development. The assumption in literature is that intensifying production by fertilizer leads to high productivity (Kuri & Laha, 2011).

3. **Irrigated land as percentage of land area (X_5)**

This refers to agricultural areas purposely provided with water, including land irrigated by controlled flooding. Irrigation is a very important input of agriculture. In countries where arable agriculture predominates, the success of agricultural development is closely linked with the development of irrigation (Mohanty, 1999). Prior expectations are that irrigated land as percentage of land area will have a positive, significant relationship with agricultural development.

4. **Labour force in agriculture as percentage of labor force (X_6)**

The labour force in agriculture is defined as people of working age who are engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period or not at work owing to temporary absence from a job, or to working-time arrangements (AFDB, 2017). Prior expectations are that as agriculture develops, the requirement for human labour in agricultural production will decrease. Therefore, a negative relationship is expected between agricultural development and the labor force in agriculture.

CHAPTER 5

RESULTS: LEVEL OF FINANCIAL INCLUSION AND AGRICULTURAL DEVELOPMENT IN THE SADC REGION

5.1 Introduction

This chapter discusses the levels of financial inclusion and agricultural development in the SADC region. SADC countries are ranked according to their levels of financial inclusion and agricultural development. The chapter concludes by comparing the index of financial inclusion and the agricultural development index (ADI).

5.2 Level of financial inclusion in the SADC region

The level of financial inclusion has been calculated and ranked for 13 SADC countries. Mozambique and Seychelles were omitted from this index because of data unavailability for most of the financial inclusion indicators that were chosen for this study. The 13 SADC countries' level of financial inclusion is presented in Table 5.1. This index gathers information from the World Bank (G20 financial inclusion indicators, to be specific, updated to 2014). The indicators were categorized into different dimensions, the dimensions were totaled and assigned different weights (the data presented as percentages of the total population). The weights were assigned based on the importance of the dimension in the financial sector, before finally assigning 1 to the highest and 0 to the lowest financially included country.

Depending on the results of the value of this SADC IFI index, the countries were divided into three different categories as applied by Blando (2013) and Sarma (2008):

1. High financial inclusion – IFI value of 0.5 to 1

2. Medium financial inclusion – IFI value of 0.3 to 0.5

3. Low financial inclusion – IFI value of 0.3 to 0.

The 13 countries can only be categorized into medium and low financial inclusion because there is no country whose IFI value exceeded 0.5 in this study. Five of the 13 SADC countries fall within the medium financial inclusion category, while the other eight countries are within the low financial inclusion category, as illustrated in Table 5.1.

Table 5.1: *Level of financial inclusion in 13 SADC countries*

Country	Penetration (D1)	Usage (D2)	Availability (D3)	Index of Financial inclusion	Rank		
Mauritius	1	1	1	**0.422656312**	**1**		
South Africa	0.838564866	0.8400523	0.00366834	**0.409993969**	**2**		
Tanzania	0.423967409	0.0777933	0.92626265	**0.372231819**	**3**		**Medium FI**
Botswana	0.589397782	0.6213045	0.06609888	**0.371728366**	**4**		
Namibia	0.682658907	0.541027	0.002198515	**0.339957238**	**5**		
Zimbabwe	0.323634362	0.0963196	0.45469234	**0.276243781**	**6**		
Zambia	0.367834129	0.0619092	0.094902759	**0.163569279**	**7**		
Swaziland	0.271774896	0.1838656	0.0447135	**0.161557094**	**8**		
Angola	0.281939289	0.0586198	0	**0.105235997**	**9**		
Lesotho	0.135027162	0.1439068	0.011210362	**0.094686341**	**10**		**LOW FI**
Malawi	0.129534046	0.0476072	0.030916443	**0.068355238**	**11**		
DRC	0.12117862	0.006569	0.00029529	**0.041069736**	**12**		
Madagascar	0	0	0.033405803	**0.011009885**	**13**		

Source: *Author's own calculations and compilation based on data from World Bank (2018)*

Columns 2 to 4 in Table 5.1 present the values of the three dimensions (D1 = Dimension 1) incorporated in the calculation of the IFI. The 5th column in Table 5.1 presents the values of the IFI for the 13 SADC countries, while the 6th column ranks the countries' level of financial inclusion in descending order (from the highest financially included to the lowest financially included country).

Mauritius has the highest level of financial inclusion in the SADC region, with an IFI value of 0.423. The country also has the highest value in all three dimensions of financial inclusion (penetration, usage and availability) used in this study. These results are in line with those obtained by Finmark Trust (2015), where Mauritius recorded 85% of its population as banked, indicating that most of the population has moved from the informal financial market to the formal financial market. Nanda and Kaur (2016) obtained an IFI value of 0.585 for Mauritius and ranked the country number 9 out of 68 countries. This shows that Mauritius is close to obtaining inclusive finance. Finance is inclusive when it provides opportunities for economic growth and ensures that all segments of the population have fair access to those opportunities.

On the contrary, the results show that Madagascar has the lowest level of financial inclusion in the SADC region, with an IFI value 0.011, placing the country at the bottom. The country had the lowest value of 0 in two of the financial inclusion indicators used in the study, penetration and

usage, while it recorded 0.033 in the availability dimension. The lowest availability of 0 was recorded for Angola, as shown in Table 5.1. This suggests that the services are provided to the people of Madagascar, but they still prefer to use informal financial services rather than formal financial services.

In a study by Anand and Chhikara (2013), Madagascar recorded an IFI value of 0.009, ranking at the bottom out of 49 countries. Similar results were obtained by Nanda and Kaur (2016), where Madagascar was ranked number 65 out of 68 countries, with an IFI value of 0.024. Much still needs to be done to improve the level of financial inclusion in Madagascar.

5.3 Level of agricultural development in the SADC region

Four indicators were used to create the ADI in this study. The level of agricultural development was calculated and used to rank 14 SADC countries. Seychelles could not be included because of lack of data in most of the indicators of agricultural development that were chosen for the purpose of calculating this index. The composite indices of agricultural development together with the rankings are presented in Table 5.2 for the 14 SADC countries.

Information on the different indicators used was gathered from the African Development Bank and World Bank databases. As the values of the indicators are not suitable for simple addition in combined analysis, these values were first transformed to dimensions using Equation 1. The transformation of values of the variables to dimension indices was carried out so that the values would lie between 0 and 1, as shown in Table 5.2. This index gathers information from the African Development Bank, updated to 2014.

The composite agricultural development indices vary from 0.455 to 0.043, as presented in Table 5.2. South Africa was found to have the highest ADI (0.455), while Namibia had the lowest ADI (0.042). Unlike the case of Asia where Bhatia and Rai (2008) established wide-ranging inequalities in agricultural development composite indices among different countries, narrow disparities are observed among the SADC countries. The country rankings are in line with the expectations, e.g. a country such as South Africa, which is known to be the net exporter of agricultural goods in most years ranked first place in the index.

Table 5.2: *Level of agricultural development in the SADC region 2014*

Countries	Labour force % tota	Fert.consumption	Agric.prod.index	Irrigated land	ADI	Rank
South Africa	0.261265075	1	0.395383952	0.472767438	0.454733	1
Malawi	0.685398175	0.227566435	0.701682485	0.268894807	0.425732	2
Madagascar	0.943614505	0.01860008	0.351596204	0.641573662	0.384528	3
Tanzania	0.565452474	0.087297131	0.962575496	0.140054275	0.336154	4
Zambia	0.416307428	0.215791145	1	0.070778146	0.325624	5
Mauritius	0.818492857	0.017526256	0.258942627	0.325216352	0.292416	6
Zimbabwe	0.864800173	0.203904949	0.121764452	0.154332591	0.26882	7
Moz	0.561783173	0.072832405	0.558886972	0.050177476	0.267126	8
Angola	0.399721193	0.059884299	0.971095772	0.022246127	0.258213	9
Swaziland	0	0.020898576	0.280090595	1	0.21309	10
Botswana	1	0.030978414	0.229939603	0	0.204388	11
Lesotho	0.562392347	0.015241058	0.139020708	0.032523972	0.157601	12
DRC	0.256453428	0.012730456	0.18442623	0.000151883	0.106633	13
Namibia	0.176350213	0.003985632	0	0.001827983	0.042557	14

Source: *Author's own calculations and compilation based on data from (AFDB, 2018)*

Mauritius, a country known for its unfavorable external environment and its natural limitations, such as the scarcity of land for production and high production costs, as well as climatic and agronomic conditions (Weldeghaber, 2003) ranked fifth place in the index (ADI = 0.292). Given the importance of the country's (Mauritius) estate –style sugar cane farming, it is no surprise that Mauritius ranked top five in the index.

5.3.1 Different stages of agricultural development

For relative comparison of the different countries with respect to agricultural development, countries with indices between 0.5 and 1 are considered to be developed and are classified as being in stage 2 of development, and countries having composite indices between 0 and 0.3 are considered to be under-developed and are classified under stage 1 level of development, as presented in Table 5.3.

Countries with composite indices between 0.3 and 0.5 are considered to be developing and classified as being in stage 2 of agricultural development. From these findings, it is observed that five of the countries fall into the middle-development stage (stage 2) of agricultural development.

Table 5.3: *Names of countries and different stages of agricultural development*

Developmental stage	**Name of country**
Stage 2	Malawi, Tanzania, Madagascar, Zambia, South Africa
Stage 1	Swaziland, Zimbabwe, Angola, Mauritius, DRC, Lesotho, Botswana, Namibia

Source: *Author's own compilation*

5.4 Agricultural development and financial inclusion

Table 5.4 presents the IFI computed for the 13 SADC countries and the corresponding ADI along with their ranks. The countries are classified according to their income levels. According to the United Nations (2008), the countries classified as low-income countries are Tanzania, the Democratic Republic of Congo, Mozambique, Madagascar, Zimbabwe, Malawi, and Zambia; those classified as low-middle income countries are Namibia, Angola, Lesotho and Swaziland, and the upper-middle income countries are Seychelles, South Africa, Mauritius and Botswana.

The extent of financial inclusion in the SADC region as observed from the ranking of these countries using the IFI is generally as expected, which in itself is not surprising. However, there are some unexpected results. For example, Tanzania (IFI = 0.372231819), a low-income level country, is ranked higher than all the low-middle income countries and Botswana (IFI = 0.371728366), an upper-middle income country.

Besides data-related issues, a good justification for this unexpected result is the multidimensionality of the index. It is multidimensional in the sense that it combines the different levels of agricultural development indicators (agricultural input level, agricultural output level, and rural social development) into one figure. Satisfactory, suitable and comparable data for different countries are the core of a robust IFI. Inconsistencies in the ranking of countries with respect to achievement in financial inclusion may be caused by lack of sufficient and appropriate data on those countries (Sarma & Pais, 2011).

Table 5.4: *The IFI and ADI compared*

	Index of financial inclusion		**Agricultural development index**	
	Value	**Country rank**	**Value**	**Country rank**
Countries				
Upper-middle income				
Botswana	0.371728366	**4**	0.204387681	**11**
Mauritius	0.422656312	**1**	0.292416347	**6**
South Africa	0.409993969	**2**	0.454733086	**1**
Low-middle income				
Angola	0.105235997	**9**	0.25821326	**9**
Namibia	0.339957238	**5**	0.042556664	**14**
Swaziland	0.161557094	**8**	0.213090039	**10**
Lesotho	0.094686341	**10**	0.157600772	**12**
Low income				
Congo, Dem.	0.041069736	**12**	0.106632846	**13**
Madagascar	0.011009885	**13**	0.384528219	**3**
Malawi	0.068355238	**11**	0.425731756	**2**
Mozambique	**No data**		0.267125988	**8**
Tanzania	0.372231819	**3**	0.336154136	**4**
Zambia	0.163569279	**7**	0.325623658	**5**
Zimbabwe	0.276243781	**6**	0.268819898	**7**

Source: *Author's own compilation*

Malawi (ADI = 0.425732) ranked 2nd highest and also appeared to have the third highest agriculture value added as a percentage of GDP value (27.46%) in Table 3.2. As expected, agriculture contributes most to the economies of the low-income countries and normally contributes more to the economies of the low-middle income countries compared to its contribution to the economies of the upper-middle income countries in the region (Olubode-Awosola, Chilonda, Minde, & Bhatt, 2008). According to van Arendonk (2015), agriculture's

contribution to an economy seems more important in developing countries than it is in developed countries.

A comparison of the level of IFI with ADI is to ascertain if the two indices have similar numerical values, i.e. the rankings are similar, to get to the conclusion that there is a close relationship between financial inclusion and agricultural development, as observed from Table 5.4. The IFI and ADI rankings are similar for most of the countries (e.g. South Africa, Angola, Zimbabwe etc.). There are however exceptions where countries with the lowest levels of financial inclusion have relatively high levels of agricultural development and countries with the highest levels of financial inclusion have relatively low values of agricultural development. This (i.e. the lack of correlation between IFI and ADI for most countries) may be due to the fact that there are many factors that affect agricultural development other than financial inclusion.

5.6 Summary

According to the results obtained, the IFI could only be categorized into medium and low financial inclusion because no country's IFI value exceeded 0.5. The IFI values were between 0.423 and 0.011, with Mauritius ranking highest and Madagascar ranking lowest. On the contrary, Namibia appeared to be the least agriculturally developed country in the ADI, while South Africa ranked highest (ADI = 0.454). A comparison of the IFI and the ADI the two indices have similar numerical values, i.e. the rankings are similar, to get to the conclusion that there is a close relationship between financial inclusion and agricultural development, South Africa, Angola and Zimbabwe are the best examples of this relationship. There are however exceptions where countries with the lowest levels of financial inclusion have relatively high levels of agricultural development and countries with the highest levels of financial inclusion have relatively low values of agricultural development.

CHAPTER 6

RESULTS: RELATIONSHIP BETWEEN FINANCIAL INCLUSION AND AGRICULTURAL DEVELOPMENT IN SADC

6.1 Introduction

This chapter addresses the study objective concerning the relationship between financial inclusion and agricultural development in SADC. Uses both correlation analysis and panel fixed effect regression model to analyze this relationship. The results are discussed as they are presented.

6.2 Descriptive statistics

6.2.1 Agricultural production indices

Because of data unavailability on agricultural development measured, calculated and presented as a single number (updated 2018), the FAO agricultural production indices (API) was used as a proxy for agricultural development for the purpose of analysis in this study. According to the EuropeanCommission (2016), a proxy serves to assess the same contextual aspect as intended by a given common context indicator, but for which data are not available.

The study proceeds with the assumption that indicators of agricultural development, such as research and extension, irrigation intensity, fertilizer consumption, the use of tractors and many more result in improved production. Therefore, an improvement in agricultural productivity brings about greater production, ceteris paribus, which indicates the agricultural development of a country. According to van Arendonk (2015), agricultural productivity is central to development. It is the factor with the highest impact on the development of agriculture, hence API was chosen as the best proxy for agricultural development for the purposes of this study.

According to the FAO (2014),the practical levels of production in agriculture, in total volumes for each year compared to a base year, are shown by the indices of agricultural production. These production levels are based on the summation of price-weighted quantities of different commodities in agriculture produced after subtracting quantities used as inputs (seed and feed) that were calculated in the same way. The total shows, therefore, production disposed for any use except as input. The Laspeyres formula is used to calculate these indices.

The indices are calculated based on the perception of agriculture as a single enterprise. Therefore, the amounts of inputs are deducted from the production figures to avoid double-counting them. Deductions of inputs apply to both imported commodities and those that are produced domestically. Only primary agricultural products intended for animal feed (e.g. maize, soya etc.) are included in these indices. Processed and semi-processed feed items are omitted entirely from the calculations at all stages.

International commodity prices are used in these calculations to avoid using exchange rates for attaining continental and world aggregates, and also to improve and allow for international comparative analysis of productivity at national level. To derive international prices expressed as US dollars, the Geary-Khamis formula for the agricultural sector is used. With that said, the currency unit in which the prices are presented does not affect the indices published by the FAO. Data on these indices were derived from the African Development Bank's open Africa database for the period 2005-2014.

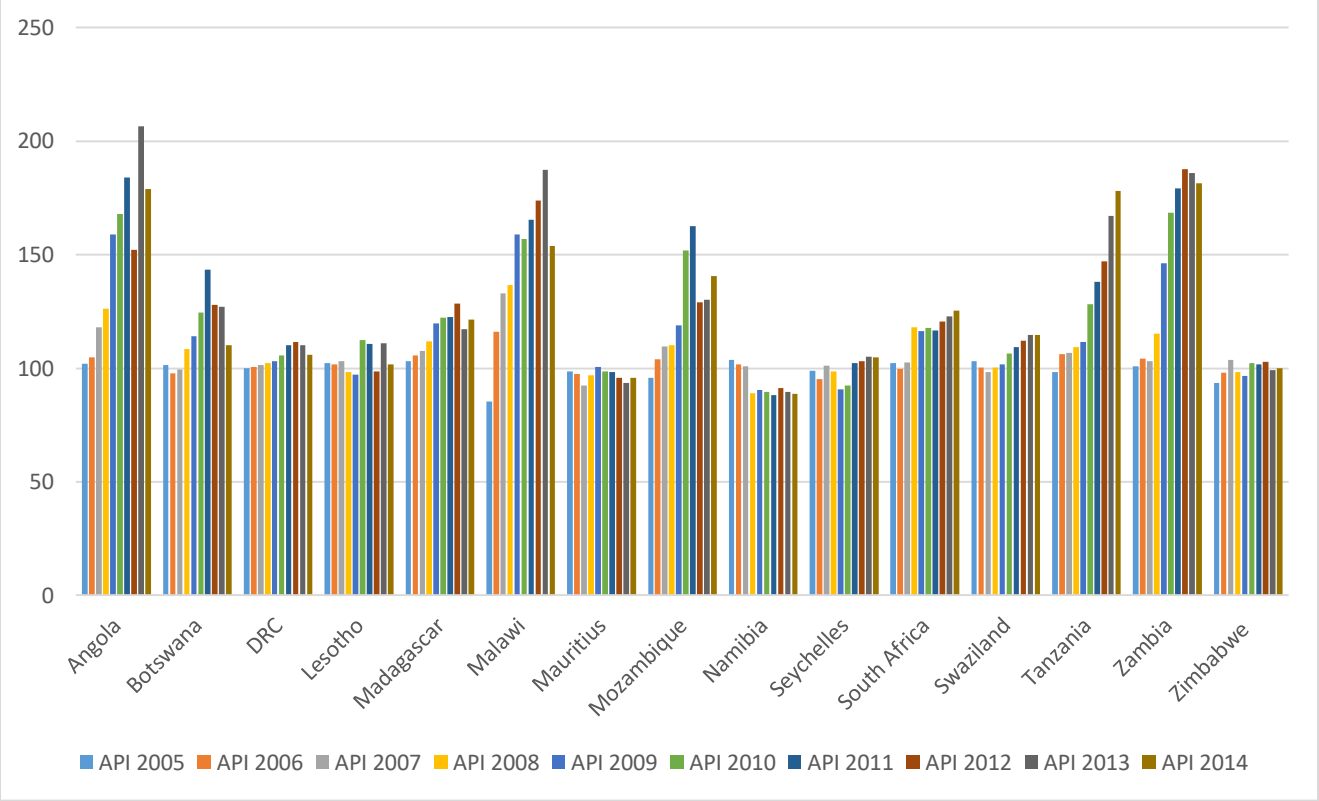

Figure 6.1: Agricultural production indices trends in all 15 SADC countries

Source: *African Development Bank (2018)*

The overall trend of the agricultural production indices for most of the SADC countries increased between 2005 and 2014, although a few exceptions exist for countries such as Namibia and Mauritius, whose bar graphs show a decline in agricultural production indices between 2005 and 2014. The numerical values of these trends are shown in Appendix Table A-2.

6.2.2 Financial inclusion

According to Sarma and Pais (2011) financial inclusion is a process that allows for the availability, access and usage of formal products and services of finance for all segments of the population. Financial inclusion is measured by different dimensions, the two most important being access and usage. Literature has identified access as the most difficult to measure. Access means the availability of financial services when needed and the products designed to meet the exact needs of the consumers and provided at affordable prices. Most importantly, services should be efficient, be profitable for the service providers, and be available at all times. The two commonly used measures of access are the number of bank branches (per 1000 km^2) and ATMs per 100 000 people. The same measures are used in this study.

Usage, means having access to financial services and actually making use of the services. It is often used as a proxy, although its main downfall is that it fails to capture those with ownership of bank accounts who do not use them (Demirguc-Kunt, Klapper, & Randall, 2013, 2014). The amount of bank loans as a proportion of total deposits is used a proxy for the usage dimension in this study. Total deposits include demand, time and saving deposits in deposit money banks. Data were retrieved from the African Development Bank's open Africa database.

6.3 Correlation analysis

Correlation is a concept for investigating the relationship between two quantitative continuous variables. The strength of the relationship between two variables is measured by the correlation coefficient. It (correlation) quantifies the positive or negative strength of the linear relationship between the two variables. The correlation between two variables can be positive (i.e., higher levels of one variable are associated with higher levels of the other) or negative (i.e., higher levels of one variable are associated with lower levels of the other), ranging between -1 and +1. The direction of the relationship is indicated by the sign of the correlation coefficient, while the magnitude of the correlation coefficient indicates the strength of the association.

6.3.1 Pairwise comparisons (correlated observations)

The study sought to test the relationship between financial inclusion and agricultural development (API used as a proxy) using pairwise correlation analysis presented in Table 6.1. Comparing a pair of means using the difference between two means (correlated pairs) is standard practice for pairwise comparisons with correlated observations. Hence, the correlation matrix in Table 6.1 was compiled in order to measure the extent to which the variables are related, as well as the strength (positive or negative) of the relationship between the variables.

Table 6.1: *Pairwise correlation of financial inclusion and agricultural production index*

Variables	**API**	**Branches**	**ATMs**	**Loans/deposits**
API	1.000			
Significance				
N	150			
Branches	**-0.2673***	**1.000**		
Significance	0.0009			
N	150	150		
ATMs	**-0.2871***	**0.5038***	**1.000**	
Significance	0.0006	0.0000		
N	141	141	141	
Loans/deposits	**-0.0493**	**-0.0520**	**-0.1011**	**1.000**
Significance	0.5574	0.5360	0.2433	
N	144	144	135	144

** Correlation is significant at the 0.05 level

The results of the pairwise correlation in Table 6.1 show that there is a significant negative correlation between access (number of branches per 1000 km^2 and ATMs per 100 000 people) and API (used as a proxy for agricultural development) at -0.2673 and -0.2871 respectively. Both the number of branches (per 1000 km^2) and ATMs (per 100 000 people) are significant at 0.05 level of significance.

The amount of bank loans as a proportion of total deposits, on the other hand, proves to have no significant relationship with the API. As shown in Table 6.1, ATMs (per 100 000 people) and

branches (per 1000 km^2) are positively correlated with each other, while the amount of bank loans as a proportion of total deposits has no correlation with either the number of branches (per 1000 km^2) or ATMs (per 100 000 people).

Branches (per 1000 km^2) and ATMs (per 100 000 people) have a strong and positive association with each other, therefore an increase or decrease in branches (per 1000 km^2) can be associated with an increase or decrease in ATMs (per 100 000 people), and vice versa. The amount of bank loans as a proportion of total deposits has a negative and weak relationship with branches (per 1000 km^2) and ATMs (per 100 000 people), meaning that the number of branches and ATMs has no effect on the number of people who use financial services.

6.4 Regression analysis

Regression analysis is a process in statistics that is used to assess the relationship among variables. It is used to model and analyze a number of variables when the focus is on determining the relationship between a response variable and one or several predictor variables. This paper's main research objective is to determine the relationship between financial inclusion and agricultural development, thus regression analysis is one of the best analytical models to analyze this relationship.

6.4.1 Regression model

In this analysis a fixed effect regression model is used to estimate the API as a function of financial inclusion indicators (number of bank branches per 1000 km^2, ATMs per 100 000 of the population and the amount of bank loans as a proportion of total deposits and three other variables that affect production (irrigated land as a percentage of land area, labor force in agriculture as a percentage of the labor force and fertilizer consumption).

A fixed effect model assesses the association among independent and dependent variables in a country, among people, firms, etc. When using a fixed effect model, the assumption is that there may be a factor that could cause biasness in the independent and dependent variables, which has to be controlled for. This is the justification for the assumption of the relationship between an entity's error term and the independent variables. Fixed effects remove the effect of those characteristics that do not vary over time so that one can explore the net effect of the independent variables on the dependent variable.

The following model was used in this study:

$Y_{it} = \alpha_0 + \beta_1 X_{1,\,it} + \ldots + \beta_n X_{n,\,it} + \alpha_i + u_{it},$

where:

Y_{it} = the dependent variable where i = country and t = time in years

α_0 = intercept

β_1 = coefficient

X_{it} = the independent variable

U_{it} = the error term.

An essential assumption of the fixed effect model is that those characteristics that do not vary over time are specific to the individual and should not be correlated with other individual characteristics. Each individual is unique. Therefore, the individuals' error term and the constant (which captures individual characteristics) should not be associated with others. If the error terms are correlated, then the fixed effect is not suitable, since inferences may be incorrect and that relationship may need to be modelled using the random effects model. To check for this, both the fixed effect and random effect models were run in this study. The Hausman test was used to determine which model best suited this analysis. Table 6.2 presents the results of the Hausman test.

The Hausman test results in Table 6.2 show a Prob> chi2 is 0.0000 that is less than 0.05 (i.e. significant). Therefore the researcher rejects the null hypothesis and accepts the alternative hypothesis, i.e. the fixed effect model is the most suitable model for this analysis. The model was run twice: 1) Fixed effect: n entity-specific using stata command xtreg and 2) Fixed effect: n entity-specific intercepts using stata command areg. Table 6.3 presents the regression analysis results.

Table 6.2: *Results of the Hausman test*

H_0: Random effect model is appropriate

H_1: Fixed effect model is appropriate

	-Coefficients-			
	(b)	(B)	(b-B)	sqrt (diag (V_b_B))
Variables	Fixed	random	Difference	S.E.
Branches	.1153201	.006985	.1083351	.0660738
ATM	.2456088	.1675886	.0780202	.0495577
Loans/deposits	-.0391711	-.0397718	.0006006	.
Labor	-5.397004	-.7327584	-4.664246	1.931628
Irr.land	13.38531	-3.862904	17.24821	18.35579
Fert	.0002458	.0000292	.0002166	.0000629

b = consistent under H_0 and H_a; obtained from xtreg

B = inconsistent under H_a, efficient under H_0; obtained from xtreg

Test: H_0: difference in coefficients not systematic

Chi2 (5) = (b-B) '[(V _ b_-V_B) ^ (-1)] (b-B)

=33.76

Prob > chi2 = 0.0000

(V _ b-V_B is not positive definite)

As can be seen from Table 6.3, both fixed effect commands yielded the same results. To correct for heteroscedasticity and autocorrelation in the model, robust standard errors adjustment was carried out. The significance of the parameters is determined by the value of its t-test. Each p-value in this analysis is compared to the preselected value of alpha, which is 0.05 (5%). Coefficients with a p-value less than alpha 0.05 are significant.

Table 6.3: *Regression analysis (model summary)*

Variable	**Fixed (xtreg)**	**Fixed (areg)**
Branches	0.11532012	0.11532012
ATM	0.24560881	0.24560881
Loans/deposits	-0.03917114***	-0.03917114***
Labor force in agric.	-5.3970039*	-5.3970039*
Irrigated land	13.385305	13.385305
Fertilizer consumption	0.00024585***	0.00024585***
Constant	293.3559**	293.3559**
N	107	107
R^2	0.37142848	0.69988006
R^2_a	0.24285703	0.63849189

Legend: *p<0.05; **p<0.01; ***p<0.001

In this analysis, the statistically significant coefficients are the constant, number of branches (per 1000 km^2) and the amount of bank loans as a proportion of total deposits, as illustrated in Table 6.4, with p-values of 0.013, 0.011, and 0.001 respectively.

Table 6.4: *Robust standard errors*

API	**Coef.**	**Robust Std.Err.**	**t**	**p>| t |**
Branches	0.11532012	.044627	2.58	0.011
ATM	0.24560881	.2977864	0.82	0.412
Loans/deposits	-0.03917114	.0114816	-3.41	0.001
Labor force in agric.	-5.3970039	2.407061	-2.24	0.027
Irrigated land	13.385305	10.97502	1.22	0.226
Fertilizer	0.00024585	.0000866	2.84	0.006
Constant	293.3559	115.9799	2.53	0.013

Number of obs. =107, **F (6, 88)** = 6.38, **Prob > F** = 0.0000, **R-squared** = 0.6999, **Adj R-squared** = 0.6385, **Root MSE** = 17.0166

Access to financial services (number of bank branches per 1000 km^2) is positively and significantly related with the API (a proxy for agricultural development). Therefore, an increase in access to financial services will lead to an increase in the API by 0.1153, ceteris paribus. On the

contrary, usage (the amount of bank loans as a proportion of total deposits) has a negative significant relationship with the API. The regression results show that increasing the amount of bank loans as a proportion of total deposits will lead to a decrease in the API by a proportion of -0.039, ceteris paribus.

6.4.2 Fisher's t test (F- test)

An F-test is a test in statistics that has an F-distribution under the null hypothesis. It is the probability between the two independent chi square variates that are distributed by their respective degrees of freedom. The F-values are always positive, thus if a negative F statistic is found, something is wrong with the analysis. The F-test in this model is 0.000 (as presented in Table 6.4), which is less than alpha 0.05 (5%), meaning that this model is perfect for this analysis, and all coefficients in the model are different from zero. This also means that all the coefficients included in this model improved the model's fit.

6.4.3 The R squared

The measure of R square is used to examine the ability of the predictor variables to determine the response variables. An R-square value above 0.5 means that the predictors are capable of explaining a great extent of the variance in the response variable. The value of R square obtained in this analysis, as shown in Table 6.4, is 0.6999, while the adjusted R square is 0.6385.

The results indicate that the independent variables (financial and agricultural) explain about 69.9% of the change in the response variable. Since some of this increase in R square value would come about as a result of the variation in that particular sample, the adjusted R square attempts to come up with a more accurate estimate of the R squared for the population. The results yielded an adjusted R square value of 63.85%, which further confirms the suitability of the predictor variables in predicting the response variable.

6.4.4 Other factors associated with the agricultural production index and financial inclusion

The financial inclusion indicators were run together with other factors that were thought to influence the change in the API (a proxy for agricultural development). These factors are the labor

force in agriculture as a percentage of labor force, irrigated land as percentage of land area and fertilizer consumption.

A. Labour force in agriculture as a percentage of labor force

Labor force in agriculture as a percentage of labor force shows a negative relationship with the index of production in these SADC countries in Table 6.4. This negative relationship is statistically significant at 5% level of significance, as per prior expectations. Theory tells one that a more developed agricultural sector has a relatively low percentage of the labor force engaged in the agricultural sector. Therefore, a more developed country will have a smaller proportion of its labor force in the agricultural sector.

B. Irrigated land as percentage of land area

The regression model results (robust standard errors) in **Table 6.4** show a positive relationship between irrigated land and the API. This means that a proportionate increase in irrigated land will increase agricultural development by a proportion of 13.385, ceteris paribus. However, this relationship is not statistically significant according to the results obtained in this analysis. This means that irrigated land cannot really explain the change in agricultural development in the SADC countries.

According to Kuri and Laha (2011), the financial inclusion process affects the cropping pattern in agriculture, that is, it affects the final level of productivity. According to these authors (Kuri & Laha, 2011), the nature of the cropping system can therefore be partly explained by the availability of irrigation facilities. This theory is unfortunately not supported by the findings of the model in this paper.

The results in Table 6.5 show that irrigated land is positively and significantly correlated with access to financial services. Therefore, it is interesting to note that that the extent of irrigation of agricultural land is positively associated with financial inclusion. It can be safely postulated from these findings that irrigated land links financial inclusion to agricultural development.

***Table 6.5**: Pairwise correlation of financial inclusion and irrigated land*

Variables	Branches	ATM's	Loans/deposits	Irr. land
Branches	1.000			
ATMs	0.5308*	1.000		
Loans/deposits	-0.0520	-0.1011	1.000	
Irr. land	0.8987*	0.3441*	-0.0474	1.000

** Correlation is significant at the 0.05 level

An increase in financial inclusion and inclusive finance will lead to more farmers affording irrigation facilities, thus helping to improve agricultural productivity. When that is achieved, the assumption is that irrigated land will be able to explain the change in agricultural development.

C. Fertilizer consumption

The results of the regression model (robust standard errors) in Table 6.4 show a positive and statistically significant relationship between fertilizer consumption and the API, meaning that a proportionate increase in fertilizer consumption will increase the API by a proportion of 0.00025, ceteris paribus. According to these results fertilizer consumption can explain the change in the agricultural development in the SADC countries.

The same theory of Kuri and Laha (2011), that the process of financial inclusion affects the cropping pattern in agriculture, hence, the nature of the cropping system can be partly explained by the availability and application of improved fertilizers, can be used to explain the inter-relation between financial inclusion and agricultural production. An increase in financial inclusion and inclusive finance will lead to more farmers being able to afford chemical fertilizers, thus helping to improve agricultural productivity. Fertilizer consumption can also be used to explain the link between financial inclusion and agricultural development.

6.5 Summary

According to the above regression analysis there is a relationship between access to and usage of financial services with agricultural development, although the number the amount of bank loans as a proportion of total deposits has a negative relationship that is statistically significant with agricultural development. Irrigated land as a percentage of land area, the labor force in agriculture

as percentage of labor and fertilizer consumption all have a relationship with agricultural development, although irrigated land does not show a particularly strong relationship.

CHAPTER 7

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

This chapter presents the summary of the findings of the study. Covers recommendations made and the suggestions for further studies on related issues and lastly addresses the limitations of the conclusions of this study.

7.2 Summary of findings

7.2.1 Level of financial inclusion and agricultural development in the SADC region

The indices of financial inclusion and agricultural development were both calculated for the purposes of meeting the first two objectives of the study, namely to determine the current levels of (a) financial inclusion, and (b) agricultural development in the SADC region. The indices of financial inclusion were calculated for 13 SADC countries based on data availability. The IFI ranged from 0.423 to 0.011, with Mauritius having the highest index and Madagascar the lowest. Similar results were obtained by Anand and Chhikara (2013) and Nanda and Kaur (2016) who concluded that Mauritius ranked among the better financially included countries, while Madagascar was ranked lower (number 65 out of 68 countries).

The indices of agricultural development were calculated for 14 SADC countries, omitting Seychelles because of lack of data. The indices varied from 0.455 to 0.043. South Africa was found to be the most agriculturally developed country in the SADC region, this came in expected lines as South Africa is known to be the net exporter of agricultural goods in most years. Namibia was found to be the least agriculturally developed country in SADC. Unlike in Asia, where Bhatia and Rai (2008) observed widespread variations in composite indices of agricultural development among different countries, narrow disparities were observed among the SADC countries.

A comparison of the IFI and the ADI have similar numerical values, i.e. the rankings are similar, to get to the conclusion that there is a close relationship between financial inclusion and agricultural development, countries South Africa, Angola and Zimbabwe are best examples of this relationship. There are however exceptions where countries with the lowest financial inclusion levels have relatively high levels of agricultural development (Madagascar, Malawi and Zambia)

and countries with the highest financial inclusion levels have relatively low values of agricultural development (Namibia and Botswana). This may be due to the fact that there are many factors that affect agricultural development besides financial inclusion.

Lack of sufficient and appropriate country data may lead to inconsistencies in the ranking of countries with respect to achievement in financial inclusion and agricultural development (Sarma & Pais, 2011). Apart from data-related issues, according to Onoja (2017), climate, soil and geographical factors all influence yields/hectare across different countries and regions of the world. Therefore, if yields are unevenly distributed, agricultural development is also bound to be unevenly distributed.

As would have been expected, agriculture contributes significantly to the economies of low-income countries and generally contributes more to the economies of low-middle income countries compared to its contribution to the economies of the upper-middle income countries in the region (Olubode-Awosola et al., 2008). According to van Arendonk (2015), in developing countries the position of agriculture in the economy seems more important, whereas it seems less important in developed countries.

7.2.2 Relationship between financial inclusion and agricultural development in the SADC region

Fixed effect regression analysis established that the number of bank branches per 1000 km^2 and ATMs per 100 000 people has a positive relationship with agricultural development. Therefore, an increase in the number of bank branches per 1000 km^2 and ATMs per 100 000 people is associated with an increase in agricultural development by 0.115 and 0.246 respectively. The amount of bank loans as a proportion of total deposits revealed a negative relationship with API, thus its increase is associated with a decrease in API by a proportion -0.039. The significance test revealed that the number of bank branches per 1000 km^2 (access) and the amount of bank loans as a proportion of total deposits (usage) can significantly explain the proportion by which API changes owing to these financial inclusion indicators.

These results are in line with those of Kuri and Laha (2011) and Olaniyi (2017), who found that usage and access to financial services have an impact on agriculture in both the short run and long run. Blando (2013);Okoye, Adetiloye, Erin, and Modebe (2016); Sarma and Pais (2011) and

Wan'goo (2013) agree with these authors; they all found access to have an impact on development. The findings conflict with those of Izhar and Tariq (2009), who showed that access to credit has no significant influence on agricultural production.

From the adjusted R square estimates, the analysis revealed that the independent variables chosen were suitable for predicting the dependent variable at an R square of 0.638. The F-test in this analysis was 0.000, which was less than alpha 0.05 (5%), meaning that the model used was appropriate, and all coefficients in the model were different from zero. This also means that all the coefficients included in the model improved the model's fit.

Irrigated land as a percentage of land area, labor force in agriculture as a percentage of labor and fertilizer consumption all have a positive relationship with agricultural development, although irrigated land had a weak relationship with agricultural development. These factors also link financial inclusion to agricultural development. This justifies the theory of Kuri and Laha (2011) that the process of financial inclusion affects the cropping pattern in agriculture, that is, the nature of the cropping system can be partly explained by the availability and increased use of agricultural inputs, technological change and technical changes such as high-yielding seeds, application of chemical fertilizers, irrigation facilities, mechanization and availability of institutionalized credit for purchasing these inputs etc.

7.3 Conclusion

From the results obtained in this study and from the literature reviewed for the purposes of this study, it can be concluded that financial inclusion is crucial for development. Literature revealed that access to financial services enhances people's ability to participate in economic activities, thus leading to overall development, growth and poverty reduction. Literature also argued that to bring about orderly development, a development mandate must be implemented with regard to inclusive finance. Finance is inclusive when it creates opportunities for economic participation along with ensuring equal access to those opportunities. While access and usage are accepted measures of financial inclusion, usage is a superior measure. Financial inclusion is beyond mere access to traditional financial services; it also encompasses both the breadth and depth of usage.

This study has therefore incorporated both the access and usage measures of financial inclusion. Using panel data over the period 2005-2014 from the African Development Bank's open Africa database, the study used panel fixed effects regression model to analyze the relationship between

financial inclusion and agricultural development. The regression analysis established that the usage of financial services (amount of bank loans as a proportion of total deposits) has a statistically significant relationship with agricultural development. The number of bank branches (per 1000 km^2) and ATMs (per 100 000 people) has a positive relationship with agricultural development and thus an increase in access to financial services is associated with an increase in agricultural development in the SADC region.

Therefore, this study confirmed the hypothesis that agricultural development and financial inclusion are positively related. Hence, high financial inclusion is associated with high agricultural development in the SADC region.

7.4 Recommendations

A vast amount of literature has recognized agriculture as a catalyst for growth in most poor economies and the importance of financial inclusion for agricultural development and economic development as a whole cannot be ignored. Agricultural credit appears to be the main channel through which most countries boost production therefore the researcher would strongly recommend that, authorities should not only deepen financial inclusion efforts through credit delivery but should also strengthen the regulatory framework in order to ensure efficient resource allocation and utilization.

Governments should also focus on financial inclusion policies that would also accommodate small holder farmers because a majority, if not all of the SADC member states rely on subsistence or traditional agriculture. Financial inclusion policies would act as catalyst in ensuring that even small-scale farmers use improved seeds, can afford irrigation facilities, use improved chemical fertilizers, access markets etc., thus leading to growth and development in agriculture.

7.5 Limitations of the study

Although this study contributes to the body of literature on various dimensions, the results are not conclusive and the extent to which findings can be generalized beyond the sample period and countries can be studied is unclear. An example is the lack of more specific data on access to and the use of financial services for agricultural purposes. Lack of these data might have created distortions in the findings of this study because one cannot really ascertain if financial inclusion leads to agricultural development or draw the conclusion that countries with a high level of

financial inclusion have high levels of agricultural development, because the data used for this analysis is not specific to only agriculture.

Financial inclusion is a multidimensional process; it incorporates information on the dimensions of usage, access, quality and impact. The dimensions of quality, the significance of the financial service or product to the needs of the consumer, and impact, the measure of change in the lives of consumers that can be attributed to the usage of a financial device or service, could not be incorporated in the analysis because of data unavailability. On a different note, indices of financial inclusion capture information on multiple aspects in a single number, therefore it would be better to use indices of financial inclusion than the individual indicators used in the analysis in this study.

Using data on only physical outlets, such as bank branches and ATMs, can give an incomplete picture on access to banking services especially with mobile phone banking now firmly established, thus reducing the importance of physical bank outlets. On the other hand, using data on the amount of bank loans as a proportion of total deposits can only partially represent the use of financial services, as there are other services, such as payments, transfers and remittances, which were not incorporated in the study.

This study fully relied on secondary data to meet the first two objectives of the study. Unavailability of data was the major limitation in meeting these objectives. Because of data availability, most indicators that would have better indicated agricultural development/financial inclusion could not be used in the indices. The study could not come up with complete IFI and ADI indices for all 15 SADC countries, which resulted in inability to make ADI and IFI comparisons for all the SADC countries.

7.6 Suggestions for future research

The study covered a period of ten years, since financial inclusion data for the period before 2005 were not available. It would be desirable to extend the present study by complementing it with other studies. The inclusion of more agriculture-specific financial inclusion indicators would improve the reliability of the conclusions arrived at. Agriculture is affected by many factors, including the use of improved seeds, technical and technological factors, which are all affected by financial inclusion. Therefore, it is desirable to look into how the process of financial inclusion influences these factors affecting agricultural productivity, hence agricultural development.

Cross-county studies on the impact of access and use of financial services on agricultural development should be carried out, as well as on the effectiveness of various financial services and financial inclusion measures to allow many countries to share the benefits of the proven successful measures in increasing financial inclusion for agricultural purposes in their individual countries.

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APPENDIX

DATA USED IN THE STUDY

Table A-1: The trends in the API, number of bank branches (per 1000 km^2) and ATMs (per 100 000 people) in the SADC countries

Country	Variables	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Angola	**API**	**101.86**	**104.87**	**118.14**	**126.3**	**158.87**	**167.82**	**183.93**	**152.2**	**206.57**	**178.83**
	Branches	13.23711	20.26585	23.26002	28.17455	31.85992	45.78216	52.03043	52.20816	61.19712	65.99721
	ATM's	1.61192	3.382393	4.915366	6.984767	9.366831	11.71605	14.32656	17.11495	19.14666	20.49139
Botswana	**API**	**101.53**	**97.77**	**99.54**	**108.52**	**114**	**124.59**	**143.49**	**128.02**	**127.07**	**110.11**
	Branches	37.85052	40.0865	46.99248	53.26576	53.28688	55.85741	53.85816	54.89296	55.91015	58.37339
	ATM's	15.8855	18.79978	31.49499	28.44812	27.1169	28.5508	26.14597	25.45642	26.50211	27.37251
DRC	**API**	**100.06**	**100.47**	**101.4**	**102.17**	**103.13**	**105.62**	**110.25**	**111.42**	**110.21**	**105.89**
	Branches	2.313615	2.302539	2.44807	2.380183	2.41377	3.039015	3.112707	3.622245	3.406716	4.267583
	ATM's	.	.	.	.	0.096729	0.399456	0.479925	0.642172	0.708351	1.086571
Lesotho	**API**	**102.26**	**101.61**	**103.08**	**98.27**	**97.08**	**112.38**	**110.61**	**98.72**	**110.88**	**101.68**
	Branches	12.98162	10.82251	11.75989	12.6762	13.06598	19.41361	19.70929	19.49698	21.20993	20.97735
	ATM's	3.787876	3.899706	4.92966	5.765398	6.652394	7.343767	8.083078	9.174694	10.83034	11.24206
Madagascar	**API**	**103.17**	**105.59**	**107.63**	**111.97**	**119.61**	**122.37**	**122.64**	**128.38**	**117.24**	**121.39**
	Branches	5.79539	5.949188	6.659439	7.075898	7.46498	7.780071	8.210749	8.746787	9.203966	10.56338
	ATM's	0.584543	0.747518	1.001363	1.228849	1.335725	1.399928	1.564267	1.715687	1.802075	2.049492
Malawi	**API**	**85.29**	**116.1**	**133.04**	**136.77**	**158.97**	**156.81**	**165.44**	**173.91**	**187.49**	**153.85**
	Branches	4.255418	4.208153	9.625341	10.75101	11.32208	14.52007	4.852014	16.72272	16.80662	16.81611
	ATM's	1.485782	1.427126	1.508681	1.757892	2.638962	2.994521	3.846359	4.338997	4.665782	4.922093
Mauritius	**API**	**98.46**	**97.43**	**92.41**	**96.77**	**100.6**	**98.55**	**98.22**	**95.8**	**93.53**	**95.74**
	Branches	123.6807	127.4147	131.1475	138.1509	151.614	153.5711	156.288	159.7289	162.3272	178.5142
	ATM's	33.85445	34.93252	38.96313	38.06053	39.50592	40.88096	43.43374	44.33074	44.8705	45.01606
Mozambique	**API**	**95.84**	**103.9**	**109.46**	**110.2**	**118.86**	**151.9**	**162.69**	**129.12**	**130.1**	**140.61**
	Branches	10.37581	10.56177	12.35826	13.04778	15.06785	17.35698	18.59129	19.91795	20.12867	21.60692
	ATM's	2.16536	3.196889	3.560621	4.133235	4.590435	5.569433	6.298914	6.811266	7.498225	8.894808
Namibia	**API**	**103.69**	**101.59**	**100.94**	**89.07**	**90.33**	**89.5**	**88.07**	**91.26**	**89.62**	**88.79**
	Branches	62.65417	69.17044	73.53295	74.85314	75.57733	76.18173	77.11039	76.569	77.28042	80.49404
	ATM's	.	9.330422	9.696003	29.2381	41.02125	48.45586	49.66841	47.68398	51.12513	53.63756
Seychelles	**API**	**98.81**	**95.34**	**101.03**	**98.67**	**90.8**	**92.39**	**102.15**	**103.02**	**104.94**	**104.67**
	Branches	218.1401	226.7574	224.4669	266.9633	264.9007	274.1228	272.3312	281.6901	290.9483	310.8253
	ATM's	33.75243	36.1055	37.29023	42.24846	44.74772	44.65412	45.91105	51.40254	65.04771	66.99584
South Africa	**API**	**102.38**	**99.63**	**102.45**	**118.14**	**116.46**	**117.74**	**116.75**	**120.65**	**122.76**	**125.45**
	Branches	47.30975	49.06029	39.95742	52.53892	62.48833	67.75194	71.31995	69.90431	71.71807	77.90815
	ATM's	25.53408	26.98423	30.93057	44.17509	52.48786	56.82834	58.70941	58.30565	58.99334	66.25156
Swaziland	**API**	**103**	**100.17**	**98.26**	**100.26**	**101.81**	**106.44**	**109.38**	**112.14**	**114.64**	**114.76**
	Branches	30.78037	31.29751	30.837	31.19854	30.67223	31.00905	35.47269	34.93095	33.61345	33.13087
	ATM's	11.67244	14.14292	14.97299	18.3303	18.41196	21.1041	21.72231	25.20664	26.37735	32.06961
Tanzania	**API**	**98.4**	**106.14**	**106.72**	**109.16**	**111.62**	**128.13**	**137.98**	**147.11**	**166.97**	**178.04**
	Branches	5.975624	5.883487	6.73643	9.278979	9.853391	10.51735	10.85113	11.63591	13.03471	13.04241
	ATM's	.	.	.	2.401963	3.273168	3.968876	4.636262	5.103007	5.54827	5.67343
Zambia	**API**	**100.74**	**104.21**	**102.99**	**115.15**	**146.15**	**168.49**	**179.1**	**187.65**	**185.83**	**181.51**
	Branches	14.82127	15.1083	16.68098	18.3037	19.33723	20.1256	20.97728	22.3089	23.72993	24.23274
	ATM's	1.30678	2.013411	2.737437	4.217546	5.981232	6.582159	6.794344	8.115282	9.080895	10.18289
Zimbabwe	**API**	**93.44**	**98.04**	**103.76**	**98.45**	**96.76**	**102.21**	**101.63**	**102.69**	**99.13**	**100.08**
	Branches	20.77007	19.49027	22.05617	18.30413	24.59481	25.99985	33.61105	70.60469	73.57098	78.15443
	ATM's	.	6.742243	7.142117	6.876537	7.260674	4.896068	3.969214	4.389947	4.294576	5.299768

Table A-2: Trends in the API for the period 2005-2014.

Country	Variable	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Angola	API	101.86	104.87	118.14	126.3	158.87	167.82	183.93	152.2	206.57	178.83
Botswana	API	101.53	97.77	99.54	108.52	114	124.59	143.49	128.02	127.07	110.11
DRC	API	100.06	100.47	101.4	102.17	103.13	105.62	110.25	111.42	110.21	105.89
Lesotho	API	102.26	101.61	103.08	98.27	97.08	112.38	110.61	98.72	110.88	101.68
Madagascar	API	103.17	105.59	107.63	111.97	119.61	122.37	122.64	128.38	117.24	121.39
Malawi	API	85.29	116.1	133.04	136.77	158.97	156.81	165.44	173.91	187.49	153.85
Mauritius	API	98.46	97.43	92.41	96.77	100.6	98.55	98.22	95.8	93.53	95.74
Mozambique	API	95.84	103.9	109.46	110.2	118.86	151.9	162.69	129.12	130.1	140.61
Namibia	API	103.69	101.59	100.94	89.07	90.33	89.5	88.07	91.26	89.62	88.79
Seychelles	API	98.81	95.34	101.03	98.67	90.8	92.39	102.15	103.02	104.94	104.67
South Africa	API	102.38	99.63	102.45	118.14	116.46	117.74	116.75	120.65	122.76	125.45
Swaziland	API	103	100.17	98.26	100.26	101.81	106.44	109.38	112.14	114.64	114.76
Tanzania	API	98.4	106.14	106.72	109.16	111.62	128.13	137.98	147.11	166.97	178.04
Zambia	API	100.74	104.21	102.99	115.15	146.15	168.49	179.1	187.65	185.83	181.51
Zimbabwe	API	93.44	98.04	103.76	98.45	96.76	102.21	101.63	102.69	99.13	100.08

Table A-3: Trends in the API and the amount of bank loans as a proportion of total deposits

Country	Variable	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Angola	API	101.86	104.87	118.14	126.3	158.87	167.82	183.93	152.2	206.57	178.83
	Loans/deposits	**2036.383**	**980.6162**	**799.9336**	**552.2285**	**61.64211**	**.**	**61.06551**	**55.44878**	**48.36566**	**42.38768**
Botswana	API	101.53	97.77	99.54	108.52	114	124.59	143.49	128.02	127.07	110.11
	Loans/deposits	**63.62812**	**42.44809**	**44.34451**	**44.94868**	**50.89538**	**51.49075**	**63.14616**	**71.5135**	**79.93987**	**85.67695**
DRC	API	100.06	100.47	101.4	102.17	103.13	105.62	110.25	111.42	110.21	105.89
	Loans/deposits	**59.01574**	**56.02621**	**54.21587**	**74.56673**	**45.17544**	**40.82083**	**51.5299**	**56.65695**	**59.96472**	**57.51505**
Lesotho	API	102.26	101.61	103.08	98.27	97.08	112.38	110.61	98.72	110.88	101.68
	Loans/deposits	**28.14077**	**25.35385**	**29.24059**	**29.93575**	**33.5638**	**36.9**	**43.9**	**55.8**	**58**	**61.44447**
Madagascar	API	103.17	105.59	107.63	111.97	119.61	122.37	122.64	128.38	117.24	121.39
	Loans/deposits	**58.91642**	**55.69042**	**55.0885**	**57.06489**	**55.9882**	**57.13602**	**53.13001**	**53.09464**	**63.2208**	**68.32069**
Malawi	API	85.29	116.1	133.04	136.77	158.97	156.81	165.44	173.91	187.49	153.85
	Loans/deposits	**42.90657**	**60.23916**	**58.05085**	**62.35741**	**67.61566**	**71.70543**	**70.88246**	**70.41199**	**53.94156**	**55.18808**
Mauritius	API	98.46	97.43	92.41	96.77	100.6	98.55	98.22	95.8	93.53	95.74
	Loans/deposits	67.44123	58.45292	65.67052	77.1589	73.83636	79.0277	91.23216	86.52583	83.82369	72.79524
Mozambique	API	95.84	103.9	109.46	110.2	118.86	151.9	162.69	129.12	130.1	140.61
	Loans/deposits	**54.81041**	**55.18552**	**53.12037**	**63.36651**	**76.024**	**79.68435**	**77.68597**	**70.49008**	**78.13698**	**81.91392**
Namibia	API	103.69	101.59	100.94	89.07	90.33	89.5	88.07	91.26	89.62	88.79
	Loans/deposits	**104.4652**	**95.41357**	**98.56287**	**95.77667**	**89.07975**	**89.25896**	**85.37952**	**91.35607**	**93.51592**	**97.58775**
Seychelles	API	98.81	95.34	101.03	98.67	90.8	92.39	102.15	103.02	104.94	104.67
	Loans/deposits	**32.04762**	**27.31326**	**31.85436**	**30.82017**	**29.03422**	**33.30716**	**30.77132**	**31.74775**	**27.81997**	**31.05163**
South Africa	API	102.38	99.63	102.45	118.14	116.46	117.74	116.75	120.65	122.76	125.45
	Loans/deposits	**99.64286**	**102.4622**	**101.7487**	**97.06579**	**95.40537**	**92.94037**	**92.84588**	**95.18926**	**95.96531**	**95.09637**
Swaziland	API	103	100.17	98.26	100.26	101.81	106.44	109.38	112.14	114.64	114.76
	Loans/deposits	**.**	**.**	**.**	**.**	**87.36663**	**74.10633**	**94.69545**	**83.62577**	**89.33525**	**86**
Tanzania	API	98.4	106.14	106.72	109.16	111.62	128.13	137.98	147.11	166.97	178.04
	Loans/deposits	**41.91114**	**47.36881**	**53.55341**	**65.84343**	**58.06865**	**55.45776**	**61.05414**	**63.26733**	**65.91033**	**69.67906**
Zambia	API	100.74	104.21	102.99	115.15	146.15	168.49	179.1	187.65	185.83	181.51
	Loans/deposits	**69.73261**	**69.81802**	**.**	**81.39297**	**82.11916**	**65.05405**	**52.55951**	**62.09527**	**57.86475**	**59.10652**
Zimbabwe	API	93.44	98.04	103.76	98.45	96.76	102.21	101.63	102.69	99.13	100.08
	Loans/deposits	**38.45595**	**44.59203**	**48.88994**	**63.97398**	**48.05956**	**70.70225**	**87.96098**	**90.96318**	**104.4106**	**99.93**

Indicator	Units	Source
Agriculture Production index (API) http://dataportal.opendataforafrica.org/		AFDB
Bank branches (per 1000 km^2) http://dataportal.opendataforafrica.org/	Number	AFDB
ATMs (per 100 000 people) http://dataportal.opendataforafrica.org/	Number	AFDB
Loans/deposits http://dataportal.opendataforafrica.org/	%	AFDB
Fertilizer consumption http://dataportal.opendataforafrica.org/	Quantity	AFDB
Irrigated land % land area http://dataportal.opendataforafrica.org/	%	AFDB
Labor force in Agric. % labor force http://dataportal.opendataforafrica.org/	%	AFDB

Table A-4: Data used to calculate the Agricultural Development Index in the SADC region

Country	Labour force as % total labour	Fertilizer consumption	Food production index	Irrigated land(%land area)	Agriculture value added
Angola	40.3384184	43337	132.84	0.068982113	5.36283613
Botswana	51.21766969	22486	92.74	0.004411272	2.55482852
DRC	37.74188159	9323	79.27	0.004852121	20.05637764
Lesotho	43.28661571	11134	92.36	0.098814229	7.15453357
Madagascar	50.19575794	13557	94.94	1.866620832	26.4202201
Malawi	45.51593198	164293	119.41	0.784896054	27.46118997
Mauritius	47.92809524	14401	92.35	9.359605911	3.22178116
Moz	43.27557525	52677	109.66	0.150054681	28.66665255
Namibia	36.29011785	3015	75.43	0.009717111	8.66828477
South Africa	37.82908628	721481	113.05	1.376649713	2.345053781
Swaziland	33.09400589	15215	100.33	2.906976744	6.121784435
Tanzania	43.34207643	63111	137.72	0.410927975	31.46947018
Zambia	40.63902174	155799	140.18	0.209849473	9.556782383
Zimbabwe	48.76735349	147225	84.99	0.45237172	14.00697084

Indicator	Source
Economically active population in agric.	AFDB http://dataportal.opendataforafrica.org/
Fertilizer consumption	AFDB http://dataportal.opendataforafrica.org/
Food production index	AFDB http://dataportal.opendataforafrica.org/
Irrigated land (% land area)	AFDB http://dataportal.opendataforafrica.org/
Agriculture value added	AFDB http://dataportal.opendataforafrica.org/

Table A-5: Data used to calculate the Index of Financial Inclusion in the SADC region

Country	A/C Ownership	Borrowed from a formal financial institution	Outstanding loans per 1000 adults	Main source of emergency (savings)	Saved at a financial institution	Made/received digital payment	High frequency account use	ATM's per 100,000 adults	Branches per 100,000 adults	Mobile money transactions per 100,000 adults
Angola	29.318121	2.824078	20.174	11.3425	14.86041	25.03928	4.97003	20.49139	11.47644	0
Botswana	51.964569	13.03491	340.1133	19.80913	26.60923	45.9401	11.37371	27.37251	8.570517	291381.4
DRC	17.476984	2.39908	5.46823	17.24116	4.721767	15.47258	1.341276	1.086571	0.778957	1342.521
Lesotho	18.497025	..	82.8607	..	..	..	..	11.24206	3.573636	49443.48
Madagascar	8.5513391	2.004079	33.74671	7.77013	3.260363	5.429972	0.72025	2.049492	1.9031	147299.8
Malawi	18.092419	6.030213	20.08205	21.39459	7.054003	11.43525	3.181295	4.922093	3.233892	136320.4
Mauritius	82.208267	17.06235	559.6298	24.80838	35.53308	53.20192	20.50484	45.01606	24.33835	0
Moz	0	0	0	0	0	0	0	8.894808	3.978724	15238.12
Namibia	58.833897	6.857876	301.5572	11.92728	26.68722	44.99777	15.89116	53.63756	12.79912	9655.882
Seychelles	0	0	278.4471	0	0	0	0	66.90361	55.51576	0
South Africa	70.317451	12.09208	454.819	22.45932	32.72622	65.99213	14.70539	66.32112	10.96506	16126.27
Swaziland	28.569443	0	193.977	0	0	0	0	32.06961	5.807883	197109.4
Tanzania	39.779476	6.504925	22.5676	16.92173	9.004318	35.5411	2.505475	5.673443	2.234134	4408315
Zambia	35.644871	4.815722	0	17.4909	16.84436	28.85924	5.393716	9.080895	4.696167	418383
Zimbabwe	32.389252	4.0383	66.08306	9.744581	5.194062	30.00977	2.063065	5.299768	12.96871	2004424

World bank G20 financial inclusion indicators

Indicator Name	**Source**
Account (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database
ATMs per 100 000 adults	International Monetary Fund, Financial Access Survey.
Borrowed from a financial institution in the past year (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database
Branches per 100 000 adults	International Monetary Fund, Financial Access Survey.
High frequency of account use (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database
Made or received digital payments (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database
Main source of emergency funds: savings (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database
Mobile money transactions per 100 000 adults	International Monetary Fund, Financial Access Survey.
Outstanding loans per 1 000 adults	International Monetary Fund, Financial Access Survey.
Saved at a financial institution (% age 15+) (http://datatopics.worldbank.org/financialinclusion/)	Global Findex database