The impact of the Europeun Union grant on access to credit and production in smallholder sugarcane agriculture in Siphofaneni, Eswatini

by

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Submitted in partial fulfilment of the requirements for the degree of

Master of Science in Agriculture (Agricultural Economics)

in the

Faculty of Natural &Agricultural Sciences

University of Pretoria

Pretoria

February 2019

Declaration

I declare that the thesis, which I hereby 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 at this or any other university or institution of higher learning.

Signature..

Date..

Sikhanyiso Angel Maziya

Acknowledgments

I would like to take this opportunity to thank God for making it possible for me to complete my studies at the University of Pretoria.

I would also like to express my profound appreciation and recognition to my supervisor, Professor Charles Machethe, who is the Head of Department of Agricultural Economics, Rural Development and Extension at the University of Pretoria, for his exemplary guidance, monitoring and constant encouragement throughout my studies. I am thankful for his continual constructive criticism, invaluable suggestions and insurmountable help, which benefitted me during my research. The blessing, help and guidance given by him from time to time will stay with me on this next chapter of my life on which I am about to embark.

I would also like to extend my heartfelt gratitude to The MasterCard Foundation Scholars' Program, for awarding me the opportunity to study at the University of Pretoria. Studying at the University has undoubtedly enhanced and grown my career.

Still more, I am thankful to Asanda Vumazonke and Eloise Law-van Wyk for their kind support and inspiration which immensely strengthened my confidence as I undertook my academic work. I am grateful for their valuable information and guidance, which helped me in completing tasks through various stages.

Lastly, I am extremely grateful and remain indebted to Busizwe Ngwenya and my colleagues and friends for being a source of inspiration and constant support.

Dedication

Proverbs 3: 5-6 "Trust in the Lord with all your heart and do not lean on your own understanding. In all your ways acknowledge Him and he will make your paths straight". This work is a product of God's grace and mercy; I would therefore like to dedicate this work to God, who is and has always been the source of strength.

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Abstract

Credit is important because it enables farmers to increase agricultural production. Access to credit from commercial banks for smallholder farmers enhances productivity and promotes farmer development. It plays an important role in alleviating poverty and creating an economically stable life. However, access to credit for rural smallholder sugarcane farmers in Eswatini is limited.

The purpose of this study was to assess the impact of a European Union (EU) grant on access to credit from commercial banks and farming activities for smallholder sugarcane farmers in Eswatini. The study determined whether smallholder sugarcane farmers had access to credit from commercial banks and other formal financial institutions. It also determined whether being a participant in an EU grant funding led to increased access to credit and to higher production for smallholder sugarcane farmers. The study determined the extent to which an EU grant funding contributed to eliminating constraints faced by smallholder sugarcane farmers.

Data was analysed using Statistical Package for the Social Sciences (SPSS) software. Descriptive and econometric analyses were performed to identify the factors that influence access to credit and farming activities for smallholder sugarcane farmers. The Propensity Score Matching (PSM) was applied to identify the impact of the EU grant funding on access to credit from commercial banks and farm activities. The matching compared beneficiaries to non-beneficiaries of the EU grant funding in terms of the independent variables hypothesised to have an effect on access to credit. After the application of PSM, the average treatment effect on the treated was used to measure the appropriateness of the intervention of the EU grant funding on smallholder sugarcane farmers in Eswatini.

Descriptive statistics show that 55% of the smallholder sugarcane farmers are male and their average age is 58 years. It also shows that about 37% of the smallholder farmers are illiterate, with only 32% attending primary school and only 31% attending high school. Lastly, it shows that, the major source of income for smallholder farmers is the sugarcane farming enterprise and that about 37.5 % of smallholder sugarcane farmers in Siphofaneni have been beneficiaries of EU grant funding.

For the logistic regression for access to credit, five of the variables used in the study were statistically significant. These variables included education, land size; grant funding, off-farm income and extension services. The variables had an effect on farmers' access to credit from commercial banks. The other variables were not significant at any level; consequently, they did not have an effect on farmers' access to credit.

The logistic regression for farming activities shows that only four variables had an effect on farmers' production. These variables included farmers' experience, grant funding, off-farm income of the farmer and extension services. The results suggest that EU grant funding increases the chances that smallholder farmers can access credit from commercial banks. Therefore, farmers that are beneficiaries of EU grant funding are presumed to have more access to credit than their counterparts who are not beneficiaries.

The average treatment effect on the treated also showed that beneficiaries of EU grant funding had a higher chance of access to credit than non-beneficiaries of EU grant funding. Overall, the EU grant has contributed to eliminating credit constraints faced by smallholder farmers. However, it has not affected full elimination of production constraints faced by smallholder sugarcane farmers in Eswatini. About 90% of the farmers pointed out that electricity and water were the major constraints they faced. The power rates are high because farmers use more electricity for water pumping directed at their fields. Further, water is another constraint because drought has hit Eswatini and therefore water from the dam in the study area has been rationed to ensure availability in the future. This has a negative effect on farmers' production, as lack of water for sugarcane production reduces the sucrose level, resulting in lower returns for the farmers.

The study makes recommendations that access to credit from formal financial institutions needs to be enhanced by encouraging smallholder farmers to work with extension officers that might help share knowledge on production, bank operations and procedures. There is also need to start up socio-economic initiatives, government policies and institutional support programmes that would support farmers by reducing obstacles hindering more effective access to credit. The involvement of

stakeholders, the MoA, through SSA and SWADE, could deal with each category of farmers separately and lobby finance institutions to reconsider their position on financing small-scale farmers in the sugarcane sector.

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List of Acronyms and Abbreviations

ACP - African Caribbean Pacific

CBS - Central Bank of Eswatini

DD - Double Difference

DFIs – Development Finance Institutions

EPA - Economic Partnership Agreements

EU – European Union

FA - Farmer Association

FBO – Farmer-based Organisation

GDP - Gross Domestic Product

KDDP - Komati Downstream Development Project

LUSIP - Lower Usuthu Smallholder Irrigation Project

MEPD - Ministry of Economic Planning and Development

MoA - Ministry of Agriculture

NDS- National Development Strategy

OLS – Ordinary Least Squares

PSM – Propensity Score Matching

SHIP- Smallholder Irrigation Project

SIDC- Eswatini Industrial Development Company

SNL - Swazi Nation Land

SP – Sugar Protocol

SSA - Eswatini Sugar Association

SWADE - Eswatini Water and Agricultural Development Enterprise

TDL - Title Deed Land

WTO – World Trade Organisation

CHAPTER 1

INTRODUCTION

1.1 Background

Agriculture is central to ensuring economic growth, reduction of poverty and providing for sustainable development in sub-Saharan Africa (Nxumalo, 2015). On average, agriculture contributes to 15% of the total Gross Domestic Product (GDP) in Africa and it is the major employer and main source of livelihood in rural areas (Taylor, 2017). The importance of agriculture is summarised in three key functions through which it plays a vital role: a trigger of overall economic growth, a source of livelihood, and a way of managing natural resources and the environment better (World Bank, 2008: 3-4).

Poverty in Sub-Saharan Africa dominates the rural areas and is widespread. Cross-country estimates revealed that GDP growth originating from the agricultural sector is twice more effective in poverty reduction than that which comes from outside the sector, confirming agriculture as the lead sector for overall growth (World Bank 2008: 6). Agriculture is this effective in poverty reduction largely because it employs most of the poor who live in the rural areas where land and labour (the key factors of production), are available (FAO, 2006: 2).

However, the growth rates in agriculture are still considerably low. There has been marginal improvement in agricultural GDP growth since the 1980s when it stood at 2.3% to an increase of about 3.2% from 2000 to 2005. There is, therefore, a need for sub-Saharan Africa to improve its productivity, which would in turn, translates to higher growth rates (Fact Sheet: Word Bank and Agriculture in Africa, 2013). To facilitate the needed growth in agriculture, it is necessary to overcome the financial constraints faced by smallholder farmers, which inhibit their ability to compete and respond to the global demand for increased investment in agriculture (World Bank, 2008: 13).

Like many places in sub-Saharan Africa, in Eswatini, agriculture is the second main employer after the government of Eswatini (MEPD, 2013). Agriculture contributes to about 13% of the GDP of the

country. However, not much has been done to enhance agriculture, food security and poverty alleviation. For example, there are only two types of tenure systems namely, Title Deed Land (TDL) and Swazi Nation Land (SNL). These are the modern and traditional sectors. About 54% of the land is TDL and 46% is SNL (Dlamini, 2011). There is no legislation on SNL and the land is held in trust by the King and allocated to tribal chiefs according to the Swazi tradition. The difference between SNL and TDL is the size of land; SNL is occupied mostly by smallholder farmers while TDL is occupied by large commercial holdings. About 61% of SNL farm holdings are less than one hectare in size (Dlamini, 2011), meaning that the majority of smallholder farmers have limited access to even just one of factors of production: land.

In Eswatini, sugar, wood and pulp are the leading contributors to export earnings. According to the Eswatini Sugar Association (SSA) (2011), the sugar industry plays a vital role in the economy of Eswatini as it is the main contributor to agricultural output, GDP and employment (MEPD, 2014). The sugar sector contributes to 18% to the country's GDP, 35% to employment and 59% to agricultural output. Eswatini enjoys preferential market access at higher prices for its sugar, especially in the European Union (EU), which makes sugar a feasible enterprise. The EU is active in the sugar sub-sector, where the focus is on increasing the productivity of small-scale sugarcane farmers by developing irrigation infrastructure.

Eswatini was identified as one of the country's most at risk from changes to the Sugar Protocol (Garside et al., 2005). A project to provide grant funding to smallholder sugarcane farmers in Eswatini was therefore established as a joint effort between the EU and Eswatini government. The grant funding covers land development costs, amounting to around 70% of the total costs. With sugarcane in the ground for collateral, farming associations were able to borrow the balance of the funding required, primarily for crop husbandry costs in the first year to harvesting.

 The success of the project is measured by the ability of some associations to settle their loans within the first two years of operation, distribute profits among their members and invest in other income

generating projects. The project is a sustainable development initiative which goes well beyond poverty alleviation, contributing handsomely to the socio-economic profile of Eswatini.

Over the past years, smallholder farmers could only access credit from informal financial institutions as they did not have collateral and could not meet the requirements of formal financial institutions (Mamba, 2016). Most African economies are characterised by a financial system that has both formal and informal segments (Mamba, 2016). Formal financial institutions are mostly commercial banks and microfinance institutions, while informal financial institutions are savings cooperatives and mostly friends, relatives and moneylenders.

Informal financial institutions connect with the clients on a personal level and thus allow easy access to information about the borrower, as well as the institution's lending ability. Informal financial institutions are flexible in such a way that they satisfy the financial needs of smallholder farmers that cannot be met by formal financial institutions. These institutions require no collateral from borrowers; hence it is easier for the rural poor to borrow from informal institutions than from formal commercial banks. According to Masuku (2010), in informal financial institutions, the credit is disbursed without thoroughly assessing the socio-economic conditions of the community and this leads to high default rates. Formal financial institutions tend to control and monitor even micro-lending as a way of hedging against certain risks.

1.2 Statement of the problem

According to Machethe (2004), in order to achieve the objectives of agricultural development, it is important to include government intervention, as most services that are used are public goods. According to the World Bank (2008), to facilitate the much-needed growth in agriculture, there is a need to overcome financial production challenges.

Despite many attempts to improve access to credit for smallholder farmers, limited success has been achieved in improving access to credit in many developing countries (Manganhele, 2010). These countries are still on the lookout for suitable strategies to enhance access to credit for smallholder farmers. Access to credit would help in alleviating poverty among smallholder farmers in many

developing countries that would in turn promote rural economic development (Stiglitz, 2002; Meyer, 2002; Meyer *et al.*, 2004, Sacerdoti, 2005; Bruck & Van dan Brueck, 2006).

The sustainability of smallholder sugarcane farming in Eswatini is under threat because of lack of access to credit (Hlophe, 2014). Limited access to credit is constraining the growth of smallholder farmers' ability to increase production by investing in innovative high-return projects and technology. Such investment can drive employment and growth in a number of industries in many developing countries, including Eswatini (Manganhele, 2010).

Eswatini is still on the lookout for strategies that may be implemented to enhance and influence production of smallholder farmers through improved access to credit (Hlophe, 2014). According to Ton *et al.* (2013), considerable attention has been paid to smallholder grants and experimentation, but there is little information on the impact and effectiveness of these grants.

Issues that relate to grant funding have been discussed in previous studies (Ton *et al.*, 2013). Some studies look at the institutional arrangements that enable the end user and grants to be reached; others look at how research can be changed to stimulate innovation in favour of smallholder farmers (Ton *et al.*, 2013). Still more, some studies relate to funding methods such as competitive funds (Heemskerk & Wennink, 2005; Hartwich & Tola, 2007; Klerkx & Leeuwis 2008; Vera-Cruz *et al.*, 2008). Others look at the conditions and institutional changes necessary to support demand-driven agricultural research and development (Dorward *et al.,* 2004; Hall *et al.,* 2006).

However, the essence of the problem lies in the fact that few studies have been carried out to analyse the effectiveness of different grants. Generally, the researchers present grants as an illustration of the favoured approach to stimulate research on smallholder impact, rather than as the object of empirical analysis. This study, therefore, sought to bridge this knowledge gap by assessing the impact of EU grant funding on access to credit and farming activities for smallholder sugarcane farmers in Eswatini.

1.3 Objectives of the study

The overall objective of the study was to assess the impact of an EU grant on access to credit and farm activities for smallholder farmers in Eswatini.

The specific objectives are to:

- Determine if smallholder sugarcane farmers have access to credit from commercial banks and other formal financial institutions;
- Determine whether being a participant in EU grant funding leads to increased access to credit and production for smallholder sugarcane farmers; and
- Determine the credit and production constraints faced by smallholder sugarcane farmers.

1.4 Hypotheses

The hypotheses to be tested are as follows:

- Smallholder sugarcane farmers do not have access to credit from formal commercial banks;
- The EU grant funding does not affect access to credit and production for smallholder sugarcane farmers in Eswatini; and
- Smallholder sugarcane farmers face credit and production constraints.

1.5 Organisation of the Thesis

This thesis consists of eight chapters. The first chapter outlines an introduction that comprises of the background information, the problem statement, the objectives and specific questions of the study and research hypothesis. The rest the dissertation is organised as follows: *Chapter 2* outlines the agricultural sector and sugar industry in Eswatini; *Chapter 3* explains the role of credit, access and its determinants; *Chapter 4* outlines the creation and role of the EU grant funding; *Chapter 5* covers the impact assessment and concept of PMS; *Chapter 6* outlines the methods and procedures used to undertake the study; description of the study area, sampling design, survey instrument and development, description of variables used in the study and data analysis; *Chapter 7* presents the

econometric results and statistics as well as the discussion thereof and finally, *Chapter 8* presents the summary, conclusions and recommendations of the study.

CHAPTER 2

AGRICULTURAL SECTOR AND SUGAR INDUSTRY IN ESWATINI

2.1 Introduction

This chapter presents an overview of the agricultural sector in Eswatini. The chapter also reviews the literature on sugarcane production, its contribution to the economy and sugar sector reforms. General views on the challenges faced by smallholder sugarcane farmers are also presented in this chapter.

2.2 The Agricultural sector

2.2.1 Contribution of agriculture to the economy

The economy of Eswatini relies heavily on agriculture. Agriculture in Eswatini encompasses two main crops namely, sugarcane and maize. These are grown commercially and on a large scale. It is estimated that agriculture accounts for three quarters of the country's total agricultural output.

Agriculture is the second largest contributor to the economy of Eswatini after the manufacturing sector. The agricultural sector is strongly connected to the manufacturing sector and employs about 70% of the population through agricultural activities. The agricultural sector contributes a total of 7.8% of the GDP (MoA, 2013). The percentage used to account for more, in earlier years. However, there has been a drastic decline in the GDP contribution to the economy; the share fell from 13.9% in 2003 to 7.8% in 2012 (CBS, 2013) mainly because of climatic shocks and severe drought.

2.2.2 Agricultural production

Agricultural production in Eswatini is characterised by arable crop farming and livestock production. It has an average elevation of between 910 and 1830 metres above sea level and is characterised by a humid to near temperate climate (Levine, 2001). This type of climate is conducive for the growing of a variety of crops and higher yields are usually obtained due to the high rainfall and moderate temperatures. Maize grown as a monocrop (cropping system) is the dominant crop (Terry, 1997). Other crops that can be grown include sweet potato and variety of legumes. The major constraint to increased productivity however, is excessive leaching of nutrients, high soil acidity and low soil fertility.

There are two types of farming in Eswatini. These are commercial and subsistence agriculture. Commercial farming is the growing of crops on a large scale and involves modern farming and efficient use of advanced technology, while subsistence farming is the growing of crops and rearing of animals for consumption (Swain, 2017). Commercial agriculture mainly operates on TDL and is characterised by high capital intensity, cash cropping and large farms. On the other hand, subsistence agriculture is mainly practised by smallholder farmers on SNL.

In Eswatini, the sugar industry dominates the commercial agricultural sector. It is followed by canned fruits and beef production for exports. Maize cultivation is a major cultivated crop by smallholder farmers who practise mainly subsistence farming. The country is historically a net importer of maize, which is the staple food in Eswatini, and the quantity demanded depends significantly on unreliable rainfall.

Achieving sustainable agricultural development remains the major challenge facing Eswatini. The growth and development of the country lies in growth and development of the agricultural sector (Masuku, 2010). Although there has been a significant increase in agricultural development, recent years have witnessed concern on constraints and challenges that limit development (Mamba, 2016). According to Mamba (2016), on the one hand, the sugar and citrus industries have proven to be large and efficient agricultural production systems. On the other hand, the low outputs and land degradation in the country are evidence that the country is not devoted to sustainable production systems.

Consequently, an overarching policy framework involving the Comprehensive Agricultural Sector Policy and National Fund Security Policy has been developed by the Eswatini government through the Ministry of Agriculture (MoA). To guide implementation of the policies, the National Programme for Food Security was established to create new exciting opportunities in the agricultural sector (Government of Eswatini, 2008).

2.2.3 Agricultural exports and imports

The World Trade Organization (WTO), Southern African Development Community and Southern African Customs Union are the major Organisations that enhance trade in Eswatini (CBS, 2012).

Eswatini has experienced both a balance of trade surplus and a balance of payment surplus in recent years (CBS, 2012). Food, fuel, energy, motor vehicles and capital goods are the major commodities imported into Eswatini. Eswatini's import partners are South Africa, Mozambique, Botswana, Japan, Namibia and Singapore (CBS, 2013). According to Figure 1, in the third quarter of 2017, imports increased from E45 884.000 to E48 543.000. From 2005 until 2017, the average of imports was E34 708.100. They reached an all-time high of E49 684. 000 in the third quarter of 2016. After that, exports increased from E50 762.000 to E63 218. 0.00 in the third quarter of 2017. The export average was E38 183.800, reaching an all-time high of E73 518.000 in the fourth quarter of 2016 (Trading Economics, 2018).
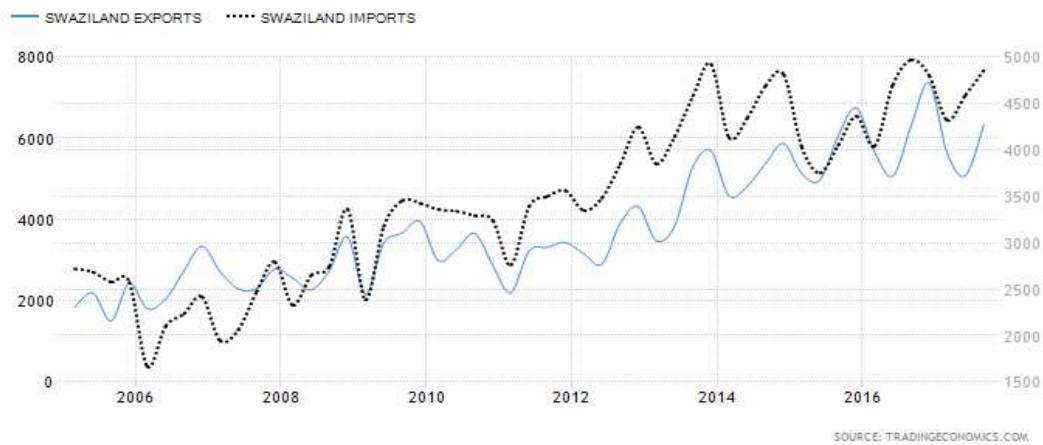
Figure 1: Imports and Exports in Eswatini

Source: Trading Economics (2018)

Sugar, cotton and wood pulp are the major commodities that are exported from Eswatini to the United States (USA), the EU and South Africa (CBS, 2016). According to Mamba (2016), Eswatini receives about 80% of its imports and sends 70% of its exports to South Africa, making the economies closely related.

2.3 The Sugar industry in Eswatini

2.3.1 Contribution to the economy

Eswatini is one of the major producers of sugar in the region, second only to South Africa (USAID Gain Report, 2017). The sugar industry in Eswatini has expanded drastically since the mid-1950s. Sugar production has become an important activity, contributing to 60% of agricultural output (Terry & Ogg, 2017). About 18% of Eswatini's GDP is contributed by the sugar sector, which itself has been dominated by sugar processing, that accounts for over 42% of the GDP (Terry & Ogg, 2017).

The expansion of the sugarcane growing area in Siphofaneni under the Lower Usuthu Smallholder Irrigation Project (LUSIP) was solely to ensure increased sugarcane production in Eswatini (Terry & Ogg, 2017). It was expected that the area would increase by about 607 hectares and hence increase sugarcane production by about 4% (CBS 2013/2014 report).

Figure 2 shows that miller-owned estates (MCP) contribute the largest share of production at 49%, followed by large-scale growers (18%), medium-size growers (12%) and small growers (21%). Although medium and small growers account for a smaller volume of total production, the largest number of growers falls under these two categories.
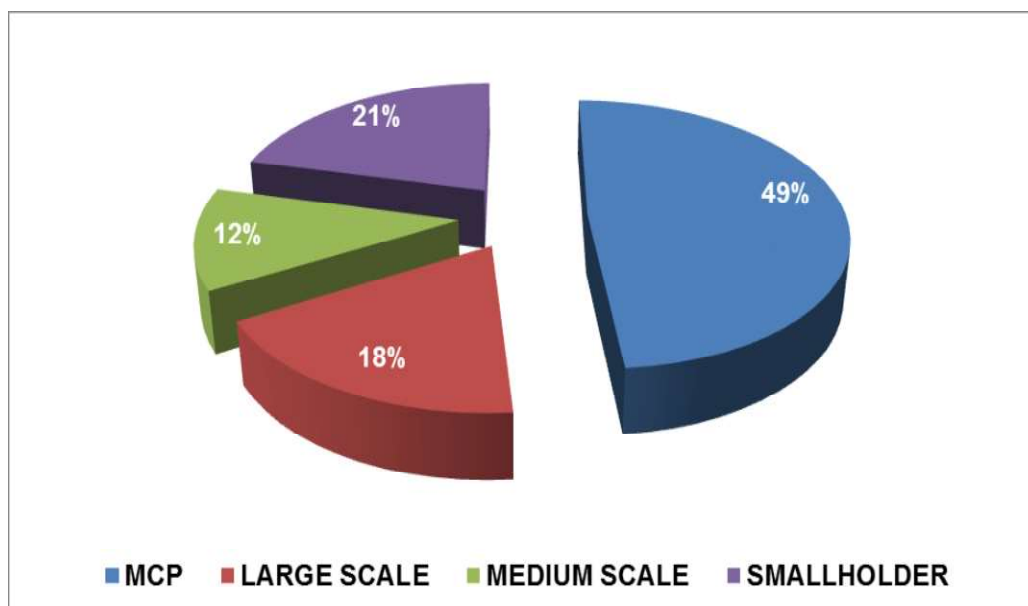
Figure 2: Contribution to Sugarcane and Production by Grower Category

2.3.2 Sugarcane Production

Interestingly, sugarcane growing in Eswatini may only be undertaken by growers who are registered and allocated a grower quota number by the Sugar Industry Quota Board. A new entrant in the sugarcane farming industry requires a quota or license. The license ensures that the millers can manage cane crushing. In other words, it ensures that the millers are not overloaded or underfed with cane (SSA, 2016). The licence also ensures that the grower has adequate water for irrigation, has land or the right to use land, and finally, that the grower is well acquainted with the rules of cane growing and the relevant legal requirements. The quota is therefore not a restriction on production; but essentially an agreement between the miller and the grower that the grower will produce a particular quantity of cane for the miller, and the miller will buy the specific quantity of cane at a specific harvesting time from the grower (SSA, 2016).

This is done to optimise the capacity of the millers and to prevent loss of value of the grower's cane due to delays in processing of the cane. Millers also require a license to manufacture sugar. The license is issued by the Minister of Enterprise and Employment after a recommendation by the SSA. The sugar industry is well organised and has no spot-market; contracts are signed between growers and millers through the quota system, implying that the volumes of cane produced are known beforehand (Masuku *et al*., 2007:74). The SSA buys the sugar from all the millers and sells it locally and internationally. The price of sugar paid to millers and the price farmers get for their cane (sucrose) is determined by the SSA through a formula that considers international market prices.

2.3.3 Sugarcane Production in Eswatini

While sugarcane is produced on a large scale, smallholder farmers have been involved in the industry. Irrigation of sugarcane has been dependent upon two dams. These dams have enabled thousands of farmers who relied on rain as their major irrigation method to consolidate their individual farms into commercial, irrigated sugarcane cooperatives. The areas under sugarcane have grown by 28%, mostly as a result of smallholder farmers' expansion (Terry & Ogg, 2017). Figure 3 shows the total revenue

(in Emalangeni) that has been generated through sugarcane production in Eswatini from 2011 to 2016. It shows that there was a drastic improvement in revenue from 2011/12 to 2013 and a slight decrease in 2014/15; however, the revenue picked up again in 2015/16.
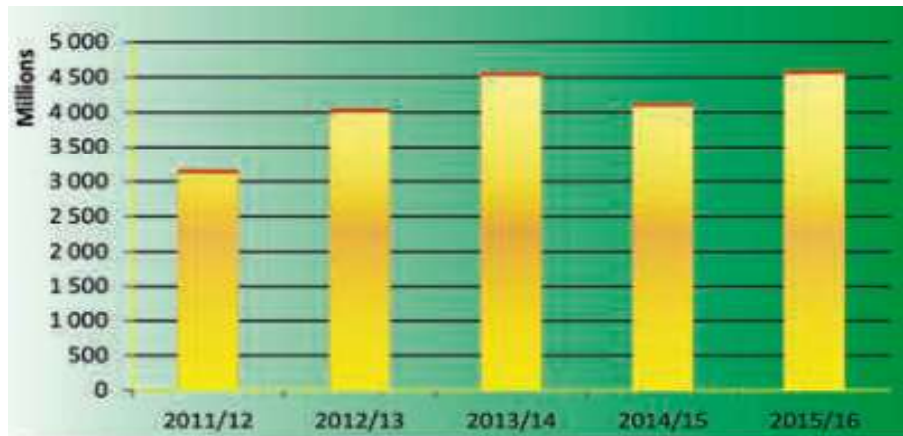
Figure 3: Total Revenue for Sugar (Emalangeni (E))

Source: SSA (2014)

According to SSA (2014), forecasts showed that sugarcane production will increase by 5%, from 4 973 571 MT (metric tonne) in the 2016/17 MY (Milling Year) to 5 200 000 MT in the 2017/18 MY, based on normal weather conditions and good rainfall received at the beginning of the year. The beginning of the year is a crucial time for sugarcane growth, as well as improvements in yields following recovery from the drought conditions of the previous season (USDA Gain Report, 2017).

The increase in sugarcane production is anticipated to be partially offset by some growers failing to re-plant their normal hectarage based on the financial impact of the drought in 2016 and some sugarcane crop that was too distressed to recover from the previous drought conditions (USDA Gain Report, 2017). The 2016/17 MY production estimate was revised upwards to 4 973 571 MT based on better than expected production and updated industry data but remains the lowest cane production in the last decade. The 2015/16 MY sugarcane production remains unchanged at 5 836 553 MT based on final industry data (USDA Gain Report, 2017). *Table 2.1* shows the production of sugarcane and

sugar in Eswatini from the 2013/14 MY to the 2017/18 MY forecast. Sugar sector reforms were introduced by the EU protocol for preferential price.

Table 2:1 Sugarcane Production in Eswatini - 2013/14

Season	Area Planted	Area Harvested	Yield (MT/HA)	Cane Crushed (MT)	Sugar Produced (MT)	Cane/Sugar Ratio
2013/14	58,979	55,478	100.8	5,591,830	653,337	8.6
2014/15	59,586	56,438	99.9	5,639,193	686,778	8.2
2015/16	59,924	57,685	101.2	5,836,553	695,408	8.4
2016/17**	61,073	56,420	88.2	4,973,571	587,004	8.5
2017/18***	62,000	57,000	91.2	5,200,00	606,000	8.6

*Source: SSA (2017) **Forecast, ***Estimate MT (Metric Tonne) MY (Milling Year)*

2.3.4 Sugar sector reforms

Sugar production is of great importance in the development of Eswatini, and it plays a multifaceted role in the overall economy (Government of Eswatini, 2006). Besides significantly contributing to GDP, it contributes directly to poverty reduction, because poor subsistence rural farmers are converted to commercial smallholder sugarcane farmers and earn some income (SSA, 2016). Like most developing countries, Eswatini typically exports semi-finished agricultural commodities to the developed world through trade agreements that offer preferential treatment to its exports. For example, the African Caribbean and Pacific-EU (ACP-EU) Protocol on Sugar (SP) and the Complementary Quantity, offers Eswatini preferential market access for its sugar to Europe (Government of Eswatini, 2006).

However, there has been a trend of trade liberalisation in the world, meaning that trade preferences will soon be a thing of the past. Markets are being liberalised and soon developed and developing economies will compete for the same markets. Krabbe and Vink (2000) agree that multilateral negotiations supported by the WTO and the rising number of regional trade blocks bring about a greater trend towards liberalisation in the world market for agricultural products.

According to Dorward et al (2004:612), agricultural trade liberalisation policies came about as a result of the failure of government interventions in the sector, which resulted in expensive, poor and late services to farmers, and grave costs to the economy. New policies consequently called for the control, motivation, and resources of private market systems and players to take on these functions more successfully and proficiently, and to take action to demand services from smallholder farmers (Ministry of Economic Planning and Development Report, 2014). The general long-term outcomes for commercial farmers involve increased exposure to a freer world market.

In November 2005, the EU sugar trade policy experienced reform for the first time in 40 years (SSA, 2014). One of the reasons for transformation was the WTO dispute on funding, when it was found that the EU sugar policy was contravening its WTO obligations. According to the South Centre (2007:1), Brazil, Thailand, and Australia, the most efficient sugar producers of the world lodged a complaint with the WTO against the EU in 2003, criticising the EU for subsidising sugar exports beyond the levels agreed on in the Uruguay Round World Trade organization negotiations. These nations were also restricted by high tariff barriers in the EU market.

They disputed measures included in the subsidisation of the export of 1.6 million tons of sugar from African, Caribbean and Pacific and Indian origin, which the EU used to export at subsidised rates because of the oversupply of its domestic market (South Centre, 2007:1). A WTO board and the Appellate Body ruled in favour of the complainants, compelling the EU to bring its domestic market policy into compliance with its WTO commitments. The transformation included a reduction in the EU sugar price by 36% over a four-year period beginning in 2005, along with a voluntary

transformation system that provided motivation for the EU's least efficient sugar manufacturers and sugar beet farmers to exit the industry (South Centre, 2007:1).

The ACP-EU Technical Centre for Agricultural and Rural Cooperation (2010) points out that the reform has resulted in a steady reduction in EU self-sufficiency in terms of sugar, and that the EU has consequently become a growing net sugar importer. This has had benefits for developing countries that sell their sugar on the open market. However, ACP countries under the SP experienced drops in their guaranteed export prices of 36%. ACP countries that signed Economic Partnership Agreements (EPAs) with the EU benefit from duty-free, quota-free access for their sugar (subject to a special safeguard mechanism setting a ceiling on total ACP exports of 3.5 million tons of white sugar equivalent, up to and including the 2015/16 season).

Developments with respect to international agricultural policies, which have resulted in the ongoing restructuring of the EU sugar market, will undoubtedly reshape the environment in which the Eswatini sugar industry operates. The European Commission (2012) reported that by 30 September 2015 there would be free market access for least developed countries under the Everything but Arms (EBA) initiative, subject only to an automatic EPA safeguard clause for ACPs that are not least developed countries. It was said that by 1 October 2015, there would be free market access for all ACP countries under EPAs, subject only to the general EPA safeguard clause. The objective of the EU sugar sector reforms was to facilitate added and enhanced market access for developing countries in the EU sugar market, and more market access for the least developed countries under EPA (European Commission, 2012).

The EU also wanted free market access for all ACPs (including SP countries) proposed in the EPA negotiations (ACP-EU, 2010). Sugar has played an important economic, environmental and social role in a number of SP countries (including Eswatini) and the new EU rules present a major challenge in that the ACPs that have been benefiting from higher prices will now have to accept even lower prices, hence reduced revenue (ACP-EU, 2010). Because of the sector reforms, smallholder farmers started experiencing major challenges in the sugar industry.

2.3.5 Challenges faced by smallholder sugarcane farmers

Sugarcane is a crucial commodity in the economy of many developing countries. It makes an important contribution to the livelihoods of many rural households. At Siphofaneni, in the Lowveld of Eswatini, sugarcane is the primary source of livelihood for many smallholder farmers. This is in line with a study by Sibiya and Hurly (2011) in KwaZulu-Natal, who observed that sugarcane production was a multi-livelihood strategy, especially in the rural areas. The importance of sugarcane for rural households is also recognised by Amritage *et al.* (2009).

A number of factors affect smallholder sugarcane farmers. According to a study conducted by UNCTAD (2009) in Eswatini, farmers have very little education, hence they are unable to use all the technology around them. Another issue affecting smallholder sugarcane farmers is lack of farming experience and business skills (Masuku, 2011).

Although sugarcane contributes largely to the economy, there has been a decline in production in most producing countries. In Eswatini, the industry is dominated by smallholder farmers; therefore, there is poor performance by farmers resulting in low revenue to mills and thus even lower returns to the farmer. In addition, according to a study by Dlamini and Dlamini (2012) in Eswatini, sugarcane yields are affected primarily by the distance to the mill, fertilizer application and the amount of labour employed. On the other hand, in Zimbabwe, low productivity levels were attributed to failure of the farmer to remove old cane from the field, inadequate farming experience and training in good management practices (Chidoko & Chimwai, 2011).

2.4 Summary

According to this chapter, the agricultural sector in Eswatini has a significant effect on the economy, as it is the major contributor to GDP and the main source of livelihood for many rural households. It is also evident that sugarcane farming in Eswatini is the leading net exporter and thus generates revenue for the country. The chapter also highlighted sugar sector reforms and the challenges smallholder sugarcane farmers face in the sugar industry. Lack of skills, education and experience are some of the major challenges that farmers face.

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CHAPTER 3

CREDIT ACCESS AND ITS DETERMINANTS

3.1 Introduction

This chapter presents a brief overview of the financial sector in Eswatini. It also presents detailed literature on the role of financial services, the factors affecting access to credit and strategies to improve access to credit by smallholder farmers.

3.2 The Role of credit in agricultural development

Previous studies have revealed that credit access has a positive impact on growth at both household and national level (Beegle *et al.*, 2003; Burgesss & Pande, 2004; Deheja & Gatti, 2002; Jacoby, 1994; Klapper *et al.*, 2004). On the other hand, studies by Kumar and Francisco (2006), Levine (2004) and Pandula (2011) have pointed out that smallholder farmer face constraints when accessing credit which lead to a negative impact on farming activities and incoming generating enterprises. It is impossible for smallholder farmers to grow and expand without access to credit. Provision of credit to smallholder farmers enhances their efficiency to increase production (Mushunje & Belete, 2001). According to SASIX (2007), support services are also recommended in achieving desired results in the growth and development of smallholder agriculture.

Zeller and Sharma (1998) have stated that to ensure an improved economic climate for poverty alleviation and growth, it is important to provide adequate rural credit. In most developing countries, credit is an important instrument in enhancing the standard of living for poor households through consumption smoothing and improved production capacity (Binswager & Khandker, 1995).

Rural poor households are the group with the highest demand for credit to ensure productive investment. These households are risk-averse, and credit therefore enables them to overcome liquidity constraints (Mamba, 2016). Through the provision of credit, rural poor households are able to partake in agricultural activities and invest in projects that would increase overall production and income, while also creating employment opportunities. This type of credit is usually provided by formal financial institutions such as commercial banks.

Formal financial institutions provide credit mainly for consumption purposes, which usually has a long-term positive impact on the overall productivity of households, allowing acquisition of skills and improvement of health. According to Masuku (2010), agricultural credit is an important tool in modernisation and commercialisation of agriculture for the rural economy. Credit is a vital element for any business, especially agriculture, which has been a non-monetary activity for rural households.

Shetty (2008) further complements this view by stating that capital is very important even if it comes in small amounts because it can be used to enhance the farm or business enterprise, i.e. buying inputs such as seed and fertiliser. This may help alleviate poverty in the rural economy as it enables people to sustain their living through their business earnings. It is important to implement such strategies that ensure no credit constraints like interest-free loans or low interest rates affect the rural economy. This is the main way that the cycle of poverty can be broken (Shetty, 2008).

This is to say, the quickest way to boost agricultural production is through the provision and introduction of cheap and easy credit for the rural economy. Availability of credit speeds up the adoption of new technologies which in turn encourages increased agricultural productivity and distribution of income in the rural economy (Lapenu, 2000).

Since agriculture transitions from subsistence to commercial farming are due to seasonal variations in farmers' produce, there is greater need for credit within the sector (Lapenu, 2000). Credit has an overall positive impact on the growth in productivity of farmers. Farmers with access to credit are associated with higher input expenditure and productivity growth than farmers who do not have credit (Mamba, 2016). According to Abedullah *et al*. (2009), in a study in Pakistan, institutional credit has a positive impact on overall agricultural production.

Additionally, according to Ali (2007), in order to achieve higher agricultural production and productivity in developing countries, it is important to provide adequate funds to the rural economy. Mamba (2016) states that if agricultural production is assembled under a straight sequence of high returns, savings, capital formation and less reliance on government, then higher agricultural production and investment could be achieved. The availability of credit enables farmers to expand

their farm holdings and use advanced technological tools to modernise their production methods. Ali (2007) states that access to credit for farmers will allow the use of new technologies, which will enhance production and thus generate higher incomes.

According to Diagne and Zeller (2001), credit is crucial for rural poor households because it helps them acquire adequate food and basic needs for the family. With the availability of credit, the rural households are able to venture into investment opportunities that may be profitable and hence generate income for the family. Diagne and Zeller (2001) further state that the availability of credit enables farmers to invest in new technologies, such as the use of drought-resistant and high-yielding crop varieties and fertiliser. This then increases the overall income of the farmers. The availability of credit and savings also helps rural households that do not own land to establish and expand family businesses, which enhances poverty alleviation and economically secures life.

Provision of rural finance is crucial, as it facilitates farmers' access to improved technologies and inputs, thus improving agricultural productivity (Zeller & Sharma. 1998). Access to irrigation equipment, access to information on new technologies, high-yielding inputs, access to market information (prices), infrastructure (roads and storage facilities) and land tenure systems are some of the factors that determine agricultural production (Zeller & Sharma. 1998). The availability of credit to farmers allows easier access to these production factors, which improves overall agricultural production. However, most smallholder farmers and rural households do not have access to credit because of lack of collateral and inadequate farm size to serve as surety to acquire a loan from a formal commercial bank.

Zeller and Sharma (1998) further state that availing credit to farmers who have small farms, are not in perfect health or lack experience hinders development. Their low productivity would lead to a lower return on investments. For this reason, Freedom from Hunger in Ghana, the Bangladesh Rural Advancement Committee (BRAC), and the Grameen Bank in Bangladesh offer financial services in combination with basic literacy programmes, training in enterprise management and education in

nutrition and health programmes to increase the likelihood of productivity for farmers who receive loans.

According to Mohamed (2003), the use of proper agricultural inputs, technological change and technical efficiency increases agricultural growth. Credit plays a crucial role in many developing countries such as Eswatini in enhancing agricultural productivity. Mohamed (2003) further argues that technological change is the result of newly acquired technical efficiency through which new technology is adopted and used more rationally. This is affected by information flow, improved infrastructure, farmers' experience and the availability of funding. Funds for this could come from farmers' own savings or loans (Mamba, 2016). In many developing countries credit is an important input, combined with modern technologies for higher agricultural productivity.

According to the FAO (2014), income for the rural people in Eswatini is derived mainly from farming activities. About 66% of the population live below the poverty line and cannot provide for their basic needs; 43% of the population live in extreme poverty (FAO, 2014). A number of factors prevent the smallholder farmers living on SNL to break out of poverty (Mamba, 2016). These are among others difficulty in accessing roads, poor linkages to markets for farmers, limited availability of irrigation water, climate change and lack of access to credit from formal commercial banks. These factors have contributed significantly to low agricultural productivity (Mamba, 2016). It is therefore important that any strategy put in place to improve income for rural households should include access to credit for smallholder farmers.

3.3 Financial services for smallholder farmers

Financial constraints are major obstacles that hinder the development of smallholder farmers. The lack of finances to fund operations has been a challenge for many smallholder farmers in developing countries. According to Diagne *et al.* (2000), provision of credit is a very important tool for poverty eradication and public institutions are requested to offer these services to smallholder farmers. Access to finance and the ability to employ sound business management principles is crucial in the economic success of smallholder farmers (Olawale & Garwe, 2010).

The results of a study by Sibiya (2014), carried out in KwaZulu-Natal in South Africa among poultry farmers, show that agricultural growth and development are affected by limited access to credit, unreliable markets for farmers and high transaction costs incurred. Therefore, financial services play a crucial role in enterprise growth and development. In addition, it increases smallholder farmers' investment opportunities (Kalinda *et al.,* 1998).

Kalinda *et al.* (1998) argue that the availability of credit is important, even if it is short-term credit to the farmer. Short-term credit enhances the bargaining power of smallholder farmers; they are then able to buy inputs such as fertilisers, improved seed and chemicals for their farms and thus increase production. Many smallholder farmers have difficulty in obtaining credit because of institutional barriers, particularly women farmers. This statement is supported by Ani *et al.* (2009) in a study of the contribution made by women in the production of groundnuts in Nigeria. They suggest that policies in the financial sector should be reversed so that these also accommodate women to access credit.

According to Zeller and Sharma (1998), financial services should be combined with other complementary services to be effective. These services include basic literacy programmes, extension services and nutrition. Literacy programmes help educate the farmer.

Such programmes are very likely to increase the efficiency of financial services provided. The more educated the farmer is, the easier it is to transact financially (Zeller & Sharma, 1998). In Eswatini, smallholder farmers have limited access to formal financial services because they lack collateral (Masuku, 2011). This hinders development of the country as a whole.

In a study conducted in Ethiopia on determinants of smallholder farmers' access to formal credit, Yehuala (2008) found that improved access to credit had benefits for smallholder farmers. According to Yehuala (2008), many formal financial institutions limit the access of rural households to credit. Therefore, the only source of credit for rural households that rely on farming as their source of livelihood is informal money lenders. These informal money lenders provide small loans for short periods, basically for consumption.

It is therefore important to note that access to finance plays an important role in poverty alleviation and enhancing an economically stable life (Zeller & Sharma, 1998). When farmers have access to financial services, they are able to improve their farms through the use of high-yielding crop varieties, chemical inputs and agricultural technology. This in turn has a positive effect on the overall income of the farmers. The more productive smallholder farmers are, the higher the production and exports. In this way, more revenue is generated for the country, increasing its GDP (Zeller & Sharma, 1998).

According to the Mozambique Rural Finance Support Programme (2003), well-timed credit may help a poor household to make investments and thus enable producers to acquire more and efficient productive assets. According to Zeller and Sharma (1998), if an additional dollar spent on a credit-based programme reduces poverty by a greater amount than a dollar spent on a poverty reduction programme, then there is a need for redirecting resources to rural financing programmes. More money should therefore be channelled towards smallholder rural households to alleviate poverty and make resources available to rural communities. To ensure that appropriate credit-based programmes that improve access to credit are successfully implemented, it is important to understand why smallholder farmers have limited access to credit from formal financial institutions (commercial banks).

Access to credit by smallholder farmers in many developing countries is disappointing. According to Gonzalez-Vega and Graham (1995), a few smallholder farmers have received loans from formal commercial banks in many developing countries. This implies that some of these countries are making efforts to make credit available to smallholder farmers, but this is not enough. Statistics show that 5% of farmers in Africa are financed through formal credit schemes against about 15% of farmers in Asia and Latin America (Gonzalez-Vega and Graham (1995). In a study conducted by Nguthi (2008), in an area of Maragua in Kenya, 16% of smallholder farmers had access to credit and the remaining 84% had none. This was merely because they did not have anything to use as collateral to obtain a loan from a formal financial institution.

3.4 Access to credit by smallholder farmers in Eswatini

The on-going perception in Eswatini is that formal commercial banks are unwilling to lend smallholder farmers (Msibi, 2009; Mavimbela *et al.,* 2010). This is mainly because smallholder farmers are considered to be a high risk and they do not have collateral to meet the banks' requirements. According to Msibi (2009), smallholder farmers increase transaction costs for formal commercial banks and they tend to borrow very small amounts. This is supported by Mavimbela *et al.* (2010), who state that smallholder farmers' loans are small and do not justify the transaction costs incurred by the banks.

Microfinance institutions and development finance institutions (DFI) are responsible for smallholder farmers' funding (CBS, 2012). In Eswatini, agricultural finance is provided by three main DFIs. These are Swazi bank, Eswatini Industrial Development Cooperation (SIDC) and Eswatini Development Finance Corporation. Institutions that also provide credit to rural households include the Inhlanyelo Fund (which is sponsored by Standard Bank Eswatini) and the World Vision, which operates in extreme poverty-stricken areas (Msibi, 2009). Other institutions that provide credit to smallholder farmers are farmer associations (FAs) and cooperatives.

There are four main commercial banks in Eswatini and one building society bank. Three of these banks are subsidiaries of South African banks, namely Nedbank Eswatini, Standard Bank Eswatini and First National Bank Eswatini. The commercial bank lending comprises short to medium-term loans to the agricultural sector, mainly the sugar industry. The Eswatini Building Society Bank is the major provider of long-term mortgages for TDL properties and has recently started lending on SNL properties (CBS, 2012). Eswatini also has about 256 non-banking institutions and 56 savings and credit cooperatives (ROSCAS, SCCO) (SACU-Kingdom of Eswatini, 2009). Moreover, one formal commercial bank, Nedbank Eswatini, has recently joined forces in financing commercial agricultural activities and the rural economy (SNL), although the financing is mostly for sugarcane production (CBS, 2012).

According to Masuku (2010), access to credit for smallholder farmers in Eswatini is mainly granted by the Swazi bank. The results indicated that about 58% of the farmers sourced credit from Swazi bank while 17 % sourced credit from the Eswatini Building Society. The majority of the rural population used cooperatives and informal institutions to access credit. About 29% of the rural population sourced credit from non-governmental organisations and 30% from friends, relatives and moneylenders (informal sources). It can therefore be concluded that the major source of credit for smallholder farmers is informal financial institutions and the statutory bank (Mamba, 2016).

In many developing countries, smallholder farmers and the rural economy have always had difficulty in obtaining credit from formal commercial banks. This was revealed in a study by Jessop *et al.* 2012), who found that most farmers in developing countries had limited or no access to any form of financial services. This had a major impact on their technical efficiency. It is therefore difficult for farmers to invest in agricultural technology, as they do not have enough income to buy inputs, which poses great difficulty on expansion. The limited availability of credit is one of the reasons for low agricultural productivity in Sub-Saharan Africa (Jessop *et al.,* 2012).

The inadequacy of credit has been a problem for years. In spite of government intervention, the supply of and demand for credit remain pressing matters in terms of the types and volume of services (Mamba, 2016). Government interventions have been unsuccessful in solving these issues (Jessop *et al.,* 2012). Nevertheless, there have been innovations in agricultural finance that have generated renewed interest in the agricultural sector. These interventions include value chain financing, microfinance and warehouse receipts to facilitate access to credit for smallholder farmers.

Rural households and smallholder farmers do not have many funds to invest in income-generating production activities, hence they are trapped in extreme poverty; this issue has been addressed by many smallholder credit schemes (Wetengere & Kihongo, 2012). Increased agricultural output was a result of positive correlation between borrowers, lenders and expenditure on new technological inputs (Wetengere & Kihongo, 2012).

Lack of financial services available to smallholder farmers is one of the factors affecting the benefits they might derive from credit facilities, together with the policy requirements of formal financial institutions (Swain, 2007). According to Swain (2007), the constraints experienced by farmers are: requirements for collateral, minimum loan amounts, application procedures, interest rates and restrictions on credit for certain purposes. This is evident from the low loan portfolio for credit; for instance, in Zambia it was 19% and in Kenya and Ghana it was 5% and 6% respectively (Jessop *et al.,* 2012).

Lack of credit has been a major challenge to agricultural development and poverty reduction in Eswatini (Msibi, 2009). According to Msibi (2009), the government of Eswatini has taken into consideration the lack of credit and has made means to enhance agricultural production through provision of finance from the African Development Bank to formal commercial banks with the sole purpose of creating employment opportunities and improving economic development. Nonetheless, formal commercial banks are still reluctant to give credit to smallholder farmers because agricultural business is still perceived as very risky in nature.

According to the MoA (2012), the agricultural sector is underfunded, especially farmers on SNL, but also other agricultural activities. Access to credit for smallholder farmers (producing on SNL) granted by formal commercial banks is limited. However, large-scale commercial farmers and TDL have access to credit and have a long-standing relationship with commercial banks (Swazi bank, 2011). The Swazi bank is a half government-owned entity (parastatal) that provides credit to the agricultural sector at subsidised interest rates and has put in place requirements that exclude smallholder farmers from accessing credit from the institution. The provision of collateral is one of the requirements when accessing credit from a formal financial institution, which in most cases smallholder farmers do not have (Swazi bank, 2012).A majority of smallholder farmers lack collateral and hence have limited access to credit from formal commercial banks in Eswatini.

According to the FAO (2014), poverty prevalence was reported to be about 69% and yet rural households were still expected to produce food for their families to aid in poverty reduction within the

rural economy. Smallholder farmers with access to credit are exposed to new technologies and use of high-yielding varieties, whereas a shortage of credit lowers agricultural production (FAO, 2014). According to Dlamini (2000), one of the factors affecting adoption of new technologies is credit and this factor is very important for production and investment in income-generating activities.

3.5 Determinants of access to credit

The use of new technologies by smallholder farmers is constrained by lack of financial capital. Research has shown that smallholder farmers with limited access to credit use fewer high-yielding varieties and invest in fewer high-quality products (Etonihu *et al.,* 2013). In rural areas of many developing countries, access to credit is limited; even when financial services are available; interest rates are quite high, making it impossible for smallholder farmers to access credit. The requirement for collateral, which most smallholder farmers do not have, is another factor affecting access to credit in many developing countries (Mamba, 2016).

According to Mohamed (2003), age, education, gender, income and degree of awareness of available financial services are the most important factors affecting access to credit from formal and quasi-formal financial institutions. Contrary to socio-economic factors affecting access to credit, Yehuala (2008) employed a logistic regression to find the determinants of smallholder farmers' access to credit in Ethiopia. The results indicated that extension services, experience in credit use from formal sources, farm size, collateral, membership to an FA and number of livestock owned were the major factors affecting smallholder farmers' access to formal credit.

In another study by Chauke *et al.* (2013), farmers' access to credit was influenced by the need for credit, farmers' perception of loan repayment, lending procedures, assets possessed by the farmer, extension programmes, distance between lender and borrower and the farmers' attitude to taking risks. Mohamed *et al.* (2013) conducted a study in Northern Ghana and employed a logistic regression to analyse the factors affecting credit available to members of farmer-based organisations (FBO). The results of the study indicated that the FBOs' homogeneity, trust, network, collective action and respect

for contracts were the major factors affecting access to credit for members. Mohamed *et al.* (2013) further concluded that social capital is the main factor affecting access to credit for FBOs.

Etonihu *et al.* (2013) used a stepwise linear regression to find out the connection between socio-economic factors and degree of credit access among smallholder farmers in Nigeria. The results of the study indicated that the education level of farmers, type of credit sources and the distance between source and borrower were significant factors affecting the degree to which smallholder farmers can access credit in the study area. These findings were similar to Dzadze *et al.* (2012), who also found that extension services, farmers' education level and ownership of an account had a significant influence on access to credit for smallholder farmers

Another study by Muhongayirea *et al.* (2013) employed a binary logit to determine the likelihood of farmers taking part in formal credit markets. The results revealed that level of education, farm income and extension services increased the likelihood of participation, while the presence of informal financial markets decreased the likelihood of participation in formal credit markets. The results achieved by Vuong-Quoc (2012) also revealed that human capital endowments, household size, marital status and distance to market influenced both the probability of borrowing and the amount of credit borrowed in Vietnam.

There are quite a number of socio-economic factors influencing access to formal credit for smallholder farmers (Mohamed & Temu, 2009). Mohamed and Temu (2009) found that having a bank account, assets (land or livestock), farm income, adoption of new technologies and the number of sources of credit significantly affected access to formal credit. Masuku (2010) concluded that one way to facilitate smallholder farmers' access to credit is improving the lending procedures so that they are flexible enough to incorporate smallholder farmers.

3.6 Summary

This chapter reviewed literature on the role of credit in agricultural development and access to credit by smallholder and sugarcane farmers. The overall objective of the chapter was to review literature on access to credit for smallholder farmers in Eswatini and international experiences on access to credit.

The determinants of access to credit were also outlined in the chapter. From the literature, it can be concluded that education level, sources of credit, off-farm income, extension services and distance to credit sources were the major factors affecting access to credit for smallholder farmers.

CHAPTER 4

CREATION AND ROLE OF THE EU GRANT FUNDING

4.1 Introduction

This chapter describes the creation and role of the EU grant funding. It also shows how the introduction of the EU grant funding in the structure of the sugar industry was crucial in enabling smallholder farmers to gain access to credit from formal commercial banks as well as the development of the area and smallholder sugarcane farmers.

4.2 The EU Grant funding

The EU is the biggest market for Eswatini's sugar in terms of earnings (SSA, 2014). Ongoing changes in the EU sugar sector further exacerbate the plight of the Eswatini economy, which is already experiencing a host of other economic quandaries, ranging from low economic growth to high levels of unemployment and poverty. The EU grant funding was initiated after Eswatini experienced counterbalancing threats to the sugar industry (MEPD, 2009). These threats included reduction in the EU SP preferential prices, rising smallholder farmers' indebtedness and capital flight since investors were moving their assets to enterprises in South Africa. Mechanisms to adapt to the EU sugar price reforms were presented in the National Adaptation Strategy.

One of the objectives of the EU grant funding was to support Eswatini's rural development and poverty reduction strategy by involving smallholder farmers in the activities of a long-standing successful sugar industry (MEPD, 2009). Another objective was to ensure that sustainable land development was facilitated, appropriate irrigation systems were procured and installed for smallholder sugarcane farmers with the provision of critical financial and technical support was provided to the farmer (MEPD, 2009). The overall objective was to support Eswatini to adapt to the EU sugar sector reforms. The purpose was to enhance the profitability of smallholder farmers. Enhancing profitability meant that the financial viability of smallholder sugarcane farmers remained sustainable. The banks and financial institutions tailored appropriate financing packages to meet the needs of smallholder sugarcane farmers. Through this support, Eswatini was able to maintain its sugar

production efficiency rating in the face of falling sucrose prices and increasing international competition.

The project started in 2009 and was implemented by the European Commission through the Delegation in Eswatini (MEPD, 2009). The EU contributed £14 895 to smallholder sugarcane farming; the beneficiaries did not contribute any amount. Implementation took place in two phases in which the principal activities were carried out. The first phase commenced with the coming into force of the financing agreement and ended 24 months before the end of the execution. The second phase entailed final audits and evaluations carried out and contracts for the implementation of the financing agreement being technically and financially closed (MEPD, 2009).

In order to apply for grant funding, farmers on SNL were grouped into FAs. According to the MEPD (2009), the EU provided grants to 32 FAs in the southern area and six FAs in the northern area of Eswatini. The programme provided financial assistance for land and irrigation equipment along with technical and business management training, which were critical elements to leverage smallholder sugarcane enterprises back into profitability. The EU provided FAs with 75% grant funding, which was for the development costs through procurement of irrigation equipment and land preparation work (MEPD, 2009). The remaining 25% was provided by the FAs through own resources or loans from formal financial institutions. The project assisted the FAs with the preparation of farm plans and ensured that all applicants had the necessary enabling documentation, i.e. evidence of access to land, a water permit and sucrose quota. This documentation was also used by the smallholder farmers when applying for a loan from commercial banks (MEPD, 2009).

A maximum of two hectares of land per household was developed for sugarcane farming. Considering the average size of smallholder farms at 1.7 hectares, the implementation of this project was expected to reduce investment costs for smallholder sugarcane farmers from E80 000 to E32 000, corresponding to a similar reduction in debts and related interest (MEPD, 2009). Coupled with sympathetic loan packages from formal financial institutions, it meant that each household would have access to cash income each year to cover family needs.

The project helped farmers to become financially viable. Farmers were then able to access credit in formal financial institutions; however, this was limited to those who were funded by the EU (SWADE, 2013).

The main purpose of the EU grant funding was to ensure farmers' access to agricultural credit. The EU fund was set up with the sole purpose of providing a guarantee in respect of loans granted by any bank for agricultural purposes (MEPD, 2009). Mavimbela (2010) noted that the EU grant funding was formed with the sole objective of encouraging financial institutions to lend funds to those engaged in sugarcane production activities with the aim of enhancing the export capacity of the nation, as well as local consumption. According to Terry and Ogg (2017), given that all sugarcane growers farmed SNL and had no title deed to the land allocated to them, they would have found it extremely difficult, if not impossible, to obtain a loan to fund capital development from formal commercial banks. The introduction of the EU grant funding in the structure of the sugar industry was therefore crucial in enabling smallholder farmers to gain access to credit.

The funds were disbursed to farmers through SWADE LUSIP. The extension officers were responsible for providing information from land preparation through the production season and harvesting (MEPD, 2009). The mill provided a guaranteed market for the product and was responsible for distributing the 'sugar cheque' to the growers and, as a consequence, credit was provided to farmers on SNL. As the number of FAs expanded, DFIs such as the SIDC, the Enterprise Trust Fund and the CBS began to play a greater role in lending (Terry & Ogg, 2017). The DFIs were willing to lend money to the farmers, under the provision that the newly established FAs or individuals had acquired a quota to grow sugar, had a licence to extract water and occupied land suitable to grow the cane, and that the mill would oversee sugarcane husbandry on the newly created farms. After seeing the success of the smallholder sugarcane production, formal commercial banks were interested in lending to smallholder farmers, but with the EU as the sole guarantor for the loan (Terry & Ogg, 2017).

4.3 Operation of the EU Grant

The EU grant funding has the potential to increase access to credit from formal commercial banks and to enhance production for smallholder sugarcane farmers. According to the Government of Eswatini (2007), the role of the EU grant funding is to influence formal commercial banks to allow access to credit for smallholder sugarcane farmers. On the other hand, SWADE is responsible for disbursing the funding from the EU to the farmers and providing extension officers that would help the farmers throughout the production period. These farmers are constrained from accessing credit from formal commercial banks by socio-economic factors such as age, gender, education level of the farmer, farming experience, farm size, and farm and non-farm income (Terry & Ogg, 2017).

The overall expected outcome of allowing access to credit for smallholder farmers would be that the smallholder sugarcane farmers will increase production and thus efficient and effective management of the farm to get the highest returns (Terry & Ogg, 2017). *Figure 4* represents the flow in which the funds move from the disbursing team to the farmer and shows the effect of the provision of credit to smallholder sugarcane farmers.
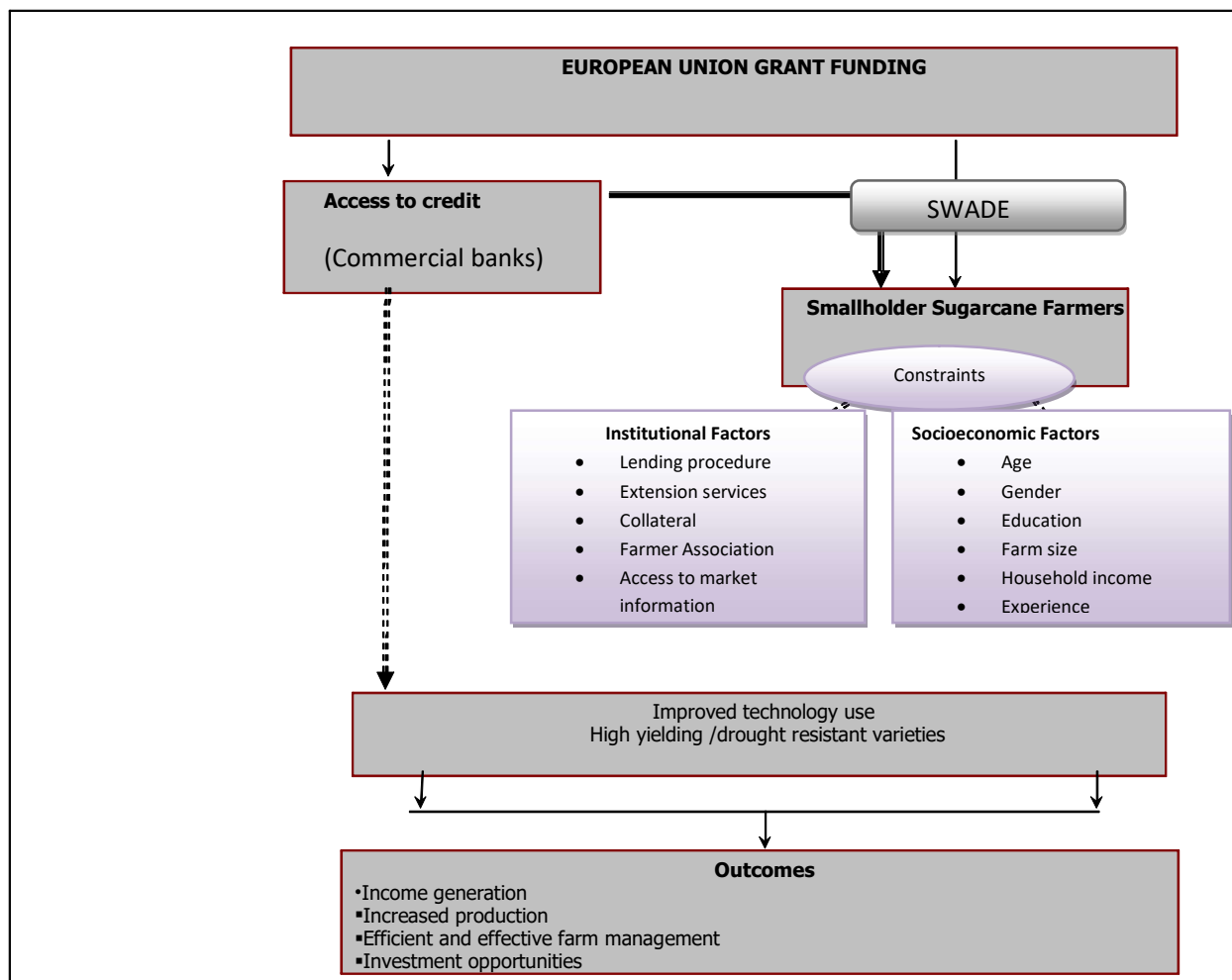
Figure 4: Operation of the Grant

Source: Author's construct (2017)

4.4 The Eswatini Water and Agricultural Development Enterprise

According to the MEPD (2008), the development of SWADE was intended to provide social and technical elements to smallholder sugarcane farmers who had sugarcane fields on SNL. The first part of the project was to develop the community through empowerment and knowledge sharing. The second part was to provide technical and financial advice to facilitate change from subsistence farming to commercial farming (Terry & Ogg, 2017).

It is important to note that these farmers were growing crops mainly to feed their families and only a small proportion was intended for sale in the market. The sales did not bring in much revenue for the

farmers. The main role of SWADE after development and technical assistance therefore, was to create independent business units that would alleviate poverty in the region, since most of these farmers were living below the poverty line before the developments.

The development of SWADE and the Komati Downstream Development Project (KDDP) covered many other small projects that were happening in the area and because of their size; they held major risks (Terry & Ogg, 2017). According to Kerr and Macdonald (2016), the EU SP premium had resulted in an income transfer worth 6.97% of GDP to the economy of Eswatini compared with 0.56% for Malawi and 0.24% for Zimbabwe. The issues in the area had already developed even before SWADE and KDDP commenced. For instance, there were job reductions owing to the fact that many businesses decided to merge to achieve economies of scale.

In 2003, there were reforms of the internal EU sugar market, set by the SP by Australia, Thailand and Brazil. According to Terry and Ogg (2017), the WTO undermined the expansion made by Eswatini to increase production of sugarcane; they demonstrated overreliance of KDDP and LUSIP on the sugar industry as their main source of income. Terry and Ogg (2017) also state that Eswatini was one of the countries at the greatest risk from the changes to the SP.

The first reform was in 2006 and the EU price decreased by 36%, hitting Eswatini harder than any of the other countries in 2009/10. In 2007 the EU established the Accompanying Measures for SP to support the ACP group sugar exporters, which was implemented through the country's National Adaptation Strategy. In 2010, world sugar prices recovered, which had a positive impact on FAs (Terry & Ogg, 2017). Dividends were shared among farmers, but those with debts earned very little since they had to pay their debts. According to Terry and Ogg (2017), these two projects were considered in the context of the economic shock and measures put in place by the EU and other agencies to enable the industry to become more competitive in a liberalised sugar market.

The SSA (2006) reported that the first reduction in revenues from the EU market was realised during the period of the strengthening of the Lilangeni. This was linked to the South African Rand during the decline in the exchange rate between the Euro and the Rand. In 2002 and 2005, there was a reduction

in Lilangeni for every Euro that was earned on the sale of sugar in the EU (37% less was received). This led to a 21% decline in the amount paid for smallholder farmer's sucrose (SSA, 2006).

The decline had a negative impact on the sugar industry in Eswatini. A study by Richardson (2012) to investigate the impact of the EU sugar policy and the experience of Eswatini revealed that the effects of the 2006 reform were felt by three groups. The first of these comprised smallholder sugarcane farmers who were affected by the decline and could not pay off their debt. The second group was employees, as retrenchment and outsourcing occurred to reduce labour costs, and the last group was the community that relied on services provided by the mills, e.g. health centres and education facilities.

4.5 The LUSIP

The major objective of the LUSIP was to enhance development and alleviate poverty in the community of Siphofaneni, located in the Lowveld of Eswatini. Most of the people in Siphofaneni were living below the poverty line before the development of LUSIP, as most farmers were subsistence farmers (SWADE, 2013). Commercialisation of farms started after the development of SWADE, KDDP and LUSIP and the goal was to reduce poverty by diversifying production and improving potable water and sanitation to scheme members. This development was one of the successful rural projects in the area.

According to the MEPD (2005), The LUSIP project commenced with the start of the construction of dams forming an off reservoir impounding water diverted from wet season flows in the Usuthu River. The project was designed to irrigate 11,500 hectares of land. Of the 6,500 hectares to be completed in Phase 1, around 51% was achieved, comprising 2,050 hectares of sugarcane and 321 hectares of alternative crops. The development of the project was a challenge because of traditional authorities in the area. The Siphofaneni area is mostly headed by chiefs and this meant that permission had to be granted before the project could be implemented. Negotiations were undertaken in an attempt to ensure even benefits to all parties involved (chiefs and farmers) (SWADE, 2013). According to the

MEPD (2009), the cost of the project was one and a half times more than the original estimate because of restructuring and delays in work.

The government of Eswatini was a major participant, contributing about 51%, with eight other funders that contributed 46% and the beneficiaries who contributed 3% (MEPD, 2009). The majority of the farmers were excited by the development and were looking forward to joining the schemes. The chiefs were also supportive of the development. As a result of the increased sugarcane production, the Ubombo mill had to expand its processing department. The cost of the expansion was paid for by Illovo, a South African transnational cooperation owned by Associated British Foods.

4.6 Summary

The objectives of the projects were presented in this chapter. The creation and development of SWADE were intended to provide technical and financial advice to facilitate change from subsistence farming to commercial farming. LUSIP's objective was to enhance development and alleviate poverty in the community of Siphofaneni. Overall, the objective of the EU grant funding was to ensure that sustainable land development was facilitated. It also ensured that appropriate irrigation systems were procured and installed for smallholder sugarcane farmers through the provision of critical financial and technical support. The operation of the EU grant funding also indicates how it affects the livelihoods of smallholder farmers and highlights the constraints that these smallholder sugarcane farmers face.

CHAPTER 5

IMPACT ASSESSMENT AND THE CONCEPT OF PROPENSITY SCORE MATCHING

5.1 Introduction

This chapter presents literature from previous studies that analysed impact assessment and used propensity score matching (PSM) to analyse the impact of participation in the programme. PSM is defined and outlined in this chapter. PSM is compared to other evaluation methods to motivate its use.

5.2 Impact assessment

According to Ogola (2007), impact assessment is the measurement of the effectiveness of a programme and the significance brought about by interaction with the programme. Impact assessments are focused on a strict and more tightly defined set of significant results, presenting a more detailed and clearer picture of the results of the programme intervention (OECD, 2014). This is seen more clearly in studies that focus on the economic significance of an intervention. There are quite a number of definitions of impact assessments, but the essence of the impact analysis is to determine the causation from intervention and measure or describe changes witnessed along the chain (OECD, 2014).

Impact assessments are specific and limited to the observed effects of intervention that have been predicted; they can also omit unexpected effects or undesirable effects anticipated by the designers of the interventions (OECD, 2014). According to Pali *et al.,* (2010), the impact assessment of a programme or policy is the variance between the results of the programme that are detected and the results that would take place without the programme, which is called counterfactual, as shown in *Figure 5* below*:*
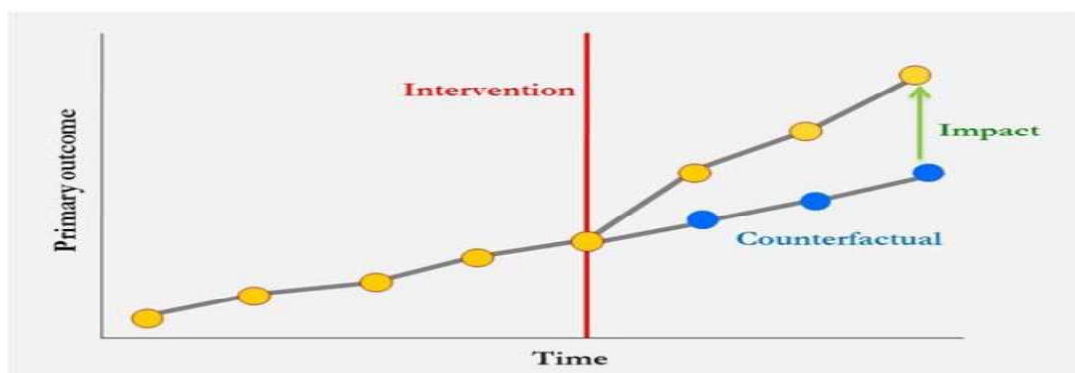
Figure 5: Illustration of a Counterfactual

Source: Pali et al., (2010)

The sustainability of a project is seen through the impact it has on productivity where the project is implemented and the impact it has on livelihoods after the termination of the project. PSM has been used in a number of studies (e.g., Samson *et al.*, 2008; Neves *et al.*, 2009; DSD *et al.*, 2012) to estimate the impact of social grants on different outcomes (e.g., nutrition, school attendance and hunger) in South Africa. Other studies that have also applied PSM to analyse impact assessment are those of Davis *et al.* (2010). Those studies analysed the impact of training programmes on farmers' productivity using PSM. Robson (2011) employed PSM to assess the impact of time limited discounts on fertiliser adoption in Western Kenya and Karlan *et al.* (2011), also used PSM to assess the impact of cash grants and indemnification on farmers' investment patterns in Ghana. Other studies used PSM to control for self-selection bias (Faltermeier & Abdulai, 2009; Akinola & Sofoluwe, 2012; Amare *et al.,* 2012; Mapila *et al*., 2012; Matchaya & Perotin, 2013), to measure the impact of the intervention.

5.3 Propensity Score Matching

Rosenbaum and Rubin (1983) define PSM as the probability of an element being assigned to a treatment given a set of covariates. Rosenbaum and Rubin (1983) further state that the propensity score is used to minimise selection bias by associating groups based on covariates. In statistics, PSM is a matching technique that estimates the effect of a treatment group intervention policy or programme by accounting for covariates that previse receiving the treatment. One way in which PSM

reduces selection bias is by confounding variables that could be found in an estimate of a treatment group effect obtained by comparing resulting outcomes among units that received treatment to those that did not receive any treatment (Rosenbaum & Rubin, 1983). Paul Rosenbaum and Donald Rubin were the first people to realise this technique and implement it in observational studies.

The main advantages of analysis using PSM is that it uses a linear combination of covariates for each score and balances treatment and control groups on a greater number of covariates without losing a large number of observations (Rosenbaum & Rubin, 1983). To overcome the dimensionality problem, it is important to have a large number of observations if the treatment and control are balanced on a large number of covariates.

According to Essama-Nssah (2006), in order to assess whether an intervention or programme is having the intended effect, it is important to use reliable methods, hence the need for effective development policy-making. Consequently, there should be an effective relationship between policy makers and impact analysis. When an intervention is undertaken, it is important to define its effectiveness. Policy makers are then able to use this information to modify or cancel ineffective and inefficient programmes and thus save resources (Grossman, 1994). Essama-Nssah (2006) further states that impact assessment of a programme needs a model of causal inference. Holland (1986) supports this statement and specifies that the effect of a cause can only be understood in relation to another cause. This is the same idea as the economic principle of measuring the return on a resource employed in one activity relative to its opportunity cost (Essama-Nssah, 2006).

According to Holland (1986), in a scenario involving two causes, participation and non-participation in a programme, a statistical model applicable to the casual involves the population in which the programme is running, for instance households, regions and individuals. It also assumes that units are exposed to the programme, i.e. *d=1* for exposure and zero otherwise. Thirdly, a set of variables represents pre-exposure to the programme; these are called *x* and all unobserved variables are called **ε.** Fourthly, *y(d)* represents the potential response from the programme intervention, which stands for

two potential responses. These may be exposure or non-exposure and are given by $\mathbf{y_1}$ under exposure, and $\mathbf{y_0}$ if there is no exposure (Holland, 1986).

In the above framework, the effect of participation on unit i is measured with respect to non-participation on the basis of the response y. This equation can be called g_i, then $g_i = (y_{1i} - y_{0i})$. It is however impossible to contemplate the value of the response variable for the same person under two common exclusive states of nature (Essama-Nssah, 2006).

According to Holland (1986), if the causal inference has a problem, it makes it difficult to observe the effect of participation on unit i. This is the reason why evaluation methods are considered to deal with the missing data problem. If a programme intervention is restricted to a certain population, evaluation methods incorporate non-participants in search of missing data. They also identify certain events under which the use of information gives reliable results of the effect (Essama-Nssah, 2006).

The assumption of homogeneity, according to Holland (1986), symbolises an event where the effect on an individual i could be estimated. The response of a participant is a function of observable and non-observable characteristics, for instance, among programme non-participants and person j with similar characteristics to participant i. Therefore, under homogeneity, the result of the non-participant is a proxy for what would have happened to individual i if he/she did not receive the programme intervention. The effect of the programme intervention on i can be estimated as $g_i = (y_{1i} - y_{0i})$. Furthermore, the assumption of homogeneity can be comparable to the ceteris paribus theory used in economics (Essama-Nssah, 2006). It assesses the implications of heterogeneity. In programme intervention, one would expect that the response will not be the same for participants and non-participants, particularly when given the choice to participate or not (Heckman & Smith, 1995).

The major variable of interest is the mean impact of the treatment on the treated. This is known as the average treatment effect on the treated. In this case, treatment means being exposed to a particular cause of a social programme.

Say $g = (y_1 - y_0)$, then the average treatment effect on the treated can be written as conditional mean:

ATET = E (g |x, d =1) = E (y |x, d = 1) − E (y$_0$| x, d =1).   (1)

The missing data here relates to the counterfactual mean E (y$_0$| x, d =1). One might be tempted to use the mean outcome for non-participants E (y$_0$| x, d =0) as a proxy for the above counterfactual mean (Essama-Nssah, 2006). According to Heckman and Smith (1995), subtracting the mean feedback for non-participants from the mean outcome of the participants gives an estimate equating to the average treatment effect on the treated and selection bias. The problem of selection bias is caused by the failure of the assumption of homogeneity. Non-participants differ from participants with regard to the observable and non-observable characteristics each group may have and thus heterogeneity may exist owing to these observed and unobserved factors (Essama-Nssah, 2006).

There are ways of correcting selection bias among variables in a study and these may be experimental or non-experimental. In the case of experiments, the treatment is randomly assigned so that participation is statistically independent of potential outcomes (Essama-Nssah, 2006). Two groups are created, one of which comprises individuals who participated in the programme; this is called the control group and the other is called the treatment group. According to Heckman and Smith (1995), the mean outcome of the control group gives an acceptable estimate of the counterfactual mean if randomisation does not take place and if no close substitutes for the experimental programme are available.

They further argue that randomisation does not completely remove the selection bias problem, but it balances the two groups of participants and non-participants so that it cancels out when estimating the mean impact of the programme. Randomly assigning the treatment guarantees that the individual has the same chance ex ante of being treated (Essama-Nssah, 2006). It can therefore be concluded that dispersal of observed and unobserved characteristics before treatment is the same for both the treated and control group (Essama-Nssah, 2006).

According to Essama-Nssah (2006), for non-experimental events there is no direct estimate of the counterfactual mean compared to the mean based on randomisation. These estimators can therefore rely on a theory that originated from Rosenbaum and Rubin (1983) called PSM. PSM is an evaluation

method that matches the treated and non-treated groups on the conditional probability of participation, given the observed characteristics (Rosenbaum & Rubin, 1983). To avoid a biased estimate of the mean impact of treatment, it is important to use the control group.

5.4 Comparison with other evaluation methods

The area of interest is mainly a function of the observable and unobservable characteristics of the group, whether or not the group participated in the programme. According to Essama-Nssah (2006), there is a need for controlling all observable and unobservable characteristics when assessing the effect of a programme intervention. Failure to do so may lead to biasness of the results. Most evaluation methods are characterised in terms of how they eliminate bias in the results of a study.

According to Essama-Nssah (2006), in order to yield an unbiased estimate of average programme impact, it is important to make sure thant randomisation balances selection bias between particioants and non-participants. Therefore, it can be concluded that the process of randomisation ensures that programme particpants have the same characteristics, both observable and unobservable, as non-participants. The propensity score tries to generate conditions that are the same in an experiment by assuming conditional independence and restraining heterogeneity through the matching process. PSM is therefore a non-parametric evaluation method that deals with making sure there is no unobserved heterogeneity with variables (Essamma-Nssah, 2006).

There is a parametric analogue of PSM based on the switching regression model where the switching mechanism is assumed to be exogenous. The outcome equation is written as follows:

$$Y_i = X_i\beta + \theta\ d_i + [\ U_i + (U_{1i} - U_{0i})d_i]\qquad\qquad(2)$$

where: u_{si} = unobserved characteristics in

$s = 1$ and $s = 0$ for participation and non-participation respectively.

Equation (2) indicates the assumption that the programme effect for an individual with characteristics x_i and the coefficients β defining the relationship between observables and the outcome are varying to

participation. The variance of the treatment effect is called the common effect assumption (Ravallion, 2005; Blundell and Costa-Dias, 2000). Conditional independence means that the value of the last term is equal to zero and therefore the application of ordinary least squares (OLS) to equation (2) would give consistent estimates that are unbiased for the programme impact. The difference between the regression analysis and PSM is that regression requires specification of the relationship between the outcome, observed attributes and participation indicator, whereas PSM does not (Essama-Nssah, 2006).

PSM is not valid when there is repeated cross-section information on results and determinants (Ravallion, 2005). It also does not hold when the unobserved characteristics affect the outcome equation positively or negatively in the form of individual fixed effects (Blundell & Costa-Dias, 2000). Assume that the individual-specific and the macroeconomic components affect participation, while the temporal-individual-specific effect is independent of participation and observed characteristics. PSM in this case is not valid because the conditional independence assumption no longer holds (Blundell & Costa-Dias, 2000). Another method that can be used to eliminate unobserved characteristics is the difference-in-difference or double difference (DD).

In order to estimate the effect of the programme intervention using the DD, the control and treatment group difference outcome of each is taken before and after intervention, then the difference between the average change between participants and non-participants is computed. The first differencing steps eliminate the troublesome unobserved characteristics and restore conditional independence, while the second steps give the actual effect or impact estimate of the programme intervention (Blundell & Costa-Dias, 2000).

Conditional independence is established through the first differencing and one can use either regression analysis or PSM to control for observed heterogeneity. Bias in DD estimates is caused by failure to make comparisons in the region of common support (Essama-Nssah, 2006). When participation and outcomes are jointly determined, it is possible to specify a selection model including single participation and single outcome (Essama-Nssah, 2006). The instrumental variable approach

can be used to sort out part of the programme impact attributable to exogenous variation in participation.

This approach relies on the conditional independence assumption known as exclusion restriction (Essama-Nssah, 2006). Exclusion restriction needs the instrumental variable to be independent of outcomes given participation (Ravallion 2003). Instrumental variable estimation is a two-stage procedure that first estimates the participation equation as a binary model using probit or logit, just like PSM. The predicted value is then used as an instrument for a participation indicator in the outcome equation (2) and OLS is employed to estimate the impact of the programme. A robust identification strategy is to rely on both the nonlinearity of the first-stage estimation process and the exclusion restriction.

According to Monteiro (2004), a two-stage procedure suggests a regression-adjusted matching estimator that tends to produce asymptotically efficient estimates. The regression is based on the equation for outcome in the matched comparison group, $Y_{oi}=X_i\beta+U_{oi..}$ In this case, the following restriction is analogous to the conditional independence assumption:

$$\hat{U}_{oi}= (Y_{0i}-X_i\beta_0\hat{})\perp d_i|p(z_i) \qquad\qquad (3)$$

where: zi is the set of participation determinants, at least one of which must be excluded from the outcome equation. In this case, the impact estimator is:

$$\Theta_{mr}=\sum \omega_t[(Y_{1t}- X_t \beta_0\hat{})-\sum w(Y_{oj}-X_j\beta_0\hat{}) \qquad\qquad (4)$$

where:

$\beta\hat{}$ is the OLS estimate of the regression coefficients in outcome equation for the comparison group. Finally, Heckman's selection-correction method can be used to cope with heterogeneity bias (Essama-Nssah, 2006). The participation equation can be estimated based on the probit model. The results of this probit analysis can be used to compute the following consistent estimates of the inverse Mills ratios:

$$\hat{\lambda}_{ot}= \phi(Z_t\ \hat{Y})/1-\phi((Z_t\ \hat{Y}),\ \hat{\lambda}_{1t}= \phi(Z_t\ \hat{Y})/\phi((Z_t\ \hat{Y}). \qquad (5)$$

Maintaining the case of homogeneous impact described above, a consistent two-stage estimate of θ can be obtained by running OLS regression of yi on:

$$X_t,\ d_t, \sigma_{ue}[d_t\ \hat{\lambda}+(1-d_t)\ \hat{\lambda}_{0t} \qquad (6)$$

using all of the observations (Lalonde 1986). In other terms, the estimating equation is:

$$Y_1=X_1\beta+\Theta d+ \sigma_{ue}\ \hat{\lambda}_i+vi. \qquad (7)$$

Essentially, the two-stage estimator treats unobservable heterogeneity has a problem of an omitted variable, and this problem can be solved by including an estimate of the omitted variable as a regressor in the outcome equation along with the participation dummy and individual characteristics (Lalonde 1986). This comparison reveals how each method controls for observable and non-observable determinants of outcome besides participation. Randomization ensures that in the pre-intervention state, the distribution of these determinants is the same for both participants and nonparticipants. PSM assumes conditional independence to get rid of unobservable heterogeneity and controls for observed heterogeneity through matching on the propensity score. The conventional regression method is a parametric analogue of PSM. The DD method is a two-step procedure that relies on differencing to control for unobservable heterogeneity stemming from fixed effects, and on averaging to control for observed heterogeneity.

The IV method relies on regression analysis to control for observables and uses an instrumental variable to recover conditional independence. The Heckman approach is analogous to the IV method except that it interprets unobservable heterogeneity as an omitted variable problem. Thus, instead of using an instrumental variable for the endogenous dummy variable in the outcome equation, it adds an estimate of the omitted variable in the equation. It turns out that PSM can act as an effective adjuvant to all these methods.

5.5 Correlation

The correlation coefficients were determined to identify any variables that might be correlated and the variables which were found to be highly correlated were either matched or one of them was excluded from the model. Koustoyiannis (1973) stated that multicollinearity refers to the presence of linear relationships (or near linear relationships) among the explanatory variables. He argued that multi-collinearity is always present in sample data and the degree of its severity in the exogenous variable should be tested. According to Kennedy (1985), for no continuous variables, a value of 0.8 or higher in absolute terms in one of the correlation coefficients indicates a high correlation between the two independent variables. Gujarati (1995) contributed also by arguing that if the Variance Inflation Factor (VIF) of a variable exceeds 10 (this will happen if R2 exceeds 0.90), that variable is said to be highly collinear (rule of thumb) and it can be concluded that multicollinearity is a problem.

5.6 Summary

The chapter outlined literature on the various evaluation methods and the most suitable method. The propensity score was defined and the importance of the application of PSM to assess the impact of a programme intervention was pointed out. It may be concluded that PSM is advantageous compared to other evaluation methods because it balances the treated and control groups on a large number of covariates without losing a large number of observations. A brief description of the impact assessment theory was also outlined in this chapter.

CHAPTER 6

METHODS AND PROCEDURES

6.1 Introduction

This chapter describes the methods and procedures used to assess the impact of the EU grant funding on access to credit and farming activities for smallholder sugarcane farmers in Eswatini. The study area, climatic conditions, sampling design, data collection process and analysis are presented in this chapter. Under data analysis, two logistic regression models are described and presented; that is, the model for access to credit and farming activities.

6.2 Study area

6.2.1 Study location

The research area is situated along the west bank of the Lower Usuthu River in the Lowveld of Eswatini. It is located at Siphofaneni. The project areas fall under seven chiefdoms: Chiefs Mgwagwa Gamedze, Mshikashika, Ngcamphalala, King Maja Mamba II, Prince Logcogco Dlamini, Chiefs Maphilingo Shongwe, Mdlaka Gamedze and Indvuna Mathambo Dlamini. This area was chosen because it is where most of the smallholder sugarcane farmers that receive the EU grant are situated.
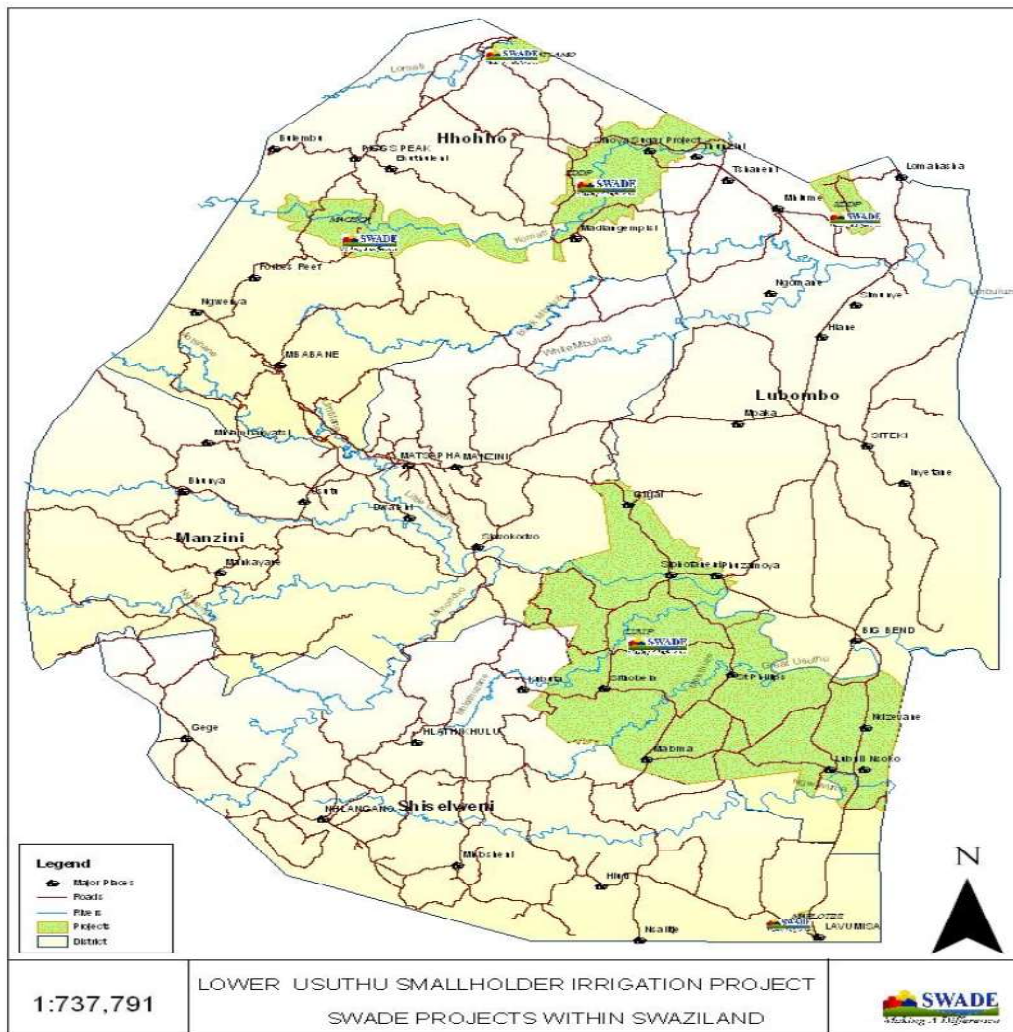
Figure 6: Map Showing SWADE Agricultural Development to Eswatini

Source: SWADE (2013)

6.2.2 Climate

The Lowveld of Eswatini is characterised by prolonged dry spells and high temperatures. Yearly rainfall ranges from 600 to 1000 mm, with the lower parts of the area receiving least rain (Manyatsi & Brown, 2009). Rain falls for a short period of time. The average temperatures range from 19^0C to 30^0C, with the maximum temperature reaching 40^0C, usually around December and January (Eswatini Meteorological Department, 2015)

6.3 Sampling design and data collection

6.3.1 Sampling design

Smallholder farmers who are non-beneficiaries and beneficiaries of the EU grant were randomly selected in the Siphofaneni area according to predetermined procedures. The design was centred on inclusion of a sample of EU non-beneficiaries as the control group to permit comparisons of the changes in the impact variables between EU beneficiaries and EU non-beneficiaries. This helped to facilitate the identification of the impact of the EU grant on access to credit and farm activities for smallholder sugarcane farmers. Smallholder sugarcane farmers' information was obtained from SWADE.

The population of the smallholder sugarcane farmers in the Siphofaneni area is about 1500. Determination of the sample size followed a proportionate to size sampling methodology as specified by Kothari (2004). The formula for calculating a sample size with simple random sampling (SRS) using a specified absolute precision approach is presented below:

$$n_{srs} = \frac{1.96^2 \hat{p}_{srs} \hat{q}_{srs}}{d^2}$$

where,

n_{srs} = sample size

$\hat{p}_{srs}$ = the estimated population

$\hat{q}_{srs} = 1 - \hat{p}_{srs}$

d   = desired absolute precision, a value of 50% was used. The reason for selecting 50% is that for a given level of precision, a p of 50% has the largest sample size.

When calculating the sample size, a 95% confidence interval (the 1.96 value in the formula) was assumed. When the above formula was used, a sample size of 280 was found. However, a sample of

104 respondents was randomly selected from the sampling frame using the SRS method. The sample

of 104 respondents was used in consideration of the type of survey. The resource limitations led to the

selection of 104 respondents and it did not have any negative effect on the representativeness of the

sample as the respondents were randomly selected and. the population of this area is homogenous. A

sample size of 104 respondents was therefore deemed as a good representation of the population.

6.3.2 Data collection and analysis

The research project made use of both primary and secondary data. Secondary data was obtained from

the MEPD, MoA and SWADE. Primary data was collected through a field survey using the farming

household as the unit of analysis. The main method of data collection was face-to-face interviews

with the aid of a structured questionnaire. The questionnaire was administered at farm level, either to

the farm/ household decision maker or his/her proxy.

The data analysis included coding, editing and entering data using Statistical Package for the Social

Sciences version 20. Descriptive analysis was used to analyse the variables in the study using

frequencies, means and standard deviations.

6.4 Model specification

Logit is a uni/multivariate method that estimates the probability of occurrence of an event. It therefore

predicts the binary dependent outcome from a set of independent variables. The reason for using a

logit model was that the errors are believed to follow standard logistic distribution, while the probit

model errors follow standard normal distribution (Indiana, 2006). The logit model has a probability

that lies between 0 and 1 and it gets closer to 0 at a slow rate as the number of independent variables

gets bigger. Therefore, the study adopted a functional form from Greene (2012)

$$\text{Prob } (Y\text{-}1|X) = \frac{e^{x\beta}}{1+ e^{x\beta}} = \ddot{E}(X'\beta)$$

where:

Y= explained variable (Takes values 0 and 1)

X= explanatory variables

β =Coefficients

Ë= logistic cumulative distribution function.

The maximum likelihood method is employed in the logistic regression. It maximises the probability of getting observed results given the coefficients of the model. Incorporating the error term, the model becomes:

$Logit(Y) = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots\ldots\ldots \varepsilon.$

This model was used for the study to investigate the factors influencing access to credit and farming activities for smallholder sugarcane farmers.

The independent variables namely, age, gender, marital status, level of education, land size, experience of farmer, on farm income, off farm income, grant funding and access to extension services were analysed using the logistic regression on dichotomous explained variables (access to credit and production). After construction of the logistic regression, PSM was used to assess the impact of the EU grant on access to credit and production.

The PSM method was important, as it assessed the impact of the EU grant on access to credit and farming activities for smallholder sugarcane farmers. The control group was matched to the treatment group to predict the probability of being a beneficiary. According to Caliendo and Kopeinig (2008), the main idea of PSM is to construct a suitable comparison group with non-beneficiary farmers that are similar to beneficiary farmers in all relevant characteristics. A propensity score was generated from a logit model, which indicated the probability of a farmer being a beneficiary of the EU grant.

6.4.1 Model estimation for access to credit

The factors affecting availability and access to credit were identified. One of the objectives of the study was to determine the factors affecting access to credit for smallholder sugarcane farmers and a logistic regression was employed in the study. A logistic regression is a statistical model that allows

for estimation on whether or not an event occurs by predicting a binary dependent variable from a set of independent variables. In the study, regression analysis was employed to find out whether being a beneficiary of the EU grant funding led to access to credit and increased production or not for smallholder sugarcane farmers in the Siphofaneni region in Eswatini. The dummy variable was the dependent variable taking the value of 1 for yes and 0 for no. The logistic regression depicts the probability that a smallholder sugarcane farmer has access or does not have access to credit from formal commercial banks. Access to credit in the study takes the values 1 if there is access to credit (yes) and 0 otherwise (no).

The logit model was useful in this study because it solicited information about the significant factors that affect access to finance for smallholder farmers. The dependent variable access to credit was measured by the probability of having access to credit from a formal financial institution. The dependent variable takes the values: 1 = Access to credit 0 = otherwise. Prior expectations of the variables are presented in *Table 6.1.*

Logit (Access to credit) $= \alpha + \beta_1 Age + \beta_2 Gender + \beta_3 Education + \beta_4 Experience + \beta_5 Land\ Size$

$+ \beta_6 Support\ services + \beta_7 Farm\ Income + \beta_8 Off\text{-}farm\ Income + \beta_9 Grant\ Funding$

$+ \varepsilon$

Table 6:2 A priori expectations for the relationship between access to formal credit and independent variables

Variable	Description	Measurement	Expected sign
Dependent Variable			
Access	Access to formal credit	Dummy (1 = access; 0 = otherwise)	
Independent Variables			
Age	Farmer's age	Years	+
Gender	Gender of farmer	Dichotomous (Male = 1; f = Female = 0)	-
Marital status	Marital status of farmer	Marital status of the farmer Married=1,0=otherwise	+
Education level	Number of years of education	Years	+
Land size	Farm size	Hectares (ha)	+
Experience	Farming experience	Years	+
On-farm income	On farm income of the farmer	Emalangeni (E)	+
Grant funding	Beneficiary or non-beneficiary	Dichotomous (Yes=1; No=0)	+
Off-farm income	Off-farm income of the farmer	Emalangeni (E)	+
Extension services	Training	Dichotomous (Yes=1; No=0)	+

Age - Age is defined as the individual head's age at the time of the interview and is a continuous variable measured in years. According to Yehuala (2008), older farmers have a better connection with formal financial institutions and cooperatives than younger farmers because of their life experience. Therefore, the variable age was expected to have a positive effect on access to credit for smallholder sugarcane farmers.

Gender – The gender of the household head has been believed to be one of the leading determinants of access to credit in the literature. Studies by Baiyegunhi (2008), in South Africa, uncovered that the gender of the household head matters in determining access to credit by smallholder farmers. They found that male-headed households are less vulnerable than female-headed households in access to credit. Therefore, gender is expected to have a negative effect on access to credit for smallholder sugarcane farmers.

Marital status - According to Opara (2010), marital status significantly affects access to credit; married farmers are likely to be under pressure to obtain credit from formal commercial banks. Thus, marital status may increase access to credit for farmers; a positive sign was therefore expected.

Education - According to Kuwornu *et al.* (2012) and Pham and Izumida (2002), education has a positive impact on access to credit. An educated farmer is believed to have more knowledge about the use of credit and hence allocates credit more efficiently on the farm. Tan *et al.* (2010) also indicated education as one of the most important variables that affects households' access to credit. Higher education levels imply a better technical knowhow and farming skills; thus the sign was expected to be positive because the more educated the farmer, the more access to information on markets and facilities provided by financial institutions.

Land size - A continuous variable measured as the total size of land in hectares cultivated by the farmers. Yehuala (2008) maintains that the larger the cultivated farm size, the more the labour required, which demands additional capital that might be obtained through credit. In addition, land can be used as collateral to secure a loan from formal commercial banks. Therefore, land size was posited to affect access to credit positively for smallholder sugarcane farmers.

Experience - The more experienced the farmer is, the more responsible he will be for making decisions for the whole family and will tend to be better at calculating the future. Mohamed (2003) expected years of experience to be a positively significant variable in that it determines one's chances to access formal and semi-formal credit. Therefore, experience was expected to have a positive effect on access to credit for smallholder sugarcane farmers.

Farm income - Nuryartono (2007) used total farm income as a proxy for welfare status and found that that total farm income reduced the chances of farmers being credit-constrained. They consequently concluded that availability of farm income, relaxed credit constraints from formal financial institutions. Farm income was expected to affect the probability of accessing credit from a formal commercial bank positively.

Off-farm income- According to a study by Ali and Deininger (2012), income from off-farm activities can relax credit constraints to give the household relatively better access to credit. Money from business enterprises coming into the farm may help farmers access credit because, should the intended business fail, the extra income will enable them to repay the borrowed money. The sign was expected to be positive.

Grant funding (EU) - EU grant funding is expected to have a positive sign because farmers who receive the grant are more likely to get credit from formal financial institutions than farmers who do not receive any funding.

Extension services - According to Beck (2007), support services help enhance farmers' knowledge of production with respect to improved production technology. These services also provide farmers with current market information, e.g. prices and help train farmers on good financial record-keeping and overall farm management, making farmers eligible for formal credit. Therefore, a positive sign was expected between extension services and access to credit for smallholder farmers.

Error term (ε) - The mean of the error term is zero with constant variation, normal distribution and no correlation with the explanatory variables in the model. It represents the unexplained variation in the dependent variable.

6.4.2 Model for Farming Activities

For farming activities, the dependent variable production was measured by the probability of having increased production after having received grant funding. The dependent variable takes the values: 1= increased production 0 = otherwise. Prior expectations for the variables are presented in *Table 6.2*.

Logit (Production) $= \alpha + \beta_1 Age + \beta_2$ *Gender* $+ \beta_3$ *Marital Status* $+ \beta_4$ *Education* $+ \beta_5$ *land size*

$+ \beta_6 Experience + \beta_7 On$-farm Income $+ \beta_8$ *Grant Funding* $+ \beta_9 Off$-farm income

$+ + \beta_{10} Extension\ Services + \varepsilon$

Table 6:3 A priori expectations for the relationship between grant funding and farming activities

Variable	Description	Measurement	Expected sign
Dependent Variable			
Production	Production	Dummy (1 = higher production; 0 = otherwise	
Independent Variables			
Age	Age of farmer	Years	+
Gender	Gender of farmer	Dichotomous (Male = 1; f = Female = 0)	+
Marital status	Marital status of farmer	Marital status of the farmer Married=1,0=otherwise	+
Education level	Level of education	Years	+
Land size	Farm size	Hectares (ha)	+
Experience	Farming experience	Years	+
On-farm income	Off farm income of the farmer	Emalangeni (E)	+
Grant funding	Beneficiary or non-beneficiary	Dichotomous (Yes = 1; No = 0)	+
Off-farm income	Off farm income of the farmer	Emalangeni (E)	+
Extension services	Training	Dichotomous (Yes = 1; No = 0)	+

Age - A continuous variable measured in years. According to Adomi *et al.* (2003), farmers are highly dependent on their previous knowledge of farm practices in cultivating, which leads to increased

production. Age is related to the number of years in the farming business and thus the skills that the farmer has acquired over the years. Therefore, age was expected to influence production positively.

Gender - According to Harris *et al.* (2015), farms with female principal operators appear to have productive advantages as suggested by higher average efficiency ratios. Therefore, female-headed farmers were expected to increase sugarcane production.

Marital status - According to Opara (2010), being married significantly affects agriculture because married farmers are likely to be under pressure to produce more, especially for sale. This is supported by Ummuna (2010), who found that marital status significantly affects agriculture because married farmers are likely to be under pressure to produce more, for sale and/or the household. Thus, being married may increase the production of farmers; therefore, a positive sign is expected.

Education - A continuous variable measured in number of years of schooling. Agricultural production requires expertise to be profitable, but with basic education, one can achieve successful production. This is in line with a study by Uwagboe *et al.* (2012) who found that educated farmers acquire, analyse and evaluate information on different agricultural inputs and this leads to improved production. Therefore, higher education levels imply better technical knowhow and farming skills. The sign is thus expected to be positive.

Land size - A continuous variable measured in hectares. According to Msibi (2009), a central factor affecting production and conservation decisions is the farmers' land size. Mpawenimana (2005) also states that farmers with larger farm sizes produce more. This is supported by Obasi *et al.* (2013), who state that production is expected to increase if farmers cultivate more hectares of land. Therefore, land size was posited to affect production positively for smallholder sugarcane farmers.

Experience - Experience is a continuous variable measured in years of farming experience. Wiredu *et al.* (2010) state that the age of a farmer can be used as a proxy for his/her experience. This means that an experienced farmer will most likely be an older farmer. According to Djomo (2012), an additional year of experience increases agricultural production, as the farmer has more knowledge of

production and thus increases efficiency. It was expected to have a positive sign because the more skills acquired, the higher the production.

On-farm income – On-farm income is an important variable because it determines the availability of working capital to invest in the adoption of technologies and production activities. Ndiwa (2007) notes that on-farm income means that the household will be able to satisfy its basic requirements and have a surplus for production activities, signifying increased production. Therefore on-farm income was expected to have a positive effect on production for smallholder sugarcane farmers.

Grant funding (EU) - EU grant funding was expected to have a positive sign because farmers who receive the grant are more likely to achieve increased production since they are able to buy high-yielding crop varieties for improved production, unlike farmers who do not receive any funding.

Off-farm income - According to Babatunde and Qaim (2010), off-farm income is an important element in agricultural production because it contributes to higher production because farmers are able to buy high-yielding crop varieties to enhance and increase overall production. Therefore off-farm income can be used as a substitute when capital is unavailable. This is in line with the work of Oseni and Winters (2009), who found that off-farm income improves production through higher input use in Nigeria. Consequently off-farm income was expected to have a positive effect on the overall production of smallholder farmers.

Extension services - According to Rahman *et al.* (2000), support services help enhance farmers' knowledge of production with respect to improved production technology. Therefore, a positive sign was expected with regard to production for smallholder farmers.

Error term (ε) - The mean of the error term is zero with constant variation, normal distribution and no correlation with the explanatory variables in the model. It represents the unexplained variation in the dependent variable.

After estimation of the logistic regression, PSM was employed to assess the impact of the EU grant on access to credit and farming activities for smallholder sugarcane farmers in Eswatini.

6.4.3 Estimating the impact of the EU Grant on access to credit and farming activities

The empirical model seeks to estimate the impact of the EU grant funding on access to credit and farming activities for smallholder sugarcane farmers in the Siphofaneni area of Eswatini. It also seeks to estimate the Average Treatment effect on the Treated (ATT). Since one can only observe whether an individual participated or never participated, it is important to assign individuals randomly to either the treatment (beneficiaries of the EU grant funding) or the control (non-beneficiaries of the EU grant funding) groups to estimate the ATT successfully.

According to Rosenbaum and Rubin (1983), Heckman *et al.* (1998) and Rosenbaum (2002), ATT has proven to be a better indicator for measuring the appropriateness of intervention strategies on smaller groups of interest, such as smallholder farmers, than the population-wide average treatment effects calculated via the logit model. Therefore, to avoid selection bias, PSM was used to estimate the ATT.

The PSM technique allows comparisons between the control and the treated groups, thus each farmer should belong to a group of beneficiaries (treated) or non-beneficiaries (control).

Let Y_1 denote the outcome of the farmer (*i*) after receiving the EU grant and Y_0 denote the outcome of the same farmer who did not receive the EU grant. Treatment (T) is a binary variable that will determine if the observation has the treatment or not. Therefore, the outcome, Y, can be calculated as follows:

$$\mathbf{Y} = TY_1 + (1\text{-}T)\,Y_0 \tag{1}$$

here: $\mathbf{Y_1}$= outcome of farmer who received grant   **T=1** (treated - beneficiaries)

$\mathbf{Y_0}$= outcome of farmer who did not receive grant   **T=0** (control – non-beneficiaries)

Since the study is an observational study, it used the ATT. The ATT is the difference between the outcomes of the treated and of the untreated observation. Then to calculate the average treatment effect on the treated, ATT follows this model:

$$\mathbf{ATT} = E\,(y_1 - y_0|\,T{=}1) = E\,(y_1|\,T{=}1) - E\,(y_0|\,T{=}1). \tag{2}$$

In the equation above the only observable is for a farmer who received the grant $E(y_1 | T=1)$. Therefore, the study matched farmers who were beneficiaries of the EU grant to non-beneficiaries of the EU grant. Central to PSM is the conditional independence assumption, which assumes random participation conditional on observed covariates (Woolridge, 2003). Assuming that the conditional independence is satisfied, the ATT can be specified as:

$$\textbf{ATT} = E(y_1 - y_0 | x, T=1) = E(y_1 | x, T=1) - E(y_0 | x, T=1). \tag{3}$$

Rosenbaum and Rubin (1983) found that matching the treatment and the control based on covariates resulted in a dimensionality problem when the number of covariates was large. Therefore, the beneficiaries and non-beneficiaries of the EU grant in the study were matched based on the propensity score $p(x)$. The propensity score is defined as the conditional possibility that farmer (i) has access to credit and is highly productive and is expressed as follows:

$$\textbf{P(x)} = \text{prob}(T=1 | x) = E(T | x) \tag{4}$$

where $\textbf{T}(0, 1)$ = binary indicator representing the treatment group.

Thus, considering the propensity score and the conditional independence assumption, the ATT equation is then written as:

$$\textbf{ATT} = E(y_1 - y_0 | p(x), T=1) = E(y_1 | p(x), T=1) - E(y_0 | p(x), T=1) \tag{5}$$

where the first term in the equation $E(y_1 | p(x), T=1)$, measures the observable outcome of the treated farmers (beneficiaries) and the second term $E(y_0 | p(x), T=1)$, measures the outcome of the control (non-beneficiaries), the counterfactual.

After calculating the propensity scores, the treatment (beneficiaries) and the control (non-beneficiaries), were matched based on the similarities or closeness of the propensity scores. The kernel and the nearest neighbour matching technique were used in this study. The nearest neighbour matching technique is the algorithm that will match each beneficiary to a non-beneficiary farmer on the basis of closely similar propensity scores (Becker & Ichino, 2002). As a robust check for results,

the kernel technique will be used to calculate the ATT. It is important to use more than one method as a robustness check (Becker & Ichino, 2002). According to Becker and Ichino (2002), the kernel technique involves matching all beneficiary farmers with a weighted average of all the non-beneficiary farmers using weights that are inversely proportional to the distance between the two groups' propensity scores. To ensure maximum covariates balance and low conditional bias, it is important to conduct one-to-one matching with replacement (Abadie & Imbens, 2006).

6.4.4 Test for multicollinearity

To test for the presence of multicollinearity, the study employed the Variance Inflation Factor (VIF) for association among the continuous explanatory variables (Gujarati, 2003). *Table 6.3* summarizes the VIF of explanatory variables. Multicollinearity is present when the VIF is greater than 10. Therefore, the hypothesis of presence of multicollinearity among the continuous explanatory variables was rejected. This means that the data were found to have no problem of multicollinearity.

Table 6:4 Variance inflation factor for continuous explanatory variables

Variable	VIF	1/VIF
Age	9.07	0.11
Farming Experience	8.32	0.12
Off farm income	1.35	0.74
Land size	1.48	0.67
On farm income	1.72	0.58
Mean	4.39	

6.4.5 Matching algorithm for EU Grant

Matching algorithm is an approach that matches the beneficiaries of EU grant funding and non-beneficiaries of the similar propensity scores, taking into consideration how the covariates are distributed in the matched treated and control groups. The mostly commonly used matching methods are the kernel matching method, where the treated group is matched with a weighted average of the

control group; nearest neighbour matching where individuals with the closest propensity scores are matched in both participants and non-participants and radius caliper matching , where the maximum propensity score distance between the groups in the treated and the distance within the control group is chosen as a matching partner for the treated individual that lies within the caliper.

6.4.6 Matching quality for EU Grant

Systematic difference in the distribution and overlap of the covariate between groups after matching should not exist when using PSM. According to Dan (2016), it is important to balance the distribution of the variables across groups of participants and non-participants in the propensity score. The balancing property is satisfied if Pseudo R^2 is lower after running the logit model. Among the participants and non-participants, the balancing property should be checked using the mean absolute standardised bias; a difference that is greater than 20% indicates that the matching process failed because the standardised difference is too large.

6.4.7 Sensitivity analysis for EU Grant

In order to avoid bias after matching, it is important to run the sensitivity analysis (Rosenbum, 1993). According to Rosenbaum (1993), the purpose of sensitivity analysis is to find out if there are any other unobserved variables that may have an effect on participation.

6.5 Summary

The chapter outlined the methods and procedures that were used in the study. It also provided insight into how and why the study area was picked and justified the methodology that was used in the study. The main data collection instrument and data analysis were outlined with supporting studies for the choice of methods used. The study employed two logistic regressions for analysis, one of which was to determine smallholder farmers' access to credit and the other for farming activities for smallholder sugarcane farmers. The reason for using the logistic regression was that it is considered to be a good fit for estimated models for the study. This allows for binary analysis by predicting the dependent outcome from a set of explanatory variables. The propensity score was then applied after the

regression to assess the impact of EU grant funding on access to credit and farming activities for smallholder sugarcane farmers.

CHAPTER 7

RESULTS AND DISCUSSIONS

7.1 Introduction

This chapter presents the findings of the study. The first part of the chapter addresses the study objective, determining if smallholder sugarcane farmers have access to credit from formal commercial banks. It provides a clear descriptive analysis of smallholder sugarcane farmers in Eswatini. The socio-economic characteristics of the smallholder farmers are discussed in further detail in this chapter.

The second part of the chapter outlines the statistical analysis of smallholder sugarcane farmers in Eswatini. Propensity Score Matching was used to determine the probability of obtaining access to credit from a formal commercial bank and consequently increased production. This chapter provides a discussion on identifying and comparing factors that might be used to explain the differences in participating in EU grant funding.

7.2 Respondents' socio-economic characteristics

7.2.1 Gender, age and education level of smallholder farmers

A random sampling method was employed using a list of beneficiaries and non-beneficiaries of EU grant funding. As shown in *Table 7.1*, there are more males (55%) than females. Therefore, males dominate sugarcane farming in Eswatini. This is in line with Mamba (2016) who found that a majority of smallholder farmers in Eswatini are males.

Table 7: 1 Gender, age and education level

Variables	Beneficiaries		Non-beneficiaries		Overall Total	
Total number of farmers *(N)*	39		65		104	
Proportion of male to female *(Male=0 Female=1)*	Males Females	20 19	Males Females	37 28	57 47	*(55%)* *(45%)*
Age (years) *(Min and Max)*	Min Max	30 69	Min Max	23 76	23 76	- -
Farmer's level of education *No schooling* *Primary* *High school*	13 17 9		26 23 16		39 (37%) 33 *(32%)* 32 *(31%)*	

Source: Survey (2017)

The average age of a typical smallholder sugarcane farmer in the sample was 56 years for beneficiaries of the EU grant funding and 58 years for non-beneficiaries. Age is a very important element in the farming business because it symbolises the experience that the farmer has of sugarcane farming. The non-beneficiaries of the EU grant funding had the minimum age of 23 years and the highest proportion of males (37%) compared to females. Overall, a majority of the farmers (55%) are males and this may be attributed to the fact that most of the land in Siphofaneni is held by males as heads of the households, hence they dominate the sugarcane farming industry.

Level of education plays a vital role in decision-making and the adoption of new technologies, thus improving overall production (Mamba, 2016). Therefore, the level of education of smallholder sugarcane farmers implies better technical knowhow and farming skills, hence increased production. The results indicate that 37% of the farmers have not attended school, 32% attended primary school and 31% attended high school. The education level of non-beneficiaries was lower (no schooling = 40%) compared to the beneficiaries (no schooling = 33%).

7.2.2 Land size of smallholder sugarcane farmers

The results show that the size of farmers' land was small. *Table 7.2* shows the number of hectares for beneficiaries and non-beneficiaries. The maximum for beneficiaries was 107 hectares and the minimum were 38 hectares, while for non-beneficiaries, the maximum number of hectares was 98 hectares and the minimum were 43 hectares. According to MEPD (2013), when the individual farmers ventured into the sugarcane farming enterprise, they combined the land and formed an association so that the land could be used as collateral when applying for a loan at formal commercial banks. Generally, in Eswatini, the land system does not allow people to own land; even if they do, the land is pre-owned by the chief. This is in line with a study by Region (2013), which found that the size of land was an important variable that influenced access to credit form formal financial institutions.

Table 7: 2 Land size held by smallholder farmers (Hectares)

Variable	Label	Beneficiaries	Non-beneficiaries
Land size (Hectares)	Minimum	38	98
	Maximum	107	43

Source: Survey (2017)

7.2.3 Main sources of income for smallholder sugarcane farmers

Table 7.3 displays the results of the study on sources of income for smallholder sugarcane farmers. The results of the study show that a majority of the farmers work full time in their farmer companies. This means that they do not have other formal employment; however, the majority of the farmers are self-employed. About 63.3% of the smallholder sugarcane farmers who are beneficiaries of the EU grant funding are full-time farmers, 3% are government/private employees, 15,7% are self-employed (have other businesses besides sugarcane farming) and 8% are pensioners. Among the non-beneficiaries 69% are full-time farmers, only 1% are government/private employees, 20% are self-employed and 5% are pensioners.

The self-employed farmers make a living through gardening as well as selling clothes and merchandise in their market stalls, hence their income is from non-agricultural activities. The results therefore show that 78.4% of the smallholder sugarcane beneficiaries of the EU grant funding and 65.8% of smallholder sugarcane non-beneficiaries of the EU grant funding derive their income from mainly sugarcane farming. According to Anang *et al.* (2015), in a study carried out in Northern Ghana to determine the factors affecting smallholder farmers' access to credit, farm income had a positive and significant relationship with access to credit. Smallholder farmers do not have many resources and have limited capital to start up enterprises.

Table 7: 3 Sources of income for smallholder farmers

Variable	Label	Beneficiaries % N = 39	Non-beneficiaries % N = 65
Occupation	Full-time farmer	63.3	69
	Part-time farmer	10	5
	Government/private	3	1
	Self-employed	15.7	20
	Pensioner	8	5
Source of income	Sugarcane farming	78.4	65.8
	Vegetable farming	1.6	10
	Off-farm income	20	24.2

Source: Survey (2017)

7.2.4 Access to Extension Services

Table 7.4 presents results of the effect of extension services, which are a very important element in the sugar industry. Extension services enhance smallholder farmers' production and marketing, thereby improving farm income and human capital. The results of the study indicate that 68% of the beneficiaries of the EU had access to extension services and 38.5% of the non-beneficiaries had access to extension services. Averages of about 75.3% and 65% show that smallholder sugarcane farmers had access to market information. The main sources of market information were government and extension officers. Other sources of market information were farmers and the internet.

Table 7: 4 Access to extension services

Variables	Definition	Beneficiaries % N = 39	Non-beneficiaries % N = 65
Access to extension services	Yes No	68 32	38.5 61.7
Access to market information	Yes No	75 25	65.8 34.2
Sources of market information	Government Extension officers Farmers Internet/media	58 40 20.3 17.6	48 32 20.5 0
Access to training	Yes No	70.3 29.7	57.3 42.7
Type of training	Planting/harvesting Irrigation General farm management Record-keeping	70.7 32.3 58.6 11.3	63.2 28 22.4 10.5

Source: Survey (2017)

7.3 Factors influencing access to credit

Access to credit is affected by socio-economic factors affecting the farmers. The factors that influence smallholder sugarcane farmers' access to credit from a commercial bank were estimated using a logistic regression. Table 7.5 presents the results of the logistic regression. Marginal probabilities allow for change in probabilities of an event occurring as a result of unit change in the independent variables. Therefore, marginal probability (dy/dx) was used in the study to show the changes in the probability of accessing credit given one unit change in the explanatory variable.

Table 7: 5 Logit regression estimate for access to formal credit

Variable	Coefficient	Standard Error	P-Value	Coefficient (Dy/Dx)	Marginal Probability
Constant	3.43	1.78	0.00***		
Age	0.02	0.03	0.49	0.00	0.39
Gender	0.06	0.51	0.99	0.00	0.89
Marital status	0.69	0.54	0.19	0.10	0.19
Education Level	0.88	0.25	0.00***	0.16	0.00***
Land size	0.85	0.28	0.07*	0.13	0.05*
Experience	-0.02	0.03	0.48	0.23	0.62
On-farm income	0.05	0.03	0.60	0.17	0.39
Grant funding	0.89	0.64	0.06*	0.04	0.00***
Off-farm income	0.05	0.03	0.07*	0.18	0.03**
Extension services	0.98	0.35	0.00***	-0.24	0.05**

***,**,* Represent the level of significance at 1%, 5% and 10% respectively.

Pseudo R2 0.3654

LR chi2 (10) = 73.52

Prob>chi2=0.000

Log likelihood=-92.348913

Source: Survey (2017)

The results correspond with the a priori expectations of the study. Education was significant at 1%. This infers that the more educated the farmer, the more the farmer is associated with a significantly higher chance of having access to credit from a commercial bank. The results of the marginal effect indicate that a farmer with a higher education level has a higher likelihood of access to credit by 16.2%. This is in line with the results of Nguyen (2003), who found that education is an important factor in accessing credit from a formal financial institution for most households. This is motivated by the fact that farmers who are educated have better knowledge of the operations and procedures of a bank, as well as the use of banks and their financial products.

Land size was significant at 10% and this means that farmers with larger-sized land were more likely to access credit from a formal commercial bank than farmers with smaller land. The prediction was that the larger the land size, the more likely it was that formal commercial banks would lend money to

the farmer, as the land can be converted into cash. This is supported by the study by Atieno (2001), who stated that the value of farm assets had a positive effect on access to credit. The probability that farmers who had more land could get credit from formal commercial banks was higher by 13.4% than in the case of those who had less.

Grant funding was statistically significant at 10%. The results show that EU grant funding increased the probability of accessing credit from formal commercial banks by 4.6%. Therefore, beneficiaries of EU grant funding were more likely to access credit from formal commercial banks than their counterparts. Moreover, off-farm income also influenced access to credit from formal commercial banks positively. The effect was significant at 5% level of significance. The results showed that the probability of farmers who had off-farm income to receive credit from formal commercial banks was higher by 18.3%. This means that farmer' financial capability increased with the amount of income they had. This is in line with a study by Muhongayirea *et al.* (2013), who found that farm income had a positive effect on participation of farmers in the credit market in Rwanda.

Furthermore, extension services yielded positive results. The variable extension services were statistically significant at 1% and the probability of farmers who had extension services obtaining credit from formal commercial banks was 24.5% higher than that of those who did not have such services. This is because farmers who have access to extension services are exposed to market information, which trains them in good financial record-keeping. This is an added advantage for commercial banks, as it shows them that farmers are responsible and therefore qualifies the farmers for credit (Mamba, 2016).

Age, gender, marital status and on-farm income were not important at any level of significance. This means that they had no effect on access to credit.

7.4 Factors influencing farming activities

The factors that influence farm activities (production) for smallholder sugarcane farmers were also estimated using a logistic regression. Results are presented in *Table 7.6.* Marginal probability shows

the changes in the probability of having increased production, given one unit increase in the explanatory variable.

Table 7: 6 Logistic regression for farm activities

Variable	Coefficient	Standard Error	p-value	Coefficient (dy/dx)	Marginal Probability
Constant	3.04	1.43	0.00***		
Age	0.04	0.05	0.56	0.00	0.47
Gender	0.08	0.73	0.84	0.00	0.82
Marital status	0.54	0.48	0.22	0.21	0.28
Education level	0.72	0.42	0.28	0.23	0.00***
Land size	0.50	0.77	0.81	0.00	0.05*
Experience	0.72	0.34	0.00***	0.20	0.00***
On-farm income	0.68	0.05	0.54	0.31	0.07*
Grant funding	0.48	0.62	0.08*	0.15	0.00***
Access to credit	0.74	0.33	0.05**	0.21	0.06**
Extension services	0.88	0.54	0.00***	-0.36	0.05**

***,**,* Represent the level of significance at 1%, 5% and 10% respectively.

Pseudo R2 0.3948

LR chi2 (10) = 83.21

Prob>chi2=0.000

Log likelihood=-96.482361

Source: Survey (2017)

Table 7.6 presents the estimated results of the logistic regression. The results indicate that experience was statistically significant at 1%, which is in line with the a priori expectation of the study. The probability of having increased production was higher by 20% for farmers who are more experienced than for those who are not. This is also in line with the results of a study by Obasi *et al*. (2013) that confirms that the experience of a farmer is associated with higher production levels.

Grant funding was also statistically significant at 10%. The probability of having increased production was higher by 15.2% for farmers who are beneficiaries of the EU grant funding than their counterparts. Off-farm income was also statistically significant at 5%. The results show that the probability of having increased production was higher by 21.3% for farmers who had other sources of income besides income from the farming business. A farmer who received income from other

businesses was more likely to have increased production. This is in line with the finding of Nehring & Paul (2005) that off-farm income has a significant effect on the overall efficiency and production of a farm.

Furthermore, extension services were statistically significant at 1%. This means that farmers who had access to extension services were more likely to have increased production than farmers who did not have access to extension services. The results are in line with the finding of a study by Lee (2007) in Uganda that extension services increase not only farmers' output but also allocative ability in production. Thus, extension services enhance production because extension officers transfer knowledge and skills to farmers. This includes providing information and educating farmers on how to apply the core principles of improved technologies to farm practises. The variables age, gender, marital status, land size and off-farm income were not statistically significant at any level. This means that the variables had no effect on the production of smallholder sugarcane farmers.

7.5 Balancing property for Propensity Score Matching

According to Smith and Todd (2005), it is important to use the balancing property for PSM to ensure that the comparison group is constructed with observable characteristics distributed evenly across quintiles in the treatment and control group. The results presented in *Table 7.7* are a chi square test for joint significance of the covariates used in the logit model before and after the match. The results show the probability value that all the covariates are not jointly significant. This means there are no differences between beneficiaries of EU grant funding and non-beneficiaries, hence self-selection bias does not exist. The matching method is satisfied.

Table 7: 7 Balancing Property

Independent Variable	I p value unmatched	II p value matched	III Mean absolute bias unmatched	IV Mean absolute bias Matched	V Absolute bias reduction
Age	0.01	0.32	0.68	0.20	32.1
Gender	0.01	0.68	0.74	0.06	44.2
Marital status	0.01	0.43	0.90	0.05	35.1
Education level	0.01	0.92	3.42	0.23	41.3
Land size	0.03	0.54	64.0	0.40	40.3
Experience	0.05	0.84	51.4	0.05	24.5
On-farm income	0.07	0.62	0.21	0.08	32.3
Grant funding	0.01	0.90	0.42	0.03	45.4
Access to credit	0.08	0.57	0.15	0.01	40.7
Support services	0.02	0.70	0.38	0.45	34.4

Source: Survey (2017)

7.6 Treatment effects of the PSM

The three matching methods indicate that participation in EU grant funding has a positive impact on access to credit from commercial banks and farm activities for smallholder sugarcane farmers. The probability model for beneficiaries of EU grant funding was estimated to calculate the probability for each observation. Each beneficiary was then matched to a non-beneficiary with a similar propensity score to estimate the average treatment effects. The radius matching method indicated that EU grant funding had a positive and significant impact on access to credit from commercial banks and farm activities for farmers. The results in *Table 7.8* show that farmers who were beneficiaries of EU grant funding had on average a higher percentage (79%) of access to credit from commercial banks. Similarly, for farm activities, the ATT shows that beneficiaries of the EU grant funding were more productive than non-beneficiaries. This result is in line with the work of Debalen *et al.* (2004) who used a similar approach to investigate the impact of non-farm diversification comparing the earning enterprise and non-earning enterprise.

Table 7: 8 Average treatment effects (Radius matching)

Treatment	Outcome Indicators	ATT	Treated On Support	Off Support	Control On Support	Off Support
	Access to credit	0.79***	39	-	65	-
		(0.69)				
	Farming activities	-0.02**	39	-	65	
		(0.01)				-

*Standard errors in parenthesis. ***,**,* level of significance at 1%, 5% and 10%*

Source: Survey (2017)

7.7 Sensitivity analysis

A sensitivity analysis was performed, and the results are presented in *Table 7.9*. Two matching methods were used to test for sensitivity analysis, the nearest neighbour matching and kernel matching. The sensitivity analysis was performed to find out if the radius matching method was robust to other matching methods. The results presented in *Table 7.9* show that the radius matching method is robust and are not sensitive to other matching methods and that it yields slightly higher results than the other methods.

Table 7: 9 Sensitivity analysis

Treatment	Outcome Indicators	ATT	Treated On Support	Off Support	Control On Support	Off Support
Nearest Neighbour Matching						
	Access to credit	0.63*** (0.82)	39	-	65	-
	Farm activities	-0.02** (0.01)	39	-	65	-
Kernel-based Method						
	Access to credit	0.43** (0.58)	39	1	65	-
	Farm activities	-0.02** (0.01)	39	1	65	-

*Standard errors in parenthesis. ***,**,* level of significance at 1%, 5% and 10%*

Source: Survey (2017)

7.8 Constraints faced by smallholder farmers

Table 7.10 presents the results of the study on credit and production constraints that are faced by smallholder sugarcane farmers in Eswatini. Chi-square was conducted to determine whether there were differential constraints among smallholder sugarcane farmers, based on socio-economic characteristics. In respect of credit, 91% of the smallholder farmers who are beneficiaries of EU grant funding pointed out that one of the major constraints they face when accessing credit is collateral. The banks require collateral in order to approve a loan for smallholder farmers. Another major constraint that smallholder farmers face is the issue of land ownership and supporting documents. In terms of production, 100% of the farmers pointed out that drought is a leading constraint, electricity (78.5% and 89%) and irrigation (65% and 70%) being second and third for both beneficiaries and non-beneficiaries respectively.

Table 7:10 Frequency of credit and production constraints

Constrains	Beneficiaries N=39 (%)	Non-beneficiaries N=65 (%)	Differences
CREDIT			
Land ownership	72.4	89.3	16.9
Collateral	91	93.5	2.5
Supporting documents	84	97	13
Active account	32	32	0
Interest rates	44.6	56.8	12.2
PRODUCTION			
Drought	100	100	0
Irrigation	65	70	5
Electricity and infrastructure	78.3	89	10.8
Extension services	22.3	37.3	15
Miscellaneous (theft/natural causes)	21.9	20.8	1.1

The extent to which the EU grant funding has contributed to eliminating these constraints is evident from the differences between beneficiaries and non-beneficiaries.

7.8.1 Credit constraints

Results also showed that interest rates were a challenge for many farmers. About 44.6% of the beneficiaries and 56.8% of non-beneficiaries pointed out that they were facing difficulty because of high interest rates. Interest rates as a cost of the loan have a significant effect on farmers' growth plans. They not only affect loan payments, but also have an impact on an enterprise funding (Ogolla, 2013). High interest rates reduce business earnings, which ultimately hinder the business's capacity to grow. High interest rates also affect business cash flow in that one has to set aside more money to repay the loans. This in turn reduces disposable income which affects the ability of farmers to pay other creditors.

The unavailability of bank accounts, collateral, and market information on banks' procedures, operations and requirements are major factors constraining smallholder farmers' access to credit from formal financial institutions (Okojie *et al.,* 2010). A study by Adejobi and Atobatele (2008) argues that access to credit for smallholder farmers is limited because of their high loan defaults, while Agnet (2008) found that banking procedures and requirements are poorly understood by smallholder farmers and this limits their access to credit from formal financial institutions. The results of the study revealed that collateral, land ownership, supporting documents and interest rates were major constraints for smallholder sugarcane farmers in Eswatini. A study by Philip *et al*. (2009) found that the nature of loans, repayment periods and interest rates are other constraints that limit farmers' access to credit from formal commercial banks.

Collateral refers to an asset that a borrower uses to secure a loan from a lender. A lender gets a guarantee which they can dispose of the asset to recover their money in case of a default. Kung'u (2011) noted that secured loans are regarded as having a low risk of default; hence they are charged a

lower interest. In contrast, most small and medium enterprises do not have tangible assets that they can use to secure loans. Their borrowing is therefore limited.

7.8.2 Production constraints

The majority of the farmers rated drought and irrigation water 65% and 70% respectively as major constraints. Both beneficiaries and non-beneficiaries of EU grant funding were affected by drought in Eswatini. According to the Office of the Residents Coordinator Situation Report (2017), the drought conditions were expected to continue until April 2017 and the effects were forecast to last into 2017. The National Meteorological Department of Eswatini recorded below normal rainfall from October 2014 to February 2015 and this has had a negative effect on water levels in dams, replenishment of ground water resources and low agricultural yields.

About 90% of Eswatini's sugar cash crop relies on irrigation, which is significantly hampered by the rationing of water. Smallholder sugarcane farmers have been complaining about the rationing of irrigation water. It was revealed during the interviews, that some farmers faced a challenge when it came to the rationing of water. This is because when water is rationed, some sugarcane farms are due for irrigation. This then has a negative impact on the sucrose level of the sugarcane, leading to lower returns. The farmers also indicated that the amount of water for irrigation was insufficient.

Most of the farmers said that electricity rates were high. The amount of electricity they used for farm machinery led to an increased electricity bill and this lowered profits. Other challenges facing smallholder farmers were theft and vandalism of on-farm equipment such as irrigation equipment. The results of the study revealed that the majority of the farmers experienced theft of water pumping equipment, as well as electrical cables. Understandably, this had a negative effect on overall sugarcane production.

The farmers also mentioned adverse weather constraining sugarcane production. Extreme temperatures and hail storms destroyed the farmers' produce, thus resulting in low returns. Theft occurred at night when the sugarcane was ready for harvesting and livestock also invaded the fields,

causing more losses to the farmer. Farmers further pointed out that sugarcane farming is very risky owing to the uncertainty of price changes.

7.9 Summary

The descriptive statistics show that a majority of the farmers were male, and their average age was 58 years. The average level of education for smallholder farmers was primary school and their main source of income was the sugarcane enterprise. Sugarcane farming was the farmers' main source of income. A majority of EU beneficiaries had access to extension services, access to extension services and market information compared to non-beneficiaries. Results also show that drought was a major constraint faced by the farmers. The regression analysis shows that the EU grant funding has a positive impact on access to credit for smallholder sugarcane farmers.

CHAPTER 8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary and findings

This chapter outlines the findings' summary and conclusions of the study. It also provides recommendations and areas of further research.

The main purpose of this study was to assess the impact of EU grant funding on access to credit and farm activities for smallholder sugarcane farmers in Eswatini. In achieving this purpose, the study addressed specific objectives, namely:

- whether smallholder sugarcane farmers have access to credit from commercial banks;
- whether being a recipient of EU grant funding increases chances of gaining access to credit and increased production for smallholder sugarcane farmers; and lastly
- whether EU grant funding has contributed to eliminating credit and production constraints faced by smallholder farmers.

Data was collected at Siphofaneni, in the Lowveld of Eswatini. A sample of 104 farmers was randomly selected and interviewed using structured questionnaires. 65 of these farmers were non-beneficiaries of EU grant funding, while the remaining 39 farmers were beneficiaries of EU grant funding. Data was analysed using descriptive and econometric analysis, and PSM was used to determine the impact of an EU grant on access to credit and farm activities for smallholder sugarcane farmers.

The findings of the study show that EU grant funding increases the chances that smallholder sugarcane farmers can access credit from commercial banks. That is to say, farmers who are beneficiaries of the EU grant funding presumably have more access to credit than their non-beneficiary counterparts.

The study showed that of the beneficiaries, 76% had access to credit, while 67% of non-beneficiaries had no access to credit from commercial banks and formal financial institutions. This implies that the

majority of the non-beneficiaries source their funds from informal money lenders. The results of the logistic regression also indicated that formal commercial banks are more inclined to finance sugarcane farmers who are beneficiaries of EU grant funding and make information readily available to these farmers. Overall, EU grant funding has a positive effect on access to credit for smallholder sugarcane farmers.

However, the study also showed that these smallholder farmers do not have full access to credit; only farmer schemes have access to credit from commercial banks and formal financial institutions. Commercial banks do not grant credit to individual farmers because they believe that these farmers will not be able to pay back the loan since they do not have any form of collateral. The results of the study showed that this belief is facilitated by the fact that smallholder farmers face major issues of drought and this has a negative impact on the crop yields of the farmers.

Nevertheless, growth in production for most smallholder farmers has been greatly affected by lack of access to credit, despite the existence of a number of financial intuitions in Eswatini. The study further showed that access to credit for many rural households is through informal channels. The informal channels are in the form of relatives, friends and ruthless moneylenders, also known as "Bo Mashonisa". These channels are a major source of funding for most farmers and the interest rates are very high.

It was shown in this study that one factor that affects a farmer's ability to access credit from formal commercial banks and formal financial institutions, is the education level of a farmer. The study revealed that the sugarcane farming industry is dominated by males (55%), most of them between the ages of 40 and 60 years and the youngest being between 18 and 25 years. Additionally, the education level of these farmers was found to be very low with 37% of them being illiterate and 31.7% of them only having attended primary school. The low level of literacy implies that they can often neither read nor write. This becomes a challenge for them when trying to access credit from banks, as most banks would require forms to be filled after clearly reading terms and conditions.

However, access to credit enhances production and productivity for smallholder farmers. With the availability of credit, a farmer is able to purchase production inputs such as fertilisers and pesticides. Experience also has a positive impact on overall production for smallholder farmers, as it enhances increased production. The more experienced a farmer is, the higher the chance of increased production because the farmer is able to apply skills that have been acquired over years of farming and thus maximise production.

Additionally, the study results showed that farmers who have access to support services are more likely to achieve increased production than farmers who do not have access to support services. The farmers with support services are able to work with extension officers who guide them on planting, irrigation, harvesting and good farm practice to ensure increased production and maximised returns. Therefore, support services have a positive effect on production for smallholder sugarcane farmers.

Nevertheless, poor farm management is a constraint for farmers that EU grant funding can not necessarily eliminate. Other major constraints include drought, which has hit Eswatini hard, electricity rates and water rationing. Prevailing constraints such as these do not allow farmers to exploit the emerging opportunities in the sugarcane industry fully. Beneficiaries of EU grant funding are at an advantage because they have extension offices that regularly help them with farm management.

8.2 Conclusions

The study revealed that despite the high number of smallholder sugarcane farmers who have bank accounts with formal commercial banks and have knowledge of the bank's operations and procedures, credit access from these institutions is still limited. The major reason is because smallholder sugarcane farmers lack collateral required by the formal commercial banks when acquiring for a loan. A majority of the smallholder sugarcane farmers in Eswatini live on SNL and therefore cannot use the land as collateral as it is held entrust by the King. The main objective of the study was to determine the impact of the EU grant funding on improving access to credit and production for smallholder sugarcane farmers. The study found that the EU grant funding has a significant impact on smallholder farmers' access to credit from formal commercial banks. This grant helps in relaxing the constraints

that these farmers face when accessing credit. The grant is also expected to improve overall production for smallholder sugarcane farmers as they are exposed to extension officers that offer services that enhance and improve farmers' experience throughout the production period.

The results of the study revealed that farmers' level of education, land size, extension services and off farm income affects access to credit for smallholder sugarcane farmers in Siphofaneni, the Lowveld of Eswatini. Provision of capacity building and training for smallholder sugarcane farmers can therefore, improve their skills and sharpen knowledge of the environment on which they are working on. With such trainings, farmers can have more knowledge on bank operations and procedures which would in turn improve the overall efficiency of the farms and increase production.

The study concludes that, while farmers' education level, land size, extension services and off-farm income affect access to credit for smallholder farmers, there are other important factors such as regulations on interest rates that restrict these farmers from accessing credit from formal commercial banks. These regulations are enforced by the Central Bank of Eswatini and this, in turn, has a negative effect of farmers.

The study revealed that sugarcane production was affected by the experience of the farmers, extension services, and access to credit. It is important to note that training on farming activities is crucial for smallholder sugarcane farmers as they are able to acquire skills and knowledge that they will use throughout the production cycle and in future.

The study further concludes that there is a need to promote education and assist smallholder farmers to have access to extension services so as to enhance their farming skills for efficient and effective overall production hence improving their financial status. It is also important that smallholder farmers develop organisations that will help reduce transaction costs and help enhance overall production.

The study has shown that credit access in Eswatini is important for smallholder farmers as they are the sole producers of sugarcane and this has a significant impact on the overall economy of the country. In order to promote a stable economy while reducing poverty levels, it is important for formal

commercial banks to lend to smallholder farmers as credit enables them to invest in new agricultural activities. This will help increase smallholder farmers production thus generating enough revenue. Among other factors, credit enables the farmers to cover production and operational costs and have access to market information for increased production and technology use.

The EU grant funding leads to improved access to credit from formal commercial banks for smallholder sugarcane farmers. Results show that being a beneficiary of the EU grant funding relaxes the financial constraints that smallholder farmers face when trying to access credit from formal financial institutions. On the other hand, the EU grant funding does not lead to improved production for smallholder farmers. This was revealed in the study as farmers who are beneficiaries of the EU grant funding faced the same challenges as those of non-beneficiaries of the EU grant funding; drought being the major challenge that both farmers met.

8.3 Recommendations

- The study revealed that smallholder sugarcane farmers have limited access to credit from formal commercial banks; however, the EU grant funding has helped relax financial constraints faced by farmers when accessing credit from formal financial institutions and this has improved access to credit for smallholder sugarcane farmers. Access to credit from formal financial institutions needs to be enhanced by encouraging smallholder farmers to work with extension officers that might help share knowledge on production, bank operations and procedures.

- There is also a need to start up socio-economic initiatives, government policies and institutional support programmes that would support farmers by reducing obstacles for more effective access to credit. The involvement of stakeholders, the MoA, through SSA and SWADE, could deal with each category of farmers separately and lobby finance institutions to reconsider their position on financing small-scale farmers in the sugarcane sector. It is important to note that a majority of smallholder farmers get credit from informal financial institutions and therefore improved access to credit can help farmers increase overall farm efficiency and production.

- Government could also subsidise farmers with inputs such as pesticides and fertilizer with a view to reduce or minimise farmers' over-reliance on manual labour to enhance sugarcane production. This could advocate the promotion and development of local smallholder farmers. There is also a need for SWADE to encourage efficient use of electricity by farmers and government to subsidize electricity. Both groups of farmers, non-beneficiaries and beneficiaries, in the study, revealed that electricity and drought were some of the major challenges that they face. The extension officers could also offer training and inspection during site visits to the farmers to ensure increased production and efficient use of electricity.

The research findings are applicable to SWADE development area in the Lowveld, government and stakeholders, which may not be a representative of sugarcane farming in terms of gaining access to credit from formal commercial banks. Therefore, it is suggested that a similar study be undertaken in all other areas.

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QUESTIONNAIRE

IMPACT ASSESSMENT OF THE EU GRANT ON ACCESS TO FINANCIAL SERVICES AND FARM ACTIVITIES FOR SMALLHOLDER SUGARCANE FARMERS IN SIPHOFANENI, ESWATINI

General Information

Interview Number: _____

Interview Date/Time_____

Name of Respondent: _____

Role of Respondent: _____

Contact Details: _____

Constituency: _____   Area: _____

Farmer Scheme Name: _____

PART A: FARMER PRODUCER DEMOGRAPHIC CHARACTERISTICS

1. **Gender**
   1. **Male (   )**
   2. **Female (   )**

2. **Age (   )**

3. **What is your marital status? (Please tick where applicable)**
   1. Single (   )
   2. Married (   )
   3. Divorced (   )
   4. Widowed (   )
   5. Separated (   )

4. **What is your level of education? Please tick where applicable**
   1. Illiterate (   )
   2. High School (   )
   3. Diploma (   )
   4. Degree (   )
   5. Other (   )

5. **How many years of farming experience do you have?_____(years)**

6. **What is the size of your household (number of people you live with) _____?**

7. **Main occupation of the household head.**
   1. Full-time farmer (   )
   2. Part-time farmer (   )
   3. Government employee (   )

4. Private company employee (   )
5. Unemployed (   )
6. Self-employed (   )
7. Pensioner (   )

8. **What is your income from sugarcane farming per month? Tick where applicable**
   1. Less than E2000 (   )
   2. E2001- 3000 (   )
   3. E3001-4000 (   )
   4. Above E4001 (   )

PART B: ACCESS TO CREDIT

The prelude, or rather assumptions that were made in the beginning of the study, assumed that in Eswatini smallholder sugarcane farmers do not have access to credit from formal financial institutions and commercial banks. To address this objective, the following questions will be asked.

9. **Do you have off-farm income? (Tick the applicable answer). If YES, answer question 10 and 11 and if NO, please skip to question 12.**
   1. Yes (   )
   2. No (   )

10. **What is the source of the off-farm income? (Tick the applicable answer)**
    1. Salary (   )
    2. Pension (   )
    3. Grant (   )
    4. Other (   )
    If other, specify_____

11. **If the household head has an off-farm income, how much is the off-farm income per annum?** _____(per year)

12. **What is the farm income of the household per annum?**
    _____(per year)

13. **Have you received a loan from a commercial bank in the last 12 months**? **(Tick the applicable answer). If YES, please answer question 14, and 15 and if NO, please skip to question 16.**
    1. Yes (   )
    2. No (   )

14. **What was the purpose of the loan?**
    1. Farm operation (   )
    2. Consumption (   )
    3. Management of the farm (   )
    4. School fees (   )
    5. Other (   )

    If other, please specify_____

15. **What was the amount of the loan? E**_____

16. **Have you had access to agricultural credit information by agricultural credit officers in the last 12 months? (Tick the applicable answer). If YES, please answer question 17 and if NO, please skip to question 18.**
    1. Yes ( )
    2. No ( )

17. **Who provides the agricultural credit information services? (Tick the applicable answer)**
    1. Commercial bank ( )
    2. Government extension officers ( )
    3. Non-governmental Ogganisations ( )
    4. Other ( )

    If other, please specify_____

18. **How do you normally finance your agricultural activities? (Tick the applicable answer)**
    1. Commercial bank ( )
    2. EU funding ( )
    3. Farm income ( )
    4. Government assistance ( )
    5. Off-farm income ( )
    6. Other ( )

    If other, specify _____

19. **For your sugarcane farming activities; have you received credit, loans or services from STAKEHOLDERS? If YES, please fill in the table below; if NO, please answer question**
    1. Yes ( )
    2. No ( )

Type of Credit/Service Code A	From Whom Code B	Frequency Code C	Tool Used as Collateral Code D

Codes

Code A:	Code B:	Code C:	Code D:
1 - Cash	1 - Farmer	1 - Only once	1 - Land title
2 - Loan	2 - Commercial bank	2 - Twice a year	2 - Farm equipment
3 - In-kind Product	3 - Sugarcane Company	3 - Once a year	3 - Salary
4 - Other	4 - Input Provider	4 - Many times in one year	4 - House

5 - Microfinance	**5 -** Beginning of season	**5 -** guarantors
6 - Moneylender	**6 -** Other	**6 -** cooperative membership
7 - Other		**7 -** Other

If other, please specify _____

20. Have you ever applied for a commercial bank loan and was it approved? Tick the applicable answer. If NO, answer question 21 and 22; if YES, skip to question 23.
1. Yes ( )
2. No ( )

21. Why was the loan request denied?
_____
_____
_____

22. What are the constraints you face specific to accessing loans from a commercial bank?
_____
_____
_____

23. What do you see as the most important limiting factor to get this financing?
1. Insufficient collateral or guarantee ( )
2. Interest rates or price too high ( )
3. Distance to the credit institutions ( )
4. Financing not available at all ( )
5. Other ( )

If other, specify _____

24. How will additional supply of credit benefit the agricultural sector?
1. Increased household income ( )
2. Increased yield ( )
3. Able to buy high yielding varieties ( )
4. Other ( )

If other, specify _____

25. What is the extent to which loan requirement, security for a loan and interest on loan are determined? Rank according to: 1 being the most important and 4 being the least.

Measure	Rank
Security for a loan	
Land	

Farm machinery	
Use of farm crops	
Guarantor	
Loan requirements	
Verification from a guarantor	
Use of supporting documents	
Assessment of the business	
Interest on loan	
Business risk level	
Type of loan product	
Possibility of default	

Codes:

1 - Most important

2 - Moderate

3 - Fair

4 - Least important

26. **What do you think is/are the biggest challenge/s to accessing credit for smallholder agricultural farmers in Eswatini?**

    _____
    _____
    _____

27. **What other finance options are you aware of?'**

    _____
    _____
    _____

28. **What do you think should be done by formal credit institutions and commercial banks to encourage farmers to apply for credit?** *Rank from the most important to least important, 1 being the most important and 4 the least important.*

Action	Rank
Set up rural branches/agents to bring services near to farmers	

Educate farmers on need and benefit of loans	
Offer a variety of loan products to farmers	
Upgrade infrastructure in farming areas	

Codes:

1 - Most important

2 - Moderate

3 - Fair

4 - Least important

PART C: SUGARCANE PRODUCTION

29. **For how long have you been producing sugarcane? _____ (years)**

30. **How many tons of sugarcane do you get per hectare _____ kg/ton?**

31. **What type of farming do you do besides sugarcane farming? Tick where applicable**
    1. Crop
    2. Livestock
    3. Both

32. **What is your main reason for production? Tick where applicable**
    1. Sale in the market
    2. Consumption
    3. Other

33. **What factors determine your productivity**
    1. Land
    2. Credit
    3. Support services
    4. Other

    If other, specify _____

Note: Questions 34, 35, 36 and 37 address beneficiaries of the EU grant funding; if not a beneficiary please skip to question 38

34. How has your production levels changed in the years you have participated in this programme? If NO, answer question 35. If yes, skip to question 36

    1. Yes ( )
    2. No ( )

35. What is the reason for no change in yields with your participation in the programme?

    _____
    _____
    _____
    _____

36. What was the reason for change in yields with your participation in the programme?

    _____
    _____
    _____
    _____

37. How have the yields changed?

    1. Increase in yield ( )
    2. Decrease in yield ( )
    3. Constant yield ( )

38. Do you have a crop extension officer operating in the area? If YES, please answer question 39, 40 and 41 if NO, please skip to question 42.

    1. Yes ( )
    2. No ( )

39. How many times/year does he/she visit your farm?

    1. Fewer than 3 times
    2. Between 3 and 5 times
    3. Between 6 and 10 times
    4. More than 10 times

40. Have the visits been helpful and how?

    _____
    _____

41. Please state the support providers and the type of support provided

Support Provider	Type of Support						
Codes	1	2	3	4	5	6	7
EU							
NGO							
SSA							

SWADE						
MOA						
Other						

Codes:

1 - Training
2 - Advisory services
3 - Credit Provision
4 - Planting and Harvesting
5 - Marketing and Transportation
6 - Keeping Farm Records
7 – Other

42. **Did you gain any knowledge from the extension agents that could help you do things differently in terms of production? If NO, please answer question 43, if YES please skip to question 44.**
    1. Yes ( )
    2. No ( )

43. **If no, please state why?**
    _____
    _____
    _____

44. **If yes, please state how.**
    _____
    _____
    _____

PART D: CONSTRAINTS FACED BY FARMERS

To address objective three, which is to determine the extent to which the EU grant has contributed to eliminating constraints that smallholder sugarcane farmer's face, the following questions will be asked.

Scale:

Not involved/ very dissatisfied/ no impact 0 – 49%

Fair extent/ neutral/ moderate impact 50-79%

Fully involved/very satisfied/ extensive impact 80 – 100%

Note: Question 45, 46, 47 and 48 addresses beneficiaries of the EU grant funding; if not a beneficiary, please skip to question 49

.

45. To what extent are you involved in the project?
1. Not involved at all ( )
2. Fair extent ( )
3. Fully involved ( )

46. Evaluate the extent to which the EU grant funding met your needs.
1. Not involved at all ( )
2. Fair extent ( )
3. To a great extent ( )

47. How would you rate your overall satisfaction with the EU grant funding?
1. Very dissatisfied ( )
2. Neutral ( )
3. Very satisfied ( )

48. Please rate your perceptions of the overall impact of the EU grant on your access to credit, productivity and production efficiency.

Measure	Impact
Access to credit	
Productivity	
Production efficiency	

Codes:

1 - No impact

2 - Moderate impact

3 - Extensive impact

49. Are there any problems that you are experiencing as a non-beneficiary of the EU grant? If YES, please answer question 50, if No, please skip to question 51. (Tick where appropriate.
(a) Yes ( )
(b) No (   )

50. What are the problems that you have been experiencing without funding from the EU?
_____
_____
_____
_____

51. How have you managed not to have any problems?

_____

_____

_____

_____

_____

Thank you for taking time to share your ideas and opinions with us. Your assistance is highly appreciated!