AGRICULTURAL INFORMATION NEEDS AND INFORMATION SERVICES FOR SMALLHOLDER SUGARCANE FARMERS IN SWAZILAND

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DECLARATION

I declare that **"Agricultural information needs and information services for smallholder sugarcane farmers in Swaziland"**, except where otherwise indicated, is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

ABSTRACT

The sugar industry is the dominant agricultural sector in Swaziland's[1] economy, contributing significantly to the gross domestic product (GDP), and smallholder sugarcane farming has become commonplace in the semi-arid lowveld of Swaziland, contributing more than 20% of production. Provision of relevant information delivery strategies to facilitate access to information by smallholder sugarcane farmers (SSFs) has become crucial to assist them in remaining competitive in the sugar industry. The study investigated the information needs and services of smallholder sugarcane farmers in Swaziland involving three mill groups, namely Mhlume, Simunye and Big Bend. The research objectives were to: (a) examine the agricultural information needs of SSFs; (b) assess the current agricultural information services for SSFs; (c) examine the challenges faced by SSFs in accessing agricultural information, and; (d) develop strategies for enhancing access to agricultural information by SSFs. The study was underpinned by a conceptual framework derived from Wilson's 1996 model of information behaviour and the theory of planned behaviour (TPB). The study adopted a positivist paradigm using the survey method, complemented by methodological triangulation, in order to collect both quantitative and qualitative data. Data was collected using survey questionnaires and interview guides. There were 168 responses and six interviews were conducted. Data was analysed qualitatively and quantitatively. The findings revealed that SSFs have unmet information needs, primarily in sugarcane crop husbandry and farmer development information. It was revealed that the information needs and information services of the SSFs were influenced by demographic factors that include labour, farm size, education, age, and mill group. For most activities, a face-to-face mode of communication was mostly used. Despite a positive attitude towards use of information and communication technology (ICT), their state of e-readiness was low. Moreover, SSFs faced several challenges emanating from poor access to information and limited use of information and communication technologies (ICTs). Barriers to the limited use of ICTs were technological, organisational, policy and individual-related. Therefore, the study recommends several measures, among others, a Sugarcane Information and Communication Centre (SICC) strategy framework. The study has implications for practice, policy and theory with regard to guiding the implementation of agricultural information services to farmers.

[1] The name of the country, "Swaziland" was changed in 2018 to "Kingdom of Eswatini"

KEYWORDS

Swaziland, information needs; information service; information use; information behaviour; information sources; information sources preference; smallholder sugarcane farmers; information dissemination.

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DEDICATION

This thesis is dedicated to my mother, Mrs. J.K. Dlamini, for giving me a form of education she did not understand but nonetheless appreciated for its value; Mr. and Mrs. Mthande; to my wife Hlobsile Masuku-Dlamini and children Okuhle, Misha and Makabongwe Dlamini. To God be the Glory!

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LIST OF ABBREVIATIONS AND ACRONYMS

AGORA	Access to Global Online Research in Agriculture
ANOVA	Analysis of Variance
B.Sc. Agric.	Bachelor of Science in Agriculture
CsPRO	Census and Survey Processing System
DOPU	Drop-Off/Pick-Up
e-LRS	Electronic Learning Readiness Survey
FAO	Food and Agriculture Organization of the United Nations
FINCORP	Swaziland Development Finance Corporation
GDP	Gross Domestic Product
GOS	Government of Swaziland
ICT	Information Communication Technology
ICTs	Information Communication Technologies
IT	Information Technology
KDDP	Komati Downstream Development Project
LUSIP	Lower Usuthu Irrigation Project
MLIS	Master of Library and Information Studies
MMR	Mixed Methods Research
MOA	Ministry of Agriculture
M.Sc.	Master of Science
NICI	National Information and Communication Infrastructure
PAIN	Personal, Anticipated Information Need
PhD	Doctor of Philosophy
SADC	Southern Africa Development Community
SCGA	Swaziland Cane Growers Association
SIDC	Swaziland Industrial Development Corporation
SNL	Swazi Nation Land
SNLS	Swaziland National Library Services
SPSS	Statistical Package for Social Sciences
SPTC	Swaziland Post and Telecommunications

SSA	Swaziland Sugar Association
SSFs	Smallholder Sugarcane Farmers
SWADE	Swaziland Water and Agricultural Development Enterprise
SWOT	Strength, Weaknesses, Opportunities and Threats
TDL	Title Deed Land
TPB	Theory of Planned Behaviour
UNISA	University of South Africa
UNISWA	University of Swaziland

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

Smallholder farming has the potential to vastly contribute to economic growth and poverty alleviation in developing countries. This is because in most developing countries, the rural population largely depends on agriculture for their livelihood (World Bank 2008:3). The literature indicates that one of the major challenges impeding the productivity of smallholder farmers is the lack of information, when information is crucial for farmers to yield good agricultural output (Tologbonse, Fashola & Obadiah 2008). According to Poulton, Dorward and Kydd (2010:1413), if smallholder farmers from Sub-Saharan Africa are to intensify production, contribute to economic growth, and poverty reduction, there is need for increasing investments in research, basic communication infrastructure, and more importantly technical information.

Agricultural productivity can arguably be improved through the provision of relevant and reliable agricultural information to assist farmers to make informed decisions (Demiryurek 2008). It is therefore imperative for information providers to understand the information needs and information services of farmers so that they could be in a better position to provide the relevant, quality and timely agricultural information required by farmers to transform their enterprises. This is because agricultural information is essential for the overall development of the agriculture sector (Bello & Obinne 2012:91).

In Swaziland, small-scale farming can be regarded as the cornerstone of economic activities in rural communities. The potential for increased productivity is hampered by the poor availability of agricultural information, yet the agricultural sector is highly dependent on new technological developments for sustainability and development. Dlamini and Worth (2016:6-7) reported that smallholder farmers are deprived of timely and accurate information to make appropriate decisions due to inadequate extension services, arguing that use of information and communication technology (ICT) could be an alternative. Extension services are supposed to play an important role in the dissemination of information and transformation of traditional agriculture (Keregero 2000). In this information age, farmers could also benefit from ICT advancements, which have made it easier and faster to share information online than before (Ajani & Agwu 2012). The utilisation of information and communication technologies (ICTs) in smallholder agriculture for

information management is essential to improving productivity in the sector (Sousa, Nicolay & Home 2016:19). As Swaziland focuses on migrating subsistence farmers to the commercial production of sugarcane so as to overcome rural poverty in Swaziland's poorest region, the semi-arid lowveld, new challenges emerge (Terry & Ogg 2017:585). While extension services have emerged as a panacea to the challenges faced by farmers in Swaziland, Dlamini and Worth (2016:6) have contended that ICT-based information services can deliver timely agricultural information to farmers to meet the acute demand for information.

The acute demand for agricultural information on which information providers have to act has been fuelled by the commercialisation of smallholder farming in Swaziland (Terry & Ogg 2017:585). Although the Government of Swaziland has undertaken a number of high profile initiatives, such as the provision of irrigation infrastructure, finance, and coordination of pooling land resources for sugarcane production in the rural areas (Mabuza, Sithole, Wale, Ortmann & Darroch 2013; Malaza & Myeni 2009:405; Samuel 2008; Terry & Ogg 2017:585), very little empirical information is available on the needs of the Smallholder Sugarcane Farmers (SSFs), and how they are met. Moreover, Swaziland extension services have been greatly curtailed by the Government of Swaziland's decision to address its fiscal challenges by cutting down the workforce, which has invariably affected information dissemination services (Dlamini & Worth 2016:3). This study therefore seeks to examine the information needs and services of smallholder sugarcane farmers in Swaziland, with the intent of devising strategies to enhance provision of agricultural information services for the sugar industry.

This study will provide a base from which further research may be carried out so as to assess how knowledge of the consumers of information can contribute to the development and provision of an effective information service. This study will further enable government agencies to enhance their understanding of farmers' information needs and knowledge on how they may best intervene to support smallholder sugarcane farmers with timely and appropriate information for their farming enterprises. There have been many similar disparate empirical studies on smallholder sugarcane, mainly focusing on the production economics (Dlamini, Rugambisa, Masuku & Belete 2010; Dlamini & Dlamini 2012; Masuku 2003), agricultural extension (Dlamini & Worth 2016), and political economy (Terry & Ogg 2017), often based on singular development schemes, however

none of these studies examined the information behaviour of these farmers. This study drew its data from all smallholder farmers across the country, with a view to generalising the findings across the smallholder sector in the sugar industry.

1.2 Background to the study

In Swaziland, extension agents are considered the main vehicle for disseminating agricultural information on improved technologies. Regrettably, the Swaziland extension service is reported to be non-effective, and has lost credibility with farmers (Dlamini & Worth 2016:6). The bad impressions created in this way can be addressed by improving the flow of information to farmers for them to obtain better yields from their agricultural enterprises. Since year 2000, the Swazi sugar industry has experienced a rapid growth of smallholder farmers due to the provision of irrigation infrastructure and the change of political support received by farmers from the state (Terry & Ogg 2017; Malaza & Myeni 2009). The scramble for the growing of sugarcane was partly fuelled by the inclusion of the commercialisation of smallholder farmers in government policy. One of the goals of the National Development Strategy (NDS) for agriculture is to enhance private sector involvement in the uplifting of Swazi Nation Land (SNL) farmers from subsistence to commercial farming, while maintaining economic efficiency in the production and promotion of sugarcane production by smallholder farmers (Government of Swaziland 1999). The inclusion of smallholder sugarcane farmers in the SNS shows the importance and recognition of the role of smallholder farmers in the economic development of the country. In the same vein, Diao, Hazell, Resnick and Thurlow (2007:12) argue that growth in agriculture can be experienced through a shift from growing low value to high value crops. Smallholder sugarcane farming in Swaziland is thus not only seen as an important vehicle in the economic development of previously disadvantaged groups, but also in the creation of employment and poverty alleviation.

Despite the infrastructural and political support for smallholder sugarcane farmers, commentators have reported lower yields on smallholder sugarcane farms compared to middle and large-scale sugarcane farmers (Dlamini & Dlamini 2012). Dlamini (2010:940) reports that smallholder sugarcane farmers were experiencing technical production inefficiencies, due to the lack of agricultural information to boost their experiences in the growing of sugarcane. The ability of smallholder sugarcane farmers to survive in the sugar industry depends on their capacity to access and use agricultural information as a development tool.

The transition from subsistence farming, where farmers primarily grow the Swazi staple food (maize) to sugarcane farming, requires farmers to quickly adapt to this new environment where farming is run as a business. For smallholder sugarcane farmers to cope with this change, they need to access relevant, concise and timely agricultural information. The growing of sugarcane is capital, knowledge, and labour intensive. For example, farmers are expected to produce a disease-free crop (Samuel 2008:7). Like any other crop, sugarcane production requires an array of activities such as land preparation, planting, pest control, irrigation, fertilizer application, weed control, and harvesting (Dlamini 1999). These activities require one to be knowledgeable or have instantaneous access to requisite information.

The importance of information in the agricultural sector cannot be overemphasised. According to Weiss, Crowder, and Bernardi (2000:185), farmers from developed countries reveal thevalue and importance of information in their willingness to pay for it. On the contrary, farmers from developing countries are not willing to pay for information services, and think it ought to be free (Babu, Glendenning, Asenso-Okyere & Govindarajan 2012:29). A change of attitudes from farmers in developing countries could result from the development of appropriate information services. Such a move hinges on understanding their needs.

In Swaziland, smallholder farmers are the key drivers of sustainable food security for the majority of the rural population (FAO 2011). This is reflected in the States' provision of more than 50 percent of the total agricultural land area to this smallholder farming. According to Terry and Ogg (2017:589), by the year 2000, smallholder farmers under customary land tenure constituted 62 percent of the total population of Swaziland, and covered 55 percent of the country. Even so, Swazi Nation Land (SNL) is marked by low productivity, insufficient commercialisation, relatively low income, and widespread poverty (Mabuza et al. 2013). Consequently, its contribution to the country's annual Gross Domestic Product (GDP) is minimal. Even before the country received independence in 1968, there had been concerns about the contribution of the customary SNL to the country's GDP (Terry 2007; Hughes 1962). In 2013, Swaziland was also ranked in the Global Hunger Index (GHI) as the 35th out of the 78 countries affected by hunger. The scores revealed an increase of 38% from the 10.4 to 14.4% between 1990 and 2013 (International Food Policy Research Institute 2013). These indicators signal the need for policies and information services that will accelerate the development of smallholder farming especially sugarcane farming which

is a strategic cash crop. This process can be enhanced through clearly understanding the expressed information needs of smallholder farmers so that it can be easy to tailor information products and services that are appropriate for them.

This study explores the information needs of smallholder sugarcane farmers with the goal of developing an information strategy that will ensure optimal delivery of information services to these important stakeholders in the sugar industry in Swaziland. Hepworth (2007:52) concurs, that knowledge of the consumer of information is essential today, due to the growing quantity of information, and the value placed on it.

1.3 Conceptual and contextual setting

Information and knowledge have become the major drivers for social and economic growth for many countries in the world. Jaeger and Burnett (2010:14) have described information as "the sum total of the content (facts, knowledge, feelings, opinions, symbols, and context) conveyed through the communication between individuals or groups through any physical or virtual medium". Agbamu (2006:74) classified information into four categories namely: technical, commercial, socio-cultural, and legal information. Kalusopa (2005:216) described information as a tool for communication, trends assessment, and shaping decisions by producers.

In general, all individuals require information to enable them to complete certain tasks appropriately and to improve the quality of their lives. Ogungbeni, Ogungbo and Adeleke (2013:121) opined that there is no field of human endeavour where information is not a component. The quality of decisions made depend on timely access to information and the quality of the information obtained. For example, information about weather forecast has always been important to many individuals including farmers for programming their daily activities. As described by Raufu, Masuku and Tijani (2016:2), information has become the most important currency for productivity, competitiveness, increased wealth, and prosperity. In the same vein, Okoedo-Okojie (2015:183) opines that information has been dubbed the "raw material for knowledge, and agricultural information being messages that are of perceivable and recognizable value to farmers". Farmers are by and large the consumers of agricultural information, which constitutes messages from multiple sources that include, amongst others the media, government entities, commodity suppliers, and non-governmental organisations (see Figure 1.1). Agricultural information is

described as all published and unpublished knowledge on general aspects of agriculture and consists of innovations, ideas, and technologies of agricultural policies (Aina 1990 as quoted by Bello and Obinne 2012:91). This includes information on weather, marketing, government regulations and agronomic data.

Smallholder farmers have great potential to increase agricultural production (SADC 2014:4), even though their contribution to agricultural growth is currently limited. Farmers have an incessant need for timely, concise, demand-driven and current information to enable them to efficiently and effectively run their farming enterprises. Ozowa (1995) posits that there is no person that can precisely know all the information needs of farmers, because the agriculture sector is information dependent. Information need is defined by Ormandy (2011:92) as the "recognition that knowledge is inadequate to satisfy a goal, within the context/situation that one finds himself/herself at a specific point in time". The effects of globalisation, coupled with climate change, require farmers to quickly adapt, and this can be achieved through having an effective flow of information to these important stakeholders in the agriculture sector.

Information is one of the main ingredients for farmers to yield good output (Tologbonse, Fashola & Obadiah 2008). Lwoga, Ngulube, and Stiwell (2011:394) have noted that information and knowledge are crucial in the improvement of the agriculture sector in African countries. The amount of information available to the modern farmer is enormous and, for farmers, this information means potential empowerment as it is vital in their decision-making processes. Information facilitates the creation of new knowledge, better decision making and communication (Kalusopa 2005:415). Information is explicitly described by Huang, Wang and Lee (1999:43) as a material product "fit for use", which by implication suggests that an information product should adhere to certain quality conditions. Within this context, Adereti, Fapojuwo and Onasanya (2006:1) have argued that the quality of information rests squarely on three pillars, namely: accuracy, timeliness, and relevance. For this reason, relevant information must be availed in a timely manner and when it is most required by farmers (Mugwisi 2013:289). Singh, Kumar and Singh (2015) concur with the view that information is vital and propose a shift from the traditional dissemination of the accurate and relevant agricultural information to leveraging modern ICTs.

Modern ICTs are central to the emphasis on a shift in the dissemination of information. Fawole and Olajide (2012:326) have reported that, due to inadequate human resource, ICTs have become an attractive option in the delivery of agricultural information. Munyua, Adera and Jensen (2009:3) have reported that modern ICTs have the potential to improve agricultural productivity by delivering knowledge and information to rural agricultural communities, providing capacity building, accessing markets and credit, restructuring of extension and scaling up inter-linkages of development interventions. Hence, to improve productivity, smallholder farmers need access to improved technologies and best practices, and to appropriate, timely and comprehensive information. Mugwisi (2014:52) reported that a lack of information is the primary challenge affecting the adaption and adoption of new technologies by farmers. Lack of information on modern technologies will therefore undoubtedly stifle agricultural development. In the same vein, the effectiveness of an information resource may be determined by the farmers' exposure to that channel or medium of dissemination.

With farming information and resources readily available and accessible online, the ability to acquire, evaluate, and process information relevant for decision-making in a timely fashion has become a critical task for farm managers (Diekmann, Loibl & Batte 2009). Public agricultural extension systems often fail due to the inadequate consultation of farmers about their information needs, and their poor understanding of information searching strategies (Babu et al. 2012). This may result in the non-integration of agricultural information with other development programmes to address the numerous related problems that farmers face. Lwoga, Ngulube and Stiwell (2010:97) assert that it is important for public and private information service providers to harbour a good knowledge of the specific needs of farmers to enable them to specifically match their information products and services to the needs of the community without making assumptions. The authors further reiterated the importance of carrying out needs assessments to map communities' knowledge and information sources to enable local farmers to locate agricultural experts in their communities. Likewise, Chomba, Mbozi, Mundia, Simpamba, Donova, & Mushingwani (2002:1) have suggested that "assessing the deficiencies is very important if proper remedial steps have to be undertaken." This implies that prescriptions on information supplied to farmers ought to be largely be based on assessments of their present situation.

It is incomprehensible as to why smallholder farmers do not frequently access information about innovative technologies, despite the plethora of information produced by researchers (Glendenning, Babu & Asenso-Okyere 2010). Further, Spurk, Schanne, Mak'Ochieng and Ugangu (2013:5) have reported that experts were unaware of the information flow between research, extension, and farmers beyond the fact that information was often irregular, not systematically supervised, and often not sufficiently specific for farmers. This scenario suggests that there is a gap between the available information and the use of information. In other words, the fact that information is available does not necessarily suggest that it is accessible. Hence, efforts must be made to maximise access to information, especially for smallholder farmers.

Smallholder sugarcane farmers in Swaziland are unable to cope and compete effectively with the increasing demand placed on them regarding the programming of their crop. This may be due to a confluence of factors that are a bottleneck on their capacity to increase their yields. These include the lack of knowledge or timely need-based information, poverty, social constraints, custom and tradition. Dlamini and Dlamini (2012:35) in a study conducted from the Lubombo region of Swaziland to determine explanatory variables for sugarcane yield gaps among small, medium, and large-scale farmers, discovered that large-scale sugarcane farmers obtained significantly higher yields than did smallholder sugarcane farmers. Arguably a major cause of this inequality emanated from inadequate information services that hardly met the information needs of farmers. In fact, FAO (2004:4) reported the establishment of new projects in agriculture without taking into consideration existing information services, or at least without considering any interactions and synergies with existing services. The mismatch between information generation and access, coupled with the heterogeneity of farmers, warrants further research on both where and how farmers access information for their specific enterprises, as well as the role ICTs can play in improving dissemination of information, particularly to smallholder sugarcane farmers in Swaziland.

1.4 Problem Statement

Smallholder sugarcane farmers continue to play a key role in the Swaziland sugar industry. The contributions of smallholder sugarcane farmers have, however, been limited, due to poor information services resulting in low productivity. Information is critical at every level of sugarcane production, particularly in the growing phases where smallholder farmers are involved.

The Swaziland extension service had been providing agricultural information services to farmers; however, over the years there has been a decline in the effectiveness of this service (Dlamini & Worth 2016). This has resulted in the extension service losing enormous credibility with farmers (FAO 2011:18), yet access to adequate information is very important to increased agricultural productivity (Mgbada 2006:67). This is in part due to use of cumbersome traditional methods of disseminating information, poor staffing (Dlamini & Worth 2016:3), and under-resourced libraries.

Despite the research and extension services' efforts, to date smallholder sugarcane farmers in Swaziland are inundated by a myriad of information deficiencies which results in the low adoption of new technologies, culminating in low yields (Dlamini 2005; Malaza & Myeni 2009; Samuel 2008; Dlamini & Dlamini 2012; Sifundza & Ntuli 2001). The low yields can be attributed to the limited flow of information to farmers (Samuel 2008:65). In addition, Phiri (2008:20) has reported a "wide agricultural and rural development information gap" in Swaziland, which is caused by poor information resource acquisition and utilisation amongst agricultural institutions. For smallholder sugarcane farmers to improve the productivity levels of their farming enterprises, it is essential to address the information gap problem.

The development of strategies to enhance the delivery of agricultural information to farmers requires an understanding of smallholder sugarcane farmers' information needs and the factors that influence them. The information needs of farmers were espoused at the Swaziland National Agriculture Summit of 2005 as the bedrock from which to shape policy and the provision of services (FAO 2011:18). This study was prompted by the lack of data in Swaziland on how the agricultural information needs of smallholder sugarcane farmers are met and how they are informed about new innovations. The study therefore poses the following principal research question:

"How can a better understanding of farmers' information needs enhance the delivery of agricultural information services to smallholder sugarcane farmers in Swaziland?"

1.5 Research purpose and objectives

The general purpose of this study is to investigate the information needs and information services of smallholder sugarcane farmers in Swaziland, with a view to developing a strategy for the

effective delivery of agricultural information services to the sugar industry. The specific research objectives as reflected in Table 1 below were to:

1. Examine the agricultural information needs of smallholder sugarcane farmers in Swaziland.
2. Assess the current agricultural information services for smallholder sugarcane farmers.
3. Examine the challenges and barriers faced by farmers in accessing agricultural information.
4. Develop strategies for enhancing access to agricultural information by smallholder sugarcane farmers.

Table 1.1: Illustration of the of the relationship between research objectives and questions

Research objective	**Research question**	**Data collection method**	**Target population**
1. Examine the agricultural information needs of smallholder sugarcane farmers in Swaziland.	a. What kind of information do smallholder farmers require? b. What are the information needs differences between the milling groups and smallholder farmers? c. What are the explanatory and predictor factors that influence the information needs of smallholder sugarcane farmers?	Survey, Interview	Smallholder sugarcane farmers; Agricultural support organisations
2. Assess the current agricultural information services for smallholder sugarcane farmers.	d. What agricultural support organisations are available to meet the agricultural information needs of smallholder sugarcane farmers? e. What are the preferred communication channels for agricultural information to smallholder sugarcane farmers? f. What is the frequency with which information communication channels are utilised by smallholder farmers? g. What is the relationship between demographic factors and the frequency with which smallholder farmers utilise ICT resources? h. What are the differences in information services between the milling groups and smallholder farmers?	Survey, Interview	Smallholder sugarcane farmers; Agricultural support organisations

	i. What are the explanatory and predictor variables for access to agricultural information services by smallholder sugarcane farmers? j. What is the state of e-readiness of smallholder sugarcane farmers?		
3. Examine the challenges faced by farmers in accessing agricultural information.	k. What challenges are encountered by smallholder farmers in accessing agricultural information from support organisations? l. What barriers are encountered by smallholder farmers in using information and communication technologies channels?	Survey, Interview	Smallholder sugarcane farmers; Agricultural support organisations
4. Develop strategies for enhancing access to agricultural information by smallholder sugarcane farmers.	l. What are the strategies for enhancing access to information services by smallholder sugarcane farmers?	Survey, Interview	Smallholder sugarcane farmers; Agricultural support organisations

1.6 Justification and originality of the study

Although a wide range of research have been conducted on information behaviour of farmers, there is hardly any consensus on the specific information needs of farmers. This is partly because the information needs of individuals are contextual, environmental, technological, and role related (Wilson 1999; Leckie, Pettigrew & Sylvain 1996; Du Preez 2015; Meyer 2016). This suggests that, conceptually, the value of studies of information needs of groups such as farmers lies in understanding the above dimensions considering the farming enterprise in which they are involved. For instance, the extent and effectiveness of interventions on smallholder farmer's needs, empirical evidence of the availability, or lack thereof, is required. The empirical findings of the study will enhance a deeper understanding of the information needs and information services of smallholder sugarcane farmers. Moreover, the findings of the study will further assist both public and the private sector information providers to develop farmer centred or farmer-led information services based on empirical evidence of farmer's needs as opposed to guesswork. The study will also create awareness among policy makers on the utilisation of ICT, challenges faced by farmers in accessing

agricultural information, and subsequently recommend possible solutions. By the same token, Ogg (1992:113) has opined that policy makers are "willing to adopt changes when the benefits of the change are clearly documented". The study will also add to the existing body of knowledge and further provide a base for further research in agricultural information needs and services of farmers.

In academic research, originality plays a key role, where scholars endeavour to "discover something new or to say something nobody has said before. Studies can be original based on the following elements: substance of the project, questions asked, research design, theories, data and the topic it focuses on" (Lamont, Fournier, Guetzkow, & Mallard 2006:166-167). The study will focus on the information needs and information services of smallholder sugarcane farmers in Swaziland to improve delivery and access to agricultural information. The originality of this study lies in the fact that so far, in Swaziland, no study has documented the information needs and services for smallholder farmers. Moreover, the study is unique in the sense that it is cross-disciplinary, linking the field of information science to agriculture. Jeffrey (2003:539) encourages cross disciplinary research arguing that "real world problems do not come in disciplinary-shaped boxes."

Several studies that have been done at international level on the awareness, adoption and sources of information (Abbas, Muhammad, Nabi & Kashif. 2003), and barriers in accessing information (Siyao 2012) by sugarcane farmers. The study used these studies as a benchmark. Furthermore, most studies have focused on the needs of individual farmers, whereas this study involved farmer companies or cooperatives, which are collective entities. Overall, the study is original, and contributes to the existing body of knowledge in the field of information science.

1.7 Scope and limitation of the study

The study focused on all smallholder farmers, who supplied sugarcane to the three sugar mills in Swaziland, which include Mhlume, Simunye and Big Bend. These were the only mills in Swaziland where sugarcane was processed so as to produce sugar-related products. Each mill had a group of smallholder sugarcane farmers within its vicinity who supplied sugarcane. Masuku (2003) has reported that the minimum distance to the sugar mills was 5km, while the maximum distance was 106 km. This suggest that some farmers are not very close to the mill, but are within the corridor where the mill is located. The study therefore investigated smallholder farmers'

information needs and information services, as well as the barriers preventing access to agricultural information. The limitation of this study stems from the sampling frame, where smallholder farmers who were not registered with the Swaziland Sugar Association remained excluded.

1.8 Research methodology

Ngulube (2015:127) argues that "methodology is central to the research process, because it is the lens through which a researcher looks when making decisions on acquiring knowledge about social phenomenon and getting answers to research questions." This suggests that a researcher ought to identify the appropriate research method and design in order to effectively address a selected research problem/topic. The study adopted the positivist paradigm for its framework and a descriptive survey research strategy to quantitatively investigate the information needs and information services of smallholder sugarcane farmers in Swaziland. The survey method identified dependent (information needs of smallholder sugarcane farmers) and independent (some characteristics of the farmers and their farms) variables. Interviews were also used to corroborate information obtained from the survey. Methodological triangulation of both quantitative and qualitative methods as suggested by Bekhet and Zauszniewski (2012:40), were used to enhance the understanding of the studied phenomenon. Yeasmin and Rahman (2012) averred that by integrating the two research approaches, a researcher can decrease weaknesses of an individual approach, and thus improve the findings of the study.

The target population for this study was smallholder sugarcane farmers in Swaziland (N=437) (SSA 2016). The population consisted of individual farmers and farmers associations carrying out their activities collectively. Since the population was large, sampling was first undertaken to come up with a manageable cohort, and questionnaires were hand delivered to all farmers in the sample lists. The farm managers or supervisors of the farmer companies were used as respondents. Secondary information, such as farm sizes, yields were obtained from existing public data from the Swaziland Sugar Association's crop statistics. Furthermore, face-to-face interviews were conducted with support agricultural organisations so as to obtain their perspectives regarding the delivery of information services to farmers. Quantitative data was analysed using the Statistical Package for Social Sciences (SPSS) while qualitative data was analysed by coding data according to similar themes. A detailed discussion of the research methodology is found in Chapter Four.

1.9 Ethical considerations

One of the requirements by the Department of Information Science, UNISA is for students to apply for ethical clearance before the commencement of their research. This research study was assessed by the Department of Information Science Research Ethics Review Committee and ethics approval was granted on 12th December 2016. In this study, ethical issues that were considered relevant included: informed consent, beneficence of participants, confidentiality, anonymity and privacy. These issues are discussed extensively in Chapter Four.

1.10 Definition of terms

The following are working definitions of terms and concepts used in this thesis:

Agricultural Information: all published and unpublished knowledge on general aspects of agriculture and consists of innovations, ideas and technologies of agricultural policies (Aina 1990, as cited in Bello & Obinne 2012:91). This includes information on weather, marketing, government regulations and agronomic data among other.

***Agricultural information system*:** a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergistically to underpin knowledge utilisation by agricultural producers (Röling 1988:33).

Information need: "…a state or process started when one perceives that there is a gap between the information and knowledge available to solve a problem and the actual solution to the problem" (Miranda & Tarapanoff 2008:2). Information needs arise from existing interactions between elements in the personal dimension and elements within a context (Du Preez 2015:29).

Information service: an information service is defined in the Business Dictionary (2018) as an "agency or department responsible for providing processed or published information on specific topics to an organization's internal users, its customers, or the general public". In this study information services refer to those support services provided by several agricultural support organisations to smallholder farmers to enable them to carry out their agricultural operations.

Smallholder farmers: are small-scale farmers who manage areas varying from less than one hectare to 50 hectares (SSA 2016).

Agriculture extension services: "are services employed by agricultural organisations, institutions and bodies to assist farmers to improve agricultural output through provision of relevant, current information and the transfer of knowledge" (Simpson & Calitz 2014:98). According to Anderson and Feder (2007:2348) this service encompasses the "delivery of information inputs to farmers" and Phali-Shikhulu, Keregero and Zwane (2008:25) consider these services a "public good".

Sugarcane: according to the Merriam-Webster Dictionary (2018) sugarcane is a "stout tall perennial grass (*Saccharum officinarum*) that has a large terminal panicle and is widely grown as a source of sugar".

1.11 Structure of the thesis

The structure of the thesis will be guided by suggestions in literature (Leedy & Ormrod 2015; Neuman 2006, Ary, Jacobs & Razavieh 2002).

Table 1.2: Structure of the thesis

Chapter	Content
Chapter 1 Overview	includes general background information, the sugar industry, statement of the problem, objectives of the study, significance of the study, scope and limitations of the study.
Chapter 2	discusses the context and location of the study
Chapter 3 Literature review	provides a review of literature related to the study to provide a theoretical foundation for the study.
Chapter 4 Research methodology	includes the research design and methodologies, data collection procedures used in data analysis
Chapter 5 Presentation of findings	presents findings of the study in the form of tables, figures and explanations.
Chapter 6 Interpretation of the findings	presents interpretation of findings with respect to research questions and compares the results obtained with those from other studies as indicated in literature.
Chapter 7 Summary, conclusions and recommendation	presents summary, conclusions and recommendations of the study and provides suggestions for further research.

1.12 Summary

This chapter lays the foundation of the study by discussing the general introduction, background to the study, conceptual and contextual setting. It also provided the problem statement, research purpose and objectives, justification and originality of the study, scope and limitation of the study,

research methodology, as well as the definition of key terms and structure of the thesis. The next chapter will provide the status of agriculture and the sugar industry in Swaziland, particularly the role of smallholder sugarcane farming, the information landscape and services.

CHAPTER TWO

STUDY AREA

2.1 Introduction

This chapter discusses the context and location of the study. It gives an overview and status of agriculture in Swaziland in relation to the land tenure arrangement. It also provides a description of the sugar industry with emphasis on smallholder farmers, and the general status of the communication infrastructure and services in Swaziland.

2.2 An overview of Swaziland's agriculture

Swaziland is a small country landlocked by South Africa and Mozambique in the east with an area of 17,364 square kilometres. The country has a population of 1.1 million people whom around 70 percent live in the rural areas. The Swaziland economy is characterised by high dependence on its membership to the South African Customs Union (SACU) and the Common Monetary Area (CMA), with the country's agricultural policies harmonised with that of the block (African Development Bank 2013). Agriculture is traditionally the backbone of Swaziland's economy, and a major source of employment for rural households, with a majority of the population relying on this sector for their livelihood. The main uses of agricultural land in Swaziland include communal grazing, subsistence and commercial farming (Mkhabela 2006:59). The evolution of agriculture had been slow, erratic and disorganised, with small-scale farmers continually getting relatively low yields. As a result, in 2007, about half a million people in Swaziland required food assistance (FAO 2008:4). The situation continues unabated in the rural areas, notwithstanding the advancements in technology, with some farmers still struggling to make ends meet, despite having been in the enterprise for a considerable period of time (FAO 2011). Even though some farmers have organised themselves into formidable cooperatives through assistance from government and international organisations, there has been little development to show for it in their production compared to commercial farmers (Dlamini & Dlamini 2012).

Swaziland's land tenure is dualistic in nature, comprising two major agricultural production systems, namely the Traditional Customary Tenure (TCT) and Title Deed Tenure (TDT). The TDT and the TCT respectively covers 46 percent and 54 percent of the country (FAO 2005). These subsectors have influence in the production capacity and patterns. Given the disparities

in land ownership, farmers under the TCT have a greater potential in expanding agricultural output, due to their access to bigger portions of the land in the country. The TDT is governed by private land ownership rights and is called the Title Deed Land (TDL). Land acquired through this system can be bought or sold as and when the owner wants (Sithole & Apedaile 1987:202). TDL holds 90 percent of available irrigation infrastructure, uses modern technologies, and produces mainly high value crops, mainly sugarcane (Sandrey & Vink 2013:188). TCT, on the other hand, is land held in trust by the King for the Swazi Nation; hence it is called Swazi Nation Land (SNL), and contains most of the rural population. This category of land is controlled and allocated by the chiefs following traditional arrangements (Mkhabela 2006:59). SNL is acquired in terms of traditional law and custom, through the discretion of chiefs, by going through a process called *kukhonta.* Through the *kukhonta* process, land-seekers are required to pay a nominal fee equivalent to the price of a cow or alternatively make payment by presentation of a live cow. The chief administers land issues with his council, and has the power to take land away from individuals, particularly prevalent in favour of developmental projects (Amstrong 1986). Upon receipt of the piece of land the individual has a responsibility to pay allegiance to the chief to guarantee sustainability of projects set up on it (Ndlovu, Dlamini & Nkambule 2014:3210). Even though land obtained through the customary tenure is easily accessible, it cannot be used as collateral to obtain commercial credit from banks (Mkhabela 2006:71). Furthermore, even though SNL consists of subsistence farmers growing mainly rain-fed maize, it has persistently fallen short in meeting the food requirements for its staple food (maize), with a decline in yields from the year 2004 to 2007 (Manyatsi, Thomas, Masarirambi, Hachigonta & Sibanda 2013:217). The failure by the smallholder farmers to meet their productive capacity is largely a result of limited access to mechanisation and technology (Sandrey & Vink 2013:188).

The World Bank and the Government of Swaziland (GOS) have been continuously engaged in reviewing means of improving the productivity of small-scale farmers and how best to integrate smallholder farmers to markets (World Bank 2011b:vi). The effort to improve the productivity of smallholder farmers is illustrated in the Swaziland National Development Strategy (NDS) for the period 1997-2022, and further outlined and detailed in the 2008 Poverty Reduction Strategy and Action Plan (PRSAP), where agriculture is put as a key focus. The PRSAP ambitiously sets out strategies that would promote the development of the sector with a view to improve food security and the welfare of smallholder farmers. The PRSAP further identifies

agriculture as a key pillar for poverty reduction. It further recommends increased productivity and commercialisation of SNL by improving irrigation infrastructure, hence reducing the strong dependence on rain-fed agriculture. The strategy embraced the formation of sustainable farmer groups/companies/cooperatives, and the development of appropriate information services, particularly marketing information (GOS 2008). Other agriculture sector policies that encourage the development of smallholder farmers include the following: Swaziland National Irrigation Policy (2005), Comprehensive Agriculture Sector Policy (2005), and the National Food Security Policy for Swaziland (2005). These agriculture sector policies, in a nutshell, advocate for the intensification of agricultural production among smallholder farmers on SNL to ensure that they are on par with their counterparts in large, privately-owned farms and plantations, which are in TDL.

2.2.1 Sugarcane farming in Swaziland

The sugar industry is an important player in terms of its contribution to the economy of Swaziland. The country is amongst the largest sugarcane producers and was ranked number 27 globally in 2007. Sugar dominates the country's agricultural production by value and a crucial export to the European Union (EU) under special preferences (Sandrey & Vink 2009:184). In 2014-15, the Swaziland sugar industry was ranked the fourth largest in Africa, although the country is relatively small (Terry & Ogg 2017:585). The sugar industry consists of three mills, namely Mhlume, Simunye and Big Bend Mill (Figure 2.1); all located in the eastern lowveld of the country. The Sugar Act of 1967, together with the Sugar Industry Agreement and the constitution of the Swaziland Sugar Association (SSA), regulates all aspects of the industry, from the right to grow sugarcane to how the sugar is marketed (UNCTAD 2000:6). The SSA is an umbrella body that comprises the sugarcane growers and millers. These entities have organised themselves to form the Swaziland Cane Growers Association (SCGA) and Swaziland Sugar Millers Association (SSMA), which then constitute the council as the highest policy body of the SSA. According to the SCGA (www.scga.cosz), the purpose of the organisation is to "serve and support cane growers through promoting, advocating and fostering their collective interest, sustainability and progress." Membership to SCGA is open to any person who is a holder of a permit or quota. The sugar industry grower is made of four components, namely Miller-cum-planters and estates, large-scale growers, medium-scale growers and small-scale growers. The SSA receives financial support from the growers and millers to conduct research on their behalf. The SSA regulates entry into the industry by

providing quotas to prospective farmers who have land and water. The sum of the quotas is based on what SSA can sell in a year (UNCTAD 2000:7).

The by-products of sugarcane are used to produce biofuels (ethanol) and the generation of electricity, with surplus integrated into the national power grid (Philips 2014). This sector was the biggest single foreign currency earner, generating revenue of more than four (4) billion emalangeni annually. It also provides approximately 16 percent of total export revenue, 74 percent of total agricultural output and 35 percent to total agricultural wage employment (SSA 2015:6).

Sugarcane production covered an area of about 57 262 hectares in 2012 and was projected to increase over the coming years (SSA 2013). About 7 000 hectares of the land were farmed by smallholder associations (Malaza & Myeni 2009:405). According to the SSA (2018) smallholder sugarcane farmers and individuals contribute over 20 percent of sugarcane in the industry.

2.2.2 Smallholder sugarcane farming

The Swaziland sugar industry, which had largely been dominated by large-scale estates since its inception in 1957, has seen a rapid increase in the involvement of smallholder farmers. Terry (1997:196) has revealed that in 1991, efforts were made to extend participation to small-scale growers, with the aim of reducing poverty in the rural areas. Presently, there is a substantial number of smallholder sugarcane farmers along the Komati and Great Usutu River in the lowveld, distinguishable by cane stands. These farmers operate as individuals and in groups under the communal land arrangement administered by the chief and funded at varied levels by the European Union (EU) and state financial institutions (Samuel 2008). In 2012-13, smallholder farmers were responsible for 23 percent of production and the area under sugarcane had "grown by 28 percent most of which was due to smallholder expansion" (Terry & Oggy 2017:586). Smallholder sugarcane production has been on-going since 1960, with the establishment of Vuvulane Irrigated Farms (VIF), a scheme sponsored by the Commonwealth Development Corporation (Sifundza & Ntuli 2001:193). Increases in the prices of sugar due to the preferential treatment of Swazi sugar in international markets lured many smallholder farmers in Swaziland to grow sugarcane, resulting in sugar being colloquially known as the "Swazi gold" in the region. The major factor contributing to the shift was the profitability of sugar cane cultivation (FAO 2005). Another factor that attracted smallholder farmers to the

sugar industry is the outsourced marketing of the product to EU markets on behalf of the smallholder farmers by the SSA (Masuku 2003:3).

Moreover, the GOS and international donors, for example the European Union (EU), have made a significant investment in irrigation infrastructure development to encourage smallholder farmers to engage in commercial farming and increase productivity for poverty alleviation. For instance, a huge investment has been made in the development of the Maguga Dam Project, which culminated in the development of about 6 000 hectares of land under the Komati Downstream Development Project (KDDP); and the development of infrastructure for the Lower Usuthu Irrigation Project (LUSIP) (Malaza & Myeni 2009:405). By investing in a large-scale irrigation system, the GOS aimed to create secure access among poor smallholders to a vital resource (water) and harness the benefits of the sugar industry, which were previously enjoyed principally by the large-scale private sector (Liversage & Jonckheere 2014:7).

The GOS also established the Swaziland Water and Agricultural Development Enterprise (SWADE), a parastatal responsible for facilitating the development of smallholder sugarcane farmers in the KDDP and LUSIP corridor. Among the responsibilities of SWADE (2018) is to mobilise communities and develop chiefdom development plans (CDP), which set forth the development vision for the chiefdoms. SWADE is also responsible for training communities to inculcate the transformation mind-set, assists farmers to establish farmer companies based on credible business plans, and further exercises oversight in the overall operation of the sugarcane farming schemes. According to Ndlovu et al. (2014:3206), much activity on the projects was seen in the year 2005, following community mobilisation.

The establishment of the development projects have seen farmers forming cooperatives/farmer companies and pooling their communally operated land to ensure effective farm size thus establishing a viable business that many smallholders would not have been able to achieve (GRM International 2013). In return, individual smallholder farmers acquire a share in the business and receive dividends on profits (Liversage & Jonckheere 2014:11). The European Union (EU) provided financial support and also assisted in turning the leadership of these farmer companies into effective business managers (EU 2013). In addition to the EU's funding, there had been great financial support from government-funded development finance institutions, such as the Swazi Bank, Swaziland Development Finance Corporation

(FINCORP), and the Swaziland Industrial Development Corporation (SIDC) (Samuel 2008). Commercial banks, for example Nedbank and SSA, also partnered with the GOS, though informal, to ensure the funding and development of smallholder sugarcane farmers (Nxumalo 2010).

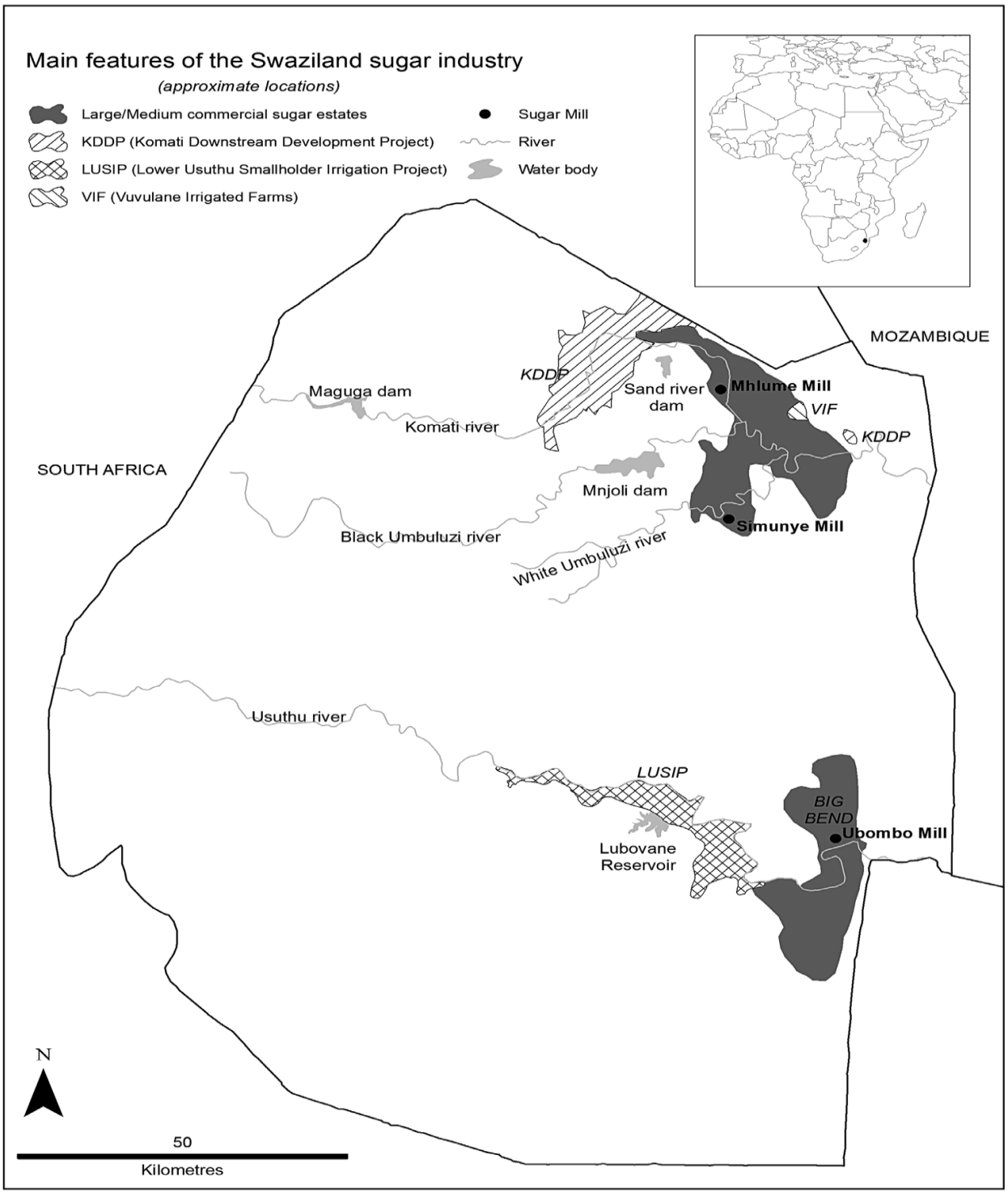

Figure 2.1: Map showing location of sugar mills (Terry & Ogg 2017:588)

2.3 Agricultural information and services in Swaziland

Agricultural information services in Swaziland can be classified according to whether they are subsistence-based (SNL), or commercial-based (TDL). Agricultural information is generated through research locally produced by the University of Swaziland and Ministry of Agriculture's (MOA) Department of Agricultural Research and Specialists Services (DARSS), which is based at the Malkerns Research Station, though at a minimal scale, thus widening the agricultural and development information gap (Phiri 2008:20). The lack of extensive research institutions means the country has to rely on regional research institutions and bodies such as SADC, and international institutions such as FAO, for agricultural research. The research output from these institutions is mostly consumed by subsistence-based farmers, whereas well-developed commercial farmers tend to rely on services provided by private companies (Phiri 2008:10). Mavuso and Ballantyne (1992:10) raised concerns regarding the import of most of the research information from outside sources, and the absence of major research by Swazi companies. According to these authors the information obtained by companies from abroad is usually adapted to local settings, kept privately within the industry, and only circulated through personal and technical contacts.

The Swaziland agricultural information system encompasses three main entities, which include research institutions, extension officers, and farmers. In addition to these entities there are a number of distinct private organisations and institutions linked to agriculture that are providing occasional information services to smallholder farmers. Agricultural information in Swaziland can be accessed through the following mechanisms: libraries and information centres, information networks (Thiyam & Dlamini 2013:308), agricultural shows, telephone, radio, television (Jibowo & Dube 2008:62), and through local leaders (Jibowo, Dube & Dlamini 2014).

2.3.1 Agricultural extension services

Agricultural extension has remained a primary service across the four regions of Swaziland, facilitating information flow within the agriculture sector. The Swaziland Agricultural Extension Service began in the 1930s, dominated by the British colonial system, and progressed to a localised system staffed by mostly native Swazis (Trail 1985). Agriculture extension work gained momentum in 1970s with the advent of the Rural Development Areas

Programme (RDAP) (Keregero & Phali-Shikhulu 2010). Between the 1970s and 1990s, the level of service by the Ministry of Agriculture (MOA) to the clientele reached its peak, and thereafter started to decline (Keregero 2000:79). The decline was partly attributed to the wholesale institutional importation of the concept and practice of agricultural extension from a western tradition to the Swazi context. This resulted in conflicts with the economic setting within which the service had to operate and the policy environment of the service (Phali-Shikhulu, Keregero & Zwane 2008:26).

In affirmation, the Swaziland National Agricultural Summit (SNAS) held in 2007 recognised that the Swaziland Agricultural Extension Service was inefficient and completely run down (FAO 2011:18). In the same vein, Sifundza and Ntuli (2001:193) reported that one of the causal factors was limited human resource availability. As a result, the extension profession lacked credibility among farmers (Diamond (1994:73). The author further reported the inherent poor timing of messages, rigidity of the system, irrelevant information, and poor planning processes. Likewise, Keregero (1997) reported that access to agricultural information services by farmers was very poor, due to weak coordination between research institutions and the Swaziland Agriculture Extension Services. The problem of lack of coordination also exists among research institutions. According to Mavuso and Ballantyne (1992:4) there are only informal research arrangements undertaken at personal level between scientists in the Ministry of Agriculture and the University of Swaziland's Faculty of Agriculture. Therefore, the non-coordination of the key research organisations creates a problem in the distribution of information and the feedback thereof.

Extension work had been the sole mandate of the MOA, however that has changed over the past two decades, owing to the entrance of smallholder farmers into the sugar industry. For example, the SSA plays an increasingly important role in the generation of information through its technical services section, and ultimately disseminates information to smallholder sugarcane farmers. The SSA provides extension services directly and sometimes utilise the assistance of specialists from the South African Sugarcane Research Institute (SASRI), service providers or in some instances agricultural input suppliers (SSA 2013). The SSA extension officers make regular visits to smallholder sugarcane farmers alongside the government extension officers. The inclusion of private sector information providers to augment the provision of information services to smallholder farmers is seen as a panacea to the deteriorating extension service (Phali-Shikhulu, Keregero & Zwane 2008:31).

2.3.2 Agricultural libraries

Agricultural libraries in Swaziland comprise three principal libraries, which includes the University of Swaziland (UNISWA), Luyengo Campus Library, Ministry of Agriculture Library, Malkerns Research Centre Library (Thiyam & Dlamini 2013:311). The Ministry of Agriculture Library is responsible for "procuring, processing, packaging and disseminating agricultural information that supports efforts that ensure household food security and sustainable agricultural productivity" (GOS n.d.). The Luyengo Campus Library services mostly the Faculty of Agriculture students and academic staff of UNISWA. This library is a depository of the Food and Agriculture Organisation (Phiri 2008). The library supports the learning, teaching, research and extension services.

To enhance access to agricultural information by farmers in Swaziland, in 2004 the Technical Centre for Agriculture and Rural Cooperation (CTA) initiated the establishment of a Question and Answer Services (QAS), coordinated by the University of Swaziland, Faculty of Agriculture Library, with linkages to the regional QAS in the SADC region based at the University of Free State in South Africa. The QAS acts as a complementary service to the day to day provision of agricultural information service provided by the UNISWA Library with the aim of brokering or transferring knowledge to farmers (Phiri & Dlamini 2004).

2.3.3 Information and communication technologies and services

Information and communication technology has been acknowledged as an enabler in the dissemination of information for agricultural development by creating efficiencies in operations. However, Swaziland is a net importer of almost all ICT-related products, which invariably widens the gap of the digital divide in the country (GOS 2012:16). The impact of the information revolution is barely being felt within the country, given the slow development of ICT infrastructure and awareness of same as depicted in Table 1.1. Infrastructure for radio and mobile technology has wide coverage, hence government has reported an impressive penetration across the country, with internet access on both fixed line and mobile network (GOS 2012:23).

Table 2.1: ICT infrastructure indicators, 2012. Source, GOS, National Information and Communication Infrastructure (NICI) plan for 2012-2016

Indicator	Measurement
Fixed-line subscribers	7.5 per 100 inhabitants

Mobile subscribers	72 per 100 inhabitants
Population covered by mobile telephony	95%
Broadband subscribers	11059
Internet users	1.8 per 100 inhabitants
Television broadcast stations	45% of households
Radio stations	76% of households
PC	6.5 per 100 inhabitants
Electricity	48% of households

Swaziland's ICT infrastructure consists of a fixed-line network owned by the Swaziland Post and Telecommunications Cooperation (SPTC), a government parastatal, while the mobile telecommunication network is run by the Mobile Telecommunications Network (MTN Swaziland), mostly known as Swazi MTN, which is a private company that forms part of an oligopoly in South Africa, and which has enjoyed a monopoly in Swaziland with an exclusive mobile network licence since 1998 (Phiri 2008:44) until 2016 (Mbingo 2016). SPTC (2018) also a monopoly national operator, provides a spectrum of services which include telephones, voice and data services and further participates in mobile services as a joint venture partner with Swazi MTN. As a result, Swazi MTN 2018 provides call, messaging and internet-based products and services. In 2016, a new Swazi owned mobile company, Swazi Mobile, was granted a licence by the Swaziland Communications Commission (SCCOM) to operate telecommunication services (Mbingo 2016). The ending of a monopoly by MTN created necessary competition that saw mobile communication costs decreasing. Swazi MTN built an extensive infrastructure that includes a network of 200 base stations in the country, thus widening the chances of smallholder farmers having access to the network. This accounts for a geographic coverage of 93 percent, and a population coverage of 95 percent, running on GSM, 2.5G, UMTS 3G network (GOS 2012), and in 2014, it acquired the 4G/LTE licence network (Sibandze, 2016).

When the Ministry of Information and Communication Technology (MICT) was established in 2009 by government, and it was given a mandate to provide a national information, communication, and a technology delivery framework for the country. Under the MICT there is a government computer service, which is responsible for ensuring the availability of government services by setting up a functional electronic communication infrastructure. For example, staff at the MOA can be accessed through email in the different towns. The Ministry of ICT is also responsible for to overseeing the following parastatals; (SPTC, Swaziland Television Authority, Royal Science and Technology Park Project, National Research Council,

and the Swaziland Communications Commission). The statistics in Table 1.1 showed that remarkable progress has been made by government in the development of ICT infrastructure, even though more still needs to be done for the impact to be felt by smallholders in the countryside. According to the GOS (2012), SPTC was embarking on a plan to transform its fixed network, which was already 100 percent digital to the next generation networks (NGN). The continued deployment of such telecommunication infrastructure and the liberalisation of telecommunications have revolutionised the way in which information is accessed by smallholder farmers, as information systems invariably improve. Despite all the efforts by the GOS to improve the ICT infrastructure, given the need to narrow the digital divide (Dlamini & Worth 2018; Phiri 2008), "The Global Information Technology Report 2016" published by the World Economic Forum ranks Swaziland at 129 out of 139 in Networked Readiness Index (NRI), with a score of 2.9 out of 7. The NRI measures the capacity of countries to take advantage of opportunities offered by information and communication technologies (ICTs) for increased competitiveness and well-being (Baller, Dutta & Lanvin 2016:16). This suggests that Swaziland needs to do more to be technological ready.

The introduction of another player in the mobile industry curtailed the potential of Swazi MTN to continually charge "high predatory prices" (Shongwe 2016:3), which would act as a hindrance to the accessing of information by smallholder farmers. Conversely, the development of the telecommunication infrastructure brought a great deal of opportunities which could be harnessed to facilitate effective delivery of development information to smallholder farmers. Currently, very little is known specifically about how smallholder sugarcane farmers harness ICT infrastructure and ICT solutions in running their sugarcane growing enterprises. Electricity is still a challenge, a rate of coverage of merely 48 percent (Table 1.1). According to the African Development Bank (2013:7), out of all the SACU countries, Swaziland has the highest electricity cost. Lack of electricity limits smallholder farmers from accessing information and rural areas are mostly affected. This is because one needs electricity to power communication paraphenalia, such as mobile phones, computers, and televisions.

2.3.4 Media: newspapers, TV and radio programmes

In Swaziland, media plays a key role in the dissemination of information and the development of the information society. It also plays an essential role in spreading awareness of the importance and benefits of the information revolution (GOS 2012:15). In other words, media is a useful tool in agricultural education and extension, which are vehicles for the dissemination

of agricultural information. Print media is the most popular source of information in the country. The country has two daily newspapers, namely the Times of Swaziland and the Swazi Observer, which both cover sections on agriculture, where the Times of Swaziland runs a weekly column under the title "Business Farming". The Freedom House (2015), however, argue that journalists are poorly remunerated, resulting in high staff turnover in the industry, greatly affecting the gathering and processing of agricultural amongst other news.

The broadcast media, especially radio, has been the most cost-effective platform that has been extensively used in Swaziland in reaching farmers with agricultural information. Hence, radio was touted as the only mass medium that reaches the rural population (McLean 1992:62). According to Skosana (1989) as cited by McLean (1992), radio broadcasting was started in 1966, with the introduction of the country's first broadcast to provide information to help farmers improve their agricultural practices. The programmes were developed mostly by non-broadcast professionals. The Swaziland Broadcasting and Information Service (SBIS) broadcasts in both English and Siswati, complemented by a television station. According to the GOS (2012) SBIS covers over 90 percent of the country. The Siswati channel (SBIS1) provides a wide range of agricultural information like markets and rainfall statistics. The use of radio in broadcasting information has been successful, since Swaziland is a small country with only two spoken languages, English and Siswati. The other factor was that the development producers were from the rural areas, and were also engaged in farming, where as a result, the information produced and aired was beneficial. In addition to the government radio station (SBIS), there is a privately-owned radio station called the Trans-World Radio Station, which also gives airtime to adverts that include agricultural products, such as farming material. However, SBIS allocates more airtime to tailor made programmes on a weekly basis.

The Swaziland Television Authority (STVA) provides the only state-owned television station (Swazi TV), in addition to one owned privately called Channel S. Swazi TV, which covers 80 percent of the country and has 70 percent penetration. Other improvement on the country's coverage by STVA is on its satellite transmission through Multichoice Africa (GOS 2012:26) and the successful terrestrial TV migration that increased the number of channels in STVA's broadcasting platform. Swaziland's press industry can be characterised as small, with few media houses in the various platforms like print, radio, TV, and online (Musi-Aimienoho 2016).

In 2012 an agribusiness magazine called “Lilima” was launched by the Minister of Agriculture, with the intent to contribute to the development of agriculture in the country. The magazine is published monthly and covers general issues on agriculture (Nkambule 2012). The SBIS also publishes a newsletter called “Swaziland Today”, which covers some topics related to agriculture from time to time. The publication is available for free to members of the public.

2.4 Summary

This chapter provided an overview of Swaziland’s agriculture, sugarcane and smallholder farming. It also described the status of information communication services in Swaziland which include agricultural extension services, libraries, and information and communication technology as well as media services. What emerged from this chapter is that currently smallholder sugarcane farmers have restricted platforms for accessing agricultural information. The slow development of the telecommunications infrastructure in the country limits the opportunities for information service providers to timeously disseminate information to smallholder sugarcane farmers.

CHAPTER THREE

LITERATURE REVIEW ON INFORMATION NEEDS AND INFORMATION SERVICES OF SMALLHOLDER FARMERS

3.1 Introduction

This chapter explores the theory and concepts that establish the conceptual framework that underpin the study of the information needs and information services of smallholder sugarcane farmers in Swaziland. The conceptual framework was derived from the following models:

(i) Wilson's 1996 model of information behaviour (Wilson 1999); and

(ii) Theory of planned behaviour (Ajzen 1991).

This chapter begins with exploring the purpose of literature review, followed by the description of theoretical and conceptual frameworks. The literature review includes information needs, antecedents of information needs, information needs of farmers, information sources and information services for farmers. Furthermore, the review discusses information services barriers and the design and implementation of information service strategies. The chapter thereafter discusses Wilson's model and the theory of planned behaviour with the intent to define and identify the theories, concepts and constructs that informed the investigation in the study.

3.2 Purpose of literature review

Comprehensive review of literature is one of the fundamental processes in research (Meadows 2003a; Cresswell 2014; Neuman 2014; Baker 1999; Boote & Beile 2005; Randolph 2009). A literature review provides the researcher with information on the current state of knowledge in the area, studies that have been conducted on the topic, helps identify research gaps, and helps build or expand current knowledge. In addition, it assists in identifying appropriate data collection methods and challenges encountered (Meadows 2003b:564). Researchers can advance the collective understanding of a field by progressively building on the knowledge that has been generated before. This begins with a thorough, sophisticated review of literature to inform the understanding of the field of study (Boote & Beile 2005:3). Hence, a researcher gets an opportunity to demonstrate his/her understanding of the field of study, using the appropriate vocabulary, theories, variables, and phenomena. This includes demonstration of knowledge of the historical aspects and methodological nuances of exploring phenomena (Randolph 2009:2). This author argues that if the literature review is flawed, then the rest of the study will be questionable.

Considering the above, the researcher performed a literature review to gain a deeper understanding of the information needs of smallholder farmers and the factors that influence their needs. Understanding these issues is essential in guiding the design of an information services strategy that will deliver an effective service. The review of the literature encompasses studies done in both developed and developing countries, including Swaziland, to provide a broad research perspective that will form a foundation to conduct the empirical study.

The purpose of a literature review is not only to provide a synopsis of literature relevant to a topic, but it can also be used to guide the literature review process while addressing the principal research question and the sub-questions which are delineated in Chapter One (Bitso 2011:26). Therefore, the literature review process was guided by the following principal research question: **How can a better understanding of farmers' information needs enhance the delivery of agricultural information services to smallholder sugarcane farmers in Swaziland?**

In addition to the guidance by the principal research question in the literature review process, Wilson's 1996 model of information behaviour was also used as a benchmark to describe and define the concept of information needs and related factors that influence the information needs in the context of smallholder farmers. Figure 3.1 depicts the thematic concepts covered in the literature review of the study. Although the research context was presented in Chapter two, nonetheless it has been included in the literature map as the basis of the study.

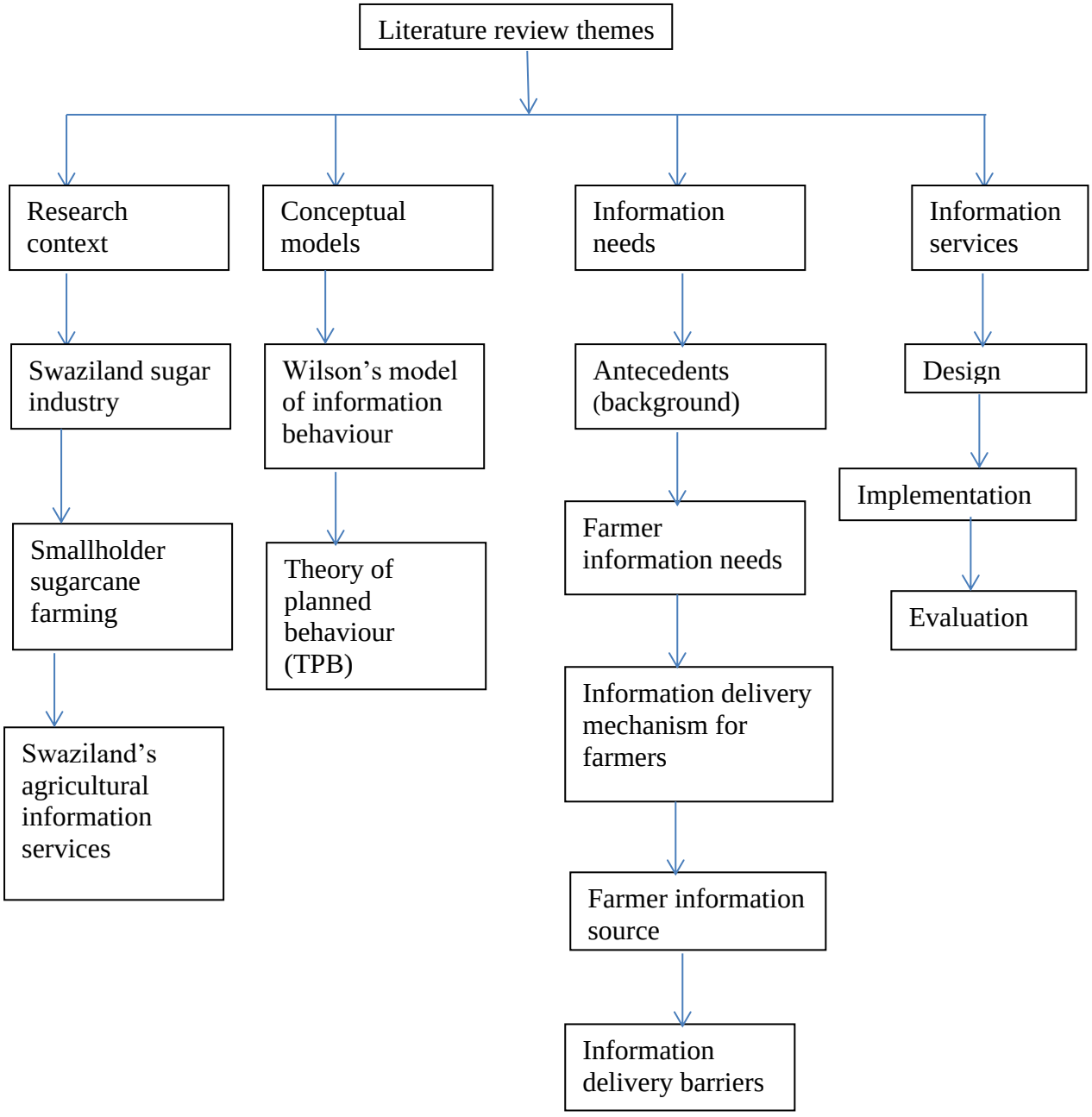

Figure 3.1: Literature map for information needs and information services

Although the topical issues making up the structure of this chapter have been identified in Figure 3.1 above, the following section clarifies terminology regarding the application of theory and concepts in social science research. The two terms: "theoretical" and "conceptual" frameworks are defined and explored to avoid confusion in their application in the context of this study. First, it is important to cast our eyes at the key concepts, where the two terms are derived to establish their respective meanings.

3.3 Theory and Concept

The concept of a theory is central in a dissertation, where it is anchored in such (Grant & Osanloo 2014:13). Numerous definitions of theory exist. Fox and Bayat (2007:29) see theory as a "set of interrelated propositions, concepts and definitions that present a systematic point of view of specifying relationships between variables with a view of predicting and explaining phenomena". Specifically, a theory plays an important role in the research design process (Ngulube 2018:1), and research implementation (Berman 2013:3). Shoemaker, Tankard & Lasorsa (as cited in Kitchel & Ball 2014:188) have contended that a research that lacks theory is viewed as problematic in advancing knowledge in a field of study. In a nutshell, a theory is critical in explaining and predicting a phenomenon in a study as revealed in the above literature. On the other hand, a concept is viewed by Liehr & Smith (1999:7) as "an image or symbolic representation of an abstract idea". Defining a concept is more challenging, because the meanings, nature of language and interpretations are embedded in the background in which it is set (Jackendoff 1989:68). Put differently, the context and setting have an influence on the meanings and disposition, which gives the impression that a concept does not exist independently. Perhaps it is for this reason that Jackendoff (1989:69) views a concept through two respective lenses: first, "it is something out there in the world"; second, it is an "entity within one's head, a private entity, a product of the imagination that can be conveyed to others only by means of language, gesture, drawing, or some other imperfect means of communication." It can be deduced from the above description that concepts exist in the minds of researchers, and can clearly be depicted using sketches or schematic diagrammes. The schematic diagrammes or symbolic representation of a phenomenon is referred to as a model (Wilson 2016). One can postulate then, that drawings are a vital element in representing ideas.

Researchers in the social sciences have used, misused and confused the respective terms of "theoretical" and "conceptual" framework (Kitchel & Ball 2014; Imenda 2014; Casanave & Li 2015). Imenda (2014:185) mentions that researchers often use the terms "theoretical" and "conceptual" framework interchangeably to express a form of a theory. On the contrary, some researchers contend that these two terms are conceptually different, even though they are both useful in conceptualising research (Casanave & Li 2015; Ngulube 2018). The confusion in the use of the terms persist in social research, yet theory is a critical component (Cooper & Meadows 2016). In the same vein, Ngulube (2018:1) views conceptual or theoretical frameworks as the glue that binds related research design components in social research, and opine that without this glue, a research design would disintegrate. This implies that both

concepts are important in research, and hence, that it is crucial to clarify their meanings so as to avoid their misuse in a study.

A clear delineation and proper selection of theory will have implications in the findings of this study. This calls for the proper usage of conceptual frameworks to aid the quality of research (Ngulube 2018:2). Many scholars do not dispute the inclusion of theory in social science research, however clarity of terminology around theory must be delineated in the context of the study at hand. Accordingly, literature on conceptual frameworks was reviewed with a view to have a broad understanding of the concept to enable the researcher to make appropriate use of it.

3.3.1 Conceptual Framework

A conceptual framework refers to the joining together of related concepts to depict a researcher's understanding of the research problem (Imenda 2014:189). In other words, a conceptual framework maps out the researcher's view on how variables connect with each other to explain the phenomenon. A conceptual framework constitutes concepts mapped diagrammatically to mirror the concepts that are being investigated in the research project. The researcher can develop a conceptual framework from concepts obtained from several components of different theories, literature, or alternatively use some parts of concepts or from personal experiences (Ngulube 2018:9). Unlike theoretical frameworks, which are ready-made, conceptual frameworks are carefully weaved in the form of conceptual model from key factors and constructs, and presented graphically or in a narrative form, to show the presupposed relationship among the variables (Imenda 2014:189; Miles & Hubberman 1994:18).

At doctoral level, Berman (2013:2) argues that conceptual frameworks can be tools that are used to enhance the conceptual thinking of doctoral students, as they put together their ideas for their research projects. The author contends that at this level, doctoral students are expected to make significant and original contributions to knowledge in their field of study. Such contributions can only be achieved through a conceptual thinking that involves the use of multiple theoretical frameworks. The conceptual frameworks can be used to establish theoretical cohesion; organise research designs and implementation; and to frame conceptual conclusions.

Likewise, the researcher developed a conceptual framework for the study of agricultural information needs of smallholder sugarcane farmers using constructs from Wilson's 1996

model of information behaviour and the theory of planned behaviour. The conceptual framework in the study was utilised to:

- Bring theoretical cohesion: the conceptual model assisted in describing the relationships among constructs from Wilson's 1996 model of information behaviour and the TPB.
- Organising research designs: the research themes and questions were derived from concepts in the models.
- Framing conceptual conclusions: the conceptual model provided means for studying information needs and finally organising the variables that informed the establishment of an effective information services strategy for smallholder sugarcane farmers.

3.3.2 Models of information behaviour

To theorise information needs, it was imperative to review some popular information behaviour models to ascertain their relevance to the study. Information behaviour constitutes the identification of a need for information; a search for information; and the ultimate use of that information (Wilson 1999:259). Therefore, the determination of information needs is one of the important aspects of the information behaviour of users. Several popular models of information behaviour were identified in literature; however, only literature based on Wilson's 1996 model was explored, due to its relevance to the study. Other models of information behaviour were not discussed, since they were not directly related to this study. Bitso (2011:27) has suggested that it is not necessary to discuss models that have no direct bearing to the study at hand, however, notes their presence should be acknowledged. The more popular information behaviour models found in literature are as follows:

- General information behaviour models:
  - Wilson (1981, 1999); Wilson and Walsh (1996) information behaviour models
  - Dervin (1983, 1996) sense-making theory
- Workplace and task-related information behaviour models:
  - Bystrom and Jarvelin (1995) task complexity and information-seeking and use
  - Leckie, Pettigrew and Sylvian (1996) information seeking of professionals' model
- Information seeking, search and retrieval models:
  - Ellis (1989) model of information behaviour
  - Kuhlthau (1991, 1993) information search process model

  - Ingwersen (1996) information retrieval process model
  - Ingwersen and Jarvelin (2005) information-seeking, retrieval and behavioural processes model
- Health-related information seeking models:
  - Johnson, Andrews and Allard (2001) comprehensive model of information-seeking
  - Gorman (1999) information-seeking in primary care
- Digital environment model:
  - Choo, Detlor and Turnbull (1999, 2000) information-seeking on the web
  - Marchionini (1995) information-seeking in electronic environments

3.3.3.1 Wilson's 1996 model of information behaviour

The study adopted Wilson's 1996 model of general information behaviour for the investigation of the information needs and information services of smallholder sugarcane farmers in Swaziland. The model is broad, comprehensive, and generally entails many important elements of information behaviour; hence it qualifies to study different kinds of information users (Wilson 1999; Niedzwiedzka 2003). In discussing the Wilson's 1996 model, other models and scholars' views or perceptions were incorporated so as to expand the breadth and depth of understanding regarding the application of the model in the study. The model is graphically presented in Figure 3.2.

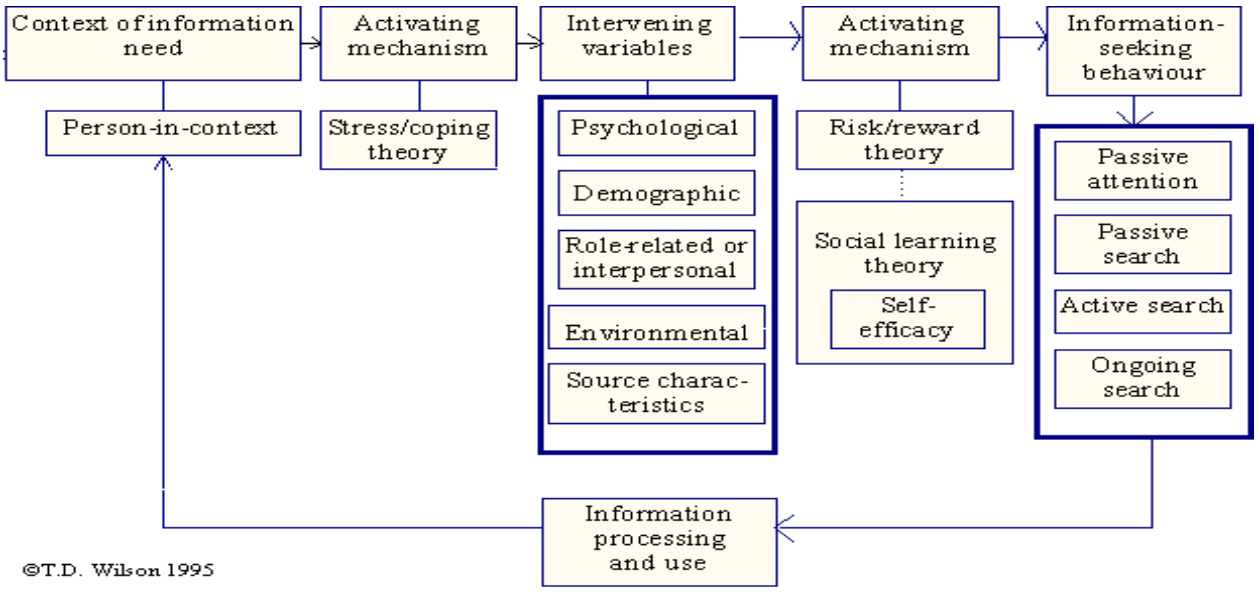

Figure 3.2: Wilson's 1996 model of information behaviour (Wilson 1999)

Wilson's 1996 model of information behaviour focuses on the information user (Robson & Robinson 2013). The model is interdisciplinary and general in nature. It is a culmination of research work from health information, advertising, economics, communication and organisational behaviour, which makes the model rich and encompassing (Wilson 1999). The model, as presented graphically, incorporates the following elements: context of an information need including the information user depicted as the "person in context", and activating mechanisms (stress/coping theory) that bridge the needs and the resultant quest for information. The stress/coping theory is used to explain why some needs may lead to information seeking, while some may not stimulate that process at all. The model also includes intervening variables that had been presented as barriers to information seeking. These include: psychological, demographic, role-related or interpersonal, environmental and source characteristics. Wilson also included a factor that may affect information-seeking and referred to this as "activating mechanisms", which includes risk/reward theory and social learning theory. The risk/reward theory introduces the aspect of why individuals seek information in certain situations, and not in others. This is also used to explain why certain information sources are used more than the others. Social learning theory is used to explain why people may or may not successfully perform a task, based on their perceived ability to perform certain tasks to a certain level of attainment (self-efficacy) (Godin & Kok 1996:88). These elements are linked in a sequence to determine "information seeking behaviour" that includes passive attention, passive search, active search, and ongoing search behaviour. The information behaviour element provides a feedback loop via "information processing and use" to complete the cycle of how a need arises and how it is satisfied (Wilson and Walsh 1996; Wilson 1999; Sonnenwald 1999; Case 2002; Niedzwiedzka 2003; Chiware 2008; Robson & Robinson 2013). It can thus be concluded that Wilson's 1996 model is comprehensive, in view of the different elements embedded on it such as information need, information seeking and information use.

Wilson's 1996 model was an improvement of the 1981 model that was perceived to have many loopholes. In 1981, Wilson realised that the concept of "information need" is interwoven into the concept of "information behaviour", hence his suggestion that "information needs" may rather be referred to as "information seeking towards satisfaction of needs" (Wilson 1981:5). He then developed a macro-model that captured the motivational factors that give rise to information needs, barriers that can affect the search for information, coupled with Ellis characteristics of information seeking to complement the model. The model was based on the

proposition that an information need cannot be categorised as a primary need, but rather, as a secondary need that arises out of needs that are more basic kind; and that an individual may encounter obstacles that will act as barriers in their quest to satisfy their information needs. These barriers could emanate from a person as an enquirer; from a person's work or life; or from the environment (Wilson 1999:252). In other words, needs in isolation or in the absence of a "person in context" and the environment may not result in an information activity. Hence, the interactions between personal, interpersonal, and environmental factors drive the occurrence of needs.

In the 1996 model, Wilson captured the barriers as "intervening variables" and as personal and psychological factors that influence information-seeking. The simplistic presentation of the 1981 model suggested that the information needs of individuals triggered information seeking (Wilson 1999). However, the 1981 model was found to be lacking in many aspects (Case 2002; Niedzwiedzka 2003). Wilson (1999:253) has stated that the model was criticised for the inadequate representation of implicit hypothesis, which subsequently motivated him to come up with another improved model of information behaviour (Figure 3.2). While some aspects in Wilson's 1981 model are relevant to this study, the 1996 model is superior in the sense that the presentation of the major components of information need is sequential. The sequence of the elements in the model and the aspect of "activating mechanism" give room for fitting other theoretical constructs or factors that may impact on the satisfaction of a need or result in the improvement of an information service. The activating mechanisms include stress/coping, risk and reward, and social learning theory. The complete overhaul and fusion of Wilson's 1981 model with the 1996 model made the latter more applicable to general studies of information needs across subject disciplines. This is because various theoretical propositions and information activities from different fields dealing with the identification and satisfaction of information needs were incorporated into the model (Niedzwiedzka 2003). Wilson (1999:256) has stated that the 1996 model represented a major revision and improvement of the 1981 model, with the basic tenets of the framework persisting in the 1996 model, for example the "person in context remains the focus of information needs". Bawden (2006:674) refers to the presence of the person-in context as the "user's life world". The model pictures the cycle of information activities from the inception of an information need to the final phase where information is processed and used (Niedzwiedzka 2003).

Even though Wilson's 1996 model is the result of a major facelift of earlier models, it has received a fair share of criticism from scholars. One of the concerns emanates from the graphical presentation of the elements of the model, which shows a simple logical and sequential process, yet information behaviour activities are interactive (Foster 2004; Gobold 2006; Bawden 2006; Robson & Robinson 2013). Perhaps this criticism was based on the premise that information flow is rarely one way (Dawdin 2006:673). Wilson acknowledged the shortcomings of the model and further explained that the omissions were made to facilitate the ease of presentation (Wilson 1997:569).

The other criticisms emanating from the model's inability to accommodate the study of certain groups of individuals in its conceptual content. In his study of the information behaviour of top-level managers, Niedzwiedzka (2003) found that the model cannot be used to explain the information behaviour of top-level managers, because they predominantly received information from various intermediaries such as low-level managers, co-workers and information officers. Therefore, Niedzwiedzka concluded that the model "cannot be considered as a general model, applicable to every category of information user because it applies to those who personally search for information". Many suggestions have come forth on how the model can be improved. Niedzwiedzka (2003) suggested that the model can be improved by having:

(i) Psychological and demographic variables under one broad heading "personal variable;
(ii) A general class of environmental variables;
(iii) Variables at the need occurrence, decision-making, processing and use of information stages.

Wilson (1997:569) acknowledged that the 1996 model had been simplified, for example by "showing intervening variables at one point", which is one of the criticisms levelled against the model. In defence of Wilson's model, Robson and Robinson (2013:181) asserted that the complexity of the model extends beyond its diagrammatic representation since the model "subsumed the earlier models without showing all of their detail".

Although Wilson's 1996 model of information behaviour's shortcomings have been generally recognised (Niedzwiedzka 2003), the model is appropriate for the study of information needs and information services of smallholder sugarcane farmers in Swaziland. First, the model was selected because it incorporates information needs and other aspects that were useful in guiding the design of research instruments for both the smallholder sugarcane farmers and information service providers. Secondly, it explained the information needs and decision making of farm managers as they solve the agriculture related problems they encountered in their farms. In

other words, the model assisted in determining factors that influence the information needs and information services of smallholder sugarcane farmers. Thirdly, its general concepts allow the easy integration of other theories that help in the comprehensive study of information needs and information services. Fourthly, it assisted in the organisation of literature to aid in the understanding of the concept of information need and information service in general.

In summary, Wilson's 1996 model of general behaviour can be used to explain the information needs and services of smallholder sugarcane farmers (person-in-context) in Swaziland. The model can explain and predict intervening variables that enhance or hinder information behaviour. Even though the model has been found befitting for the study, it is integrated with the theory of planned behaviour for the better understanding of the underlying intention and motivation of smallholder sugarcane farmers to utilise information services.

3.3.3 Theory of Planned Behaviour

The theory of planned behaviour is one of the social psychology theories that have been used extensively to predict and understand social behaviour in various platforms especially health services (Godin & Kok 1996) and technology adoption (Truong 2009). The theory was used in the study in conjunction with Wilson 1996 model to determine the most influential antecedents of smallholder sugarcane farmers' acceptance of information services existing to meet their information needs. The model is presented in Figure 3.2.

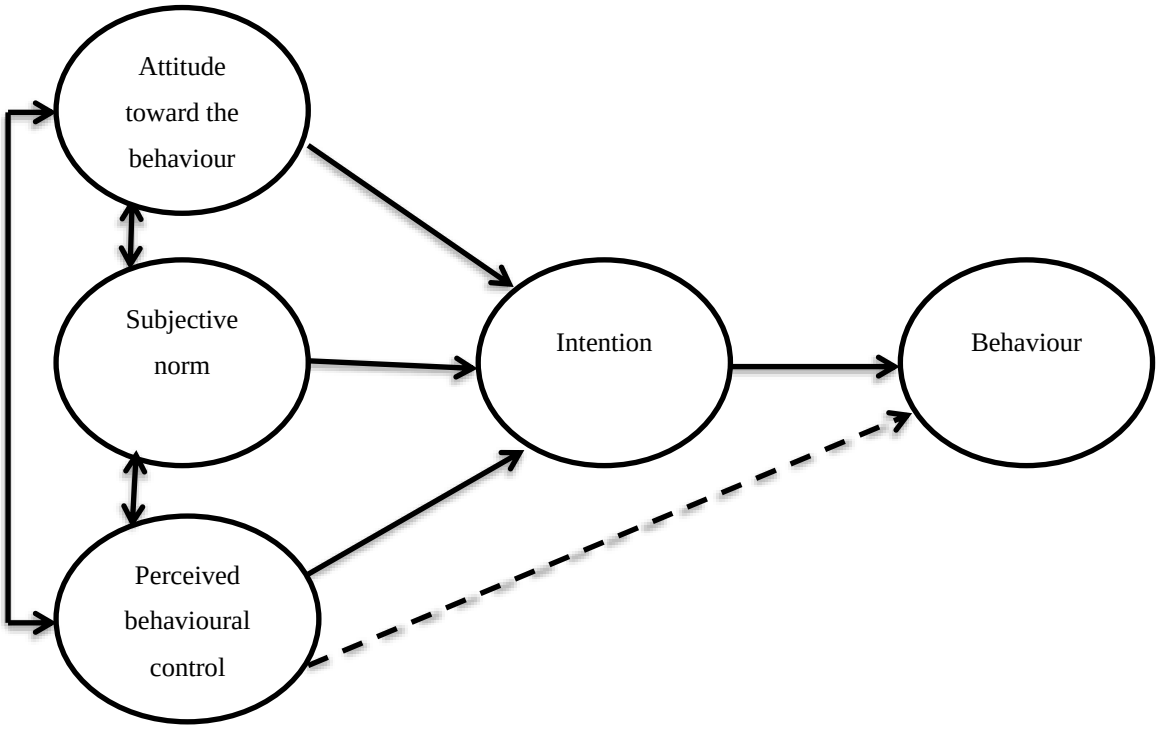

Figure 3.3. Theory of Planned Behaviour (Ajzen 1991:182)

According to Ajzen (1991:188), the theory of planned behaviour constitutes three antecedents of intention that attempt to predict deliberative and planned actions or behaviour based on an individual's beliefs. Troung (2009:180) viewed intention in the theory as "use of a particular product or service in the future". These beliefs are outlined as follows:

i) behavioural beliefs (attitude toward the behaviour): this refers to an individuals' expression of positive and negative appraisal of performing a given behaviour;

ii) normative beliefs (subjective norm): this refers to the person's social pressure from significant others to perform or not perform a certain task or behaviour; and

iii) control beliefs (perceived behavioural control): this refers to the perceived ease or difficulty of performing the behaviour. According to Troung (2009:178), these beliefs consider the factors that might enhance or discourage the performance of a given behaviour.

The theory of planned behaviour suggests that in general, smallholder sugarcane farmers' attitude, perceived social pressure, coupled with farmer's ability or control over the utilisation of information services, can influence the farmer's use of existing information services. This suggests that a farmer's use of an information service, for example, a library, would depend on whether he/she feels it to be good/bad, wise/foolish, favourable/unfavourable (farmer's attitude toward use).

Some organisations like farmers' groups or people who are important or well-respected by the farmers may influence the farmer's thoughts or decisions to use the library. In addition, if a well-respected farmer is more advanced in the use of electronic resources, then other farmers will follow. If important people think he/she should use the library, then the farmer's behaviour may be lead in that direction (subjective norm). A farmer's ability to effectively use the library or the ability to freely access materials from the library may determine that farmer's intention to use the service either instantly or in the future (behavioural control).

It is only after researchers have established these psychological nuances regarding the utilisation of existing agricultural information services that they can develop strategies that may enhance the optimal delivery of information services. In corroboration, Öhlmér, Olson and Brehmer (1998:284) have argued that it takes time for farmers to develop an intention to implement their choice of action. Hence, emphasis should be made in understanding the farmer's decision-making process. The authors mentioned that farmers would, for example, check their actions against others such as trusted advisors, and check their actions are in line

with the community's social and personal norms. Öhlmér et al. (1998:284) continued to state the factors that influence the development of intentions to perform a certain action or behaviour to be as follows: attitudes, aspirations, economic impact of problem, government support, tax rules, environmental regulations, production cycles, and support for choice of action. Therefore, the researcher incorporated the TPB into the study so as to further explore the effects of their beliefs in the development of intentions to utilise information and communication technologies to meet their information needs. A combination of Wilson's 1996 model of information behaviour and theory of planned behaviour provides a conceptual framework for this study.

3.3.4 Conceptual framework of the study

The study used constructs of Wilson's 1996 model of information behaviour and added components of the theory of planned behaviour (Ajzen 1991) to generate a more integrated model for investigating the information needs and information services of smallholder sugarcane farmers in Swaziland. In the application of Wilson's model, the researcher included the following elements of information behaviour: person in context, and identification of need, intervening factors to information acquisition. The TPB components were grafted into Wilson model (Figure 3.3), as an activating mechanism, to provide detailed information regarding the actions of the person in context, and this includes antecedents of attitudes, subjective norms, and perceived behavioural control, which determine the intentions and actions of the 'person in context'. In the study, TPB explained the connection between smallholder sugarcane farmers' perception and the utilisation of information resources to meet their information needs. It also predicted how farmers' current access to and current use of ICT resources may be associated with their perception of information barriers.

The next section provides a review of Wilson's 1996 model of information behaviour and the theory of planned behaviour (TPB). Moreover, it also discussed some extensions, modification and grafting of the TPB model's tenets into Wilson's 1996 model, so as to generate the conceptual framework for this study, as depicted in Figure 3.3.

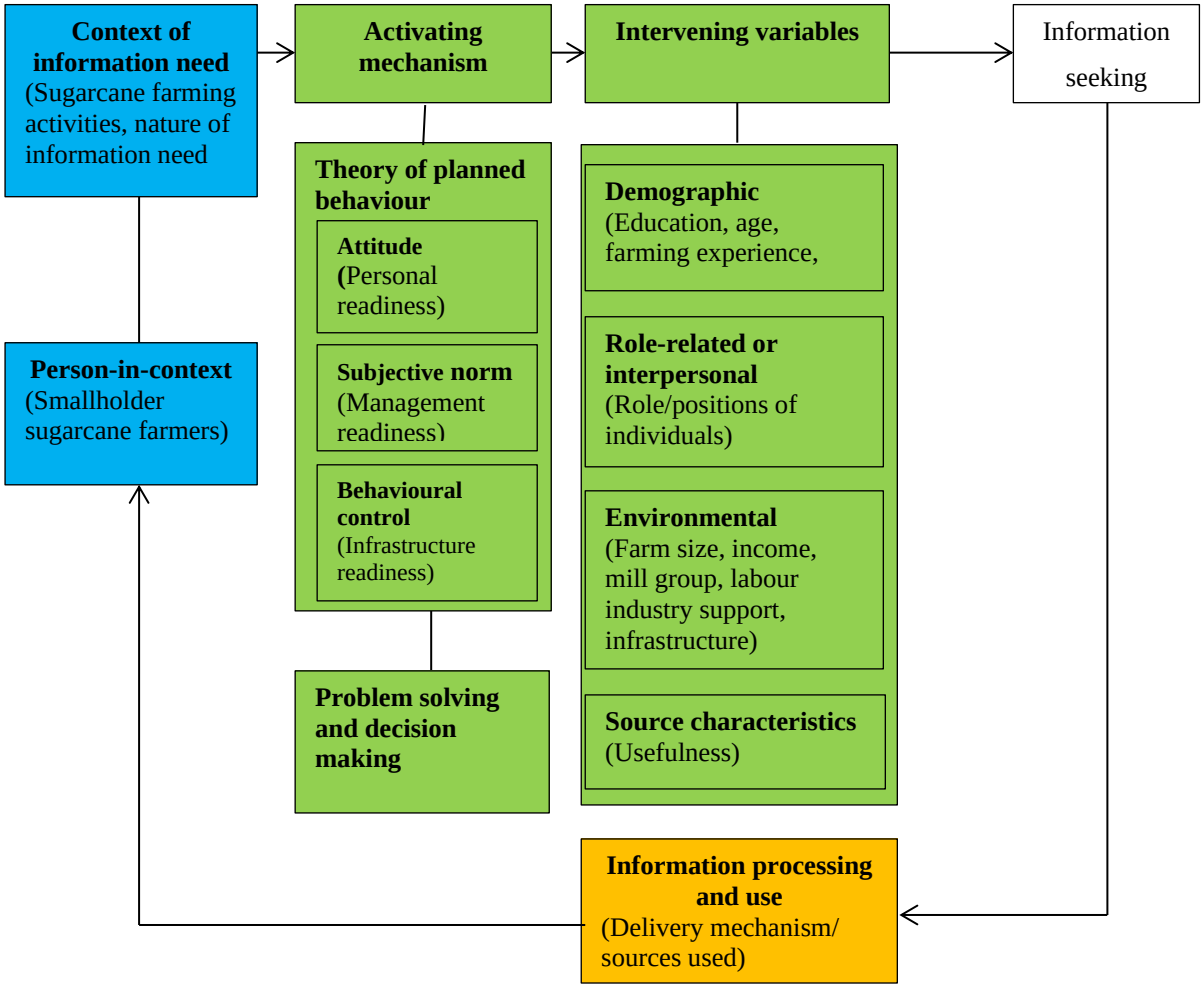

Figure 3.4: A conceptual framework for studying information needs and information services of smallholder sugarcane farmers (Adapted from Wilson (1999) and Ajzen (1991:182).

Context of information need

In the model, the person-in-context, in this case the smallholder sugarcane farmers, constitute the focus of the information need. The information needs of the farmers would be dependent on their sugarcane farming enterprises environment. The context of the information need includes the sugarcane farming activities, and the nature of information required by the smallholder sugarcane farmer to run the farms. The type of information required by farmers represents the agricultural operations undertaken in the farm to produce sugarcane.

Activating mechanism: attitudes, subjective norms and perceived behavioural control

The model applies the TPB, which incorporates the antecedents of attitudes, subjective norms, and perceived behavioural control. These antecedents provide an understanding of what influences farmers' actions to perform certain behaviours. The model suggests that farmers'

actions could be triggered by a favourable or unfavourable assessment of behaviour (attitude), perceived social norm or peer pressure (subjective norm), and the perceived ease of performing a certain behaviour (perceived behavioural control).

Intervening variables

Intervening variables of the information needs of farmers include, demographic variables, role related or interpersonal factors, environmental factors, and source characteristics. Wilson's model of information behaviour include psychological factors, however, in this study it has been excluded, because it was silent in regard to beliefs, attitudes and behaviours clearly elucidated in the TPB model, that has been grafted into the conceptual framework as an activating mechanism. This is because psychological factors cannot be separated from the person-in-context, which Wilson's model appears to suggest (Niedzwiedzka 2003).

The psychological factors that play a key role in intervening the information needs of farmers borders firstly on, attitude towards information, technological innovation, and agricultural information systems (Cavallo, Ferrari, Bollani & Coccia 2013:44). A farmer's attitude toward a behaviour influences how that information or innovation is used in the farming enterprise. It is expected that a positive attitude towards a behaviour may motivate the farmer to perform it. Secondly, awareness of information is another psychological factor that influences information need (Moon, Mia & Berg 2016:9). This imply that the extent to which farmers utilize information resources would depend on whether the farmers understand where to obtain information.

Demographic variables

Demographic variables included in the conceptual framework of this study are personal in nature, and include age, gender, education, and farming experience. Various studies suggest that demographics such as age, level of education, and experience influence information needs (Wilson 2000; Watson & Cavanah 2015). The model proposes that the extent to which supplementary information is required to address farming issues will rely on certain individual farmer's demographic characteristics, which are described as independent variables.

Role related or interpersonal factors

This includes factors that are related to the role or the task performed by the user. The construct will explain the backgrounds that influences the person-in-context to require specific information. By way of example, is the person-in-context a, manager, supervisor or executive committee member in the farm? It will also explain the tasks that the person-in-context is likely to be performing that will require information (for example, farm operation, inclusive of land preparation, pest and disease control, irrigation, and harvesting). The tasks performed by the farmer in the context of his job will therefore influence the type of information needed. The work roles and related task justify characteristics of information needs (Leckie et al. 1996).

Environmental factors

Factors external to the farmers' persona, which are socio-economic in nature, constitute some of the underlying environmental factors that influence information needs and services of farmers. The conceptual framework considered the following environmental factors: income, farm size, labour, and mill group. The setting and the ways in which things are done in the farmer's company will have a net effect on the information needs of the farm managers. Research has established that organisational support, in terms of time, budget, and provision of ICT equipment allocated to the use of the information, influences the implementation and utilisation of services, which in turn influences the information needs of farmers (Purnomo & Lee 2010).

Source characteristics

According to Schumann and Stock (2014:9), some of the aspects that provide an impression of a quality information source include ease of use, usefulness, trust, fun, and other factors such as cost. This study examined the usefulness of available agricultural information source to establish the level of satisfaction by farmers.

The TPB, coupled with Wilson's 1996 model, provided a good conceptual framework for understanding the factors that affect the smallholder farmer's behaviour regarding the use of existing information services. Wilson's model provided the methodological pathway for discovering the information needs of farmers and the factors that contribute to their quest for information. The TPB constructs are valuable in the understanding of the underlying beliefs than inform the farmers' intentions to use agricultural information resources. In other words,

the TPB introduces into the study the essential tools for explaining the motivation of smallholder sugarcane farmers to engage in agricultural-related information behaviour.

3.4 Information needs

Information needs studies are long-standing in the information science field, even though the concept is misunderstood (Cole 2011:1216). One of the studies that served as a benchmark for the large-scale investigation of information needs was carried out in 1973 in the USA by Warner and his co-authors. The study investigated the information needs of ordinary citizens in Baltimore, particularly in terms of how their needs were satisfied, and how their needs could have been effectively and economically met from the public's perspective (Wilson 2000:51). Notwithstanding the over four decades of information studies research, there is lack of a consistent definition of "information needs", yet literature abounds with studies interrogating this concept (Timmins 2006; Omiunu 2014). The confusion regarding the definition of information needs emerges from the confusing concepts of "information" and "need" (Wilson 1981). Sometimes information can at once mean a thing, a piece of knowledge, or a process (Bystrom & Jarvelin 1995:192). The onus is on the researcher to contextualise the meaning of "information" in relation to his or her study (Bawden 2006:673). On the other hand, a need is viewed as an "inner motivational state" (Grunig 1989:209) responsible for thought and action.

In clarifying the concept of information need, Wilson (1981:8) contended that the need for information by humans does not fit within existing models of fundamental human needs because information is conceived as facts, data, opinion or advice in trying to satisfy the fundamental needs. He emphasised that information needs refer to secondary needs that arise out of the desire to satisfy primary needs. This view suggests that fundamental human needs, such as those presented by Maslow, are primary needs, and cannot be considered for this study, which seeks out the information needs of smallholder sugarcane farmers, who are basically in agribusiness. However, the researcher acknowledged that information needs evolved from primary needs, hence they come into the fore as the individual tries to fulfil the primary needs. Farmers' needs would be secondary in a sense that they are interested in improving their enterprises, which in turn will help them to put food on the table. While in the 1940s Maslow's hierarchy of human needs first included basic needs (physiological, safety), psychological (love, prestige) and self-fulfilment needs in the 1970s, Maslow later expanded his concept to include cognitive needs (McLeod 2016). Cognitive needs, which are characterised as knowledge and understanding, curiosity, exploration, the need for meaning, and predictability.

In the same vein, Case (2012:5) has acknowledged the presence of cognitive aspects in his overlapping definition of information needs, or simply put, as the "recognition that your knowledge is inadequate". In other words, an information need could just mean lack of requisite information or knowledge to resolve a certain issue.

In view of the "seemingly intractable problems" encountered in defining information needs in user studies Wilson (1981:5) concluded that what scholars refer to as "information need" is actually "information behaviour". Bawden (2006:675) confirms the suggestion by Wilson, warning scholars to refrain from talking of information needs, but of information seeking, which is a process that assists in fulfilling information needs. On the contrary, Wilson's suggestion was not heeded, as information needs studies continued unabated beyond the year 2000. Bawden reported that between 2000 and 2005, there were over 600 articles in Library and Information Science (LIS) databases with the term "information needs" in the titles and abstracts of articles.

Shedding some light on the concept of information need, Belkin, Oddy and Brooks (1982:61) viewed it as an anomaly in the user's state of knowledge dubbed as "Anomalous State of Knowledge" (ASK). This approach suggests that the user is in a dilemma regarding the specificity of the need, and how to resolve the anomaly. The authors place more emphasis on the role of the users' state of knowledge, desires to recognise the problematic aspects, and to articulate specific information needs without the involvement of third parties, such as scholars' points of view. Unfortunately, in most cases, users cannot precisely specify the kind of information required to resolve their information needs (Belkin et al. 1982:63). Therefore, the role of scholars becomes indispensable in the process. This perhaps suggests the reason why Wilson (1981), Chowdhury (1999) and Crawford (1978) argue that examining information needs can be a challenge, since this involves cognitive phenomena typically performed beyond the consciousness of the individuals, which makes it difficult to observe, let alone define their information needs. The difficulty in defining information needs could negatively impact on the output of those responsible for developing information services that would be helpful in meeting users' needs.

Krikelas (1983:6) dissected information needs with a view to give the working definitions of the components of the concepts in which information is the "stimulus that reduce uncertainty"

and need is the "recognition of the existence of this uncertainty" in an individual's life. As a result, Krikelas defined information need as the recognition of the existence of an uncertainty in the personal or work-related life of an individual (person or an organization) that can be reduced or solved through the use of information. Krikelas' definition supports definitions by Wilson (1981, 2000); Godbold (2006); Jarvelin and Wilson (2003), which describe information need as a gap that requires bridging, using information. Omiunu (2014:49) on the other hand, revealed that information need is more than just a gap. Omiunu (2014:52) defined information needs as "information gap or ignorance observed or discovered through various unconscious, unplanned and unstructured dynamisms of data and information manoeuvring, manipulating, and exchange between a potential information user and other information source or system."

The definition given by Omiunu above does not dispute that information needs represent a gap on the side of the user, but expands it to include the nuances involved in the process that trigger an information need. Even though Omiunu's definition appears to be comprehensive, this may not be the case. Ford (2008:22) views an information need as the "awareness of some conceptual incongruity and the consequent need to resolve it". This means that a person becomes aware that he/she does not know, at which point the urge to know becomes ignited as he/she tries to resolve the lack of knowledge. This view adds to the ambiguity and non-consistency in the definition of the information needs concept by suggesting that a user has an arbitral understanding of what is needed to resolve a problem. The difficulty in defining an individual's information needs may deter scholars from embarking on information needs studies of certain groups of people. Due to the difficulties faced in defining the term "information needs", Shenton and Dixon (2004:297) reported that scholars met challenges in designing appropriate research strategies in pursuit of this concept.

Examining the concept, Taylor (1968:182) stated that an information need is personal, psychological, and often inexpressible, vague and unconscious, arguing that an individual goes through four levels of information needs before he or she formally interrogates an information system or seeks assistance from information professionals. The levels of information needs articulated by Taylor (1968) are as follows:

i. Visceral need: actual, but unexpressed information need, which may manifest as a "vague sort of dissatisfaction". This need has not yet developed into a question and may take another form depending on the information that is added from time to time. Ahn,

Oettingen and Gollwitzer (2017:54) have opined that visceral needs "influence judgements about other people's needs when the individual is experiencing the need in each moment". In other words, an individual would project his/her immediate needs onto others even when their mental description of the problem has not fully taken shape.

ii. Conscious need: the individual has a developed a conscious mental description of the perceived information need, even though its development may still be poor and ambiguous. The individual may ramble about the information need with the assumption that probably an information professional may help resolve the ambiguities. If the need is put in form of a question, a search for an answer may ensue depending on the how urgent the issue may be.

iii. Formalised need: the individual can fully develop a "qualified and rational statement" of his or her information needs. Hence, the individual can describe and articulate the information need in a rational manner.

iv. Compromised need: an information system is interrogated in expectation of what information can be retrieved from a search. While an information system represents the corpus of information resources in an organisation, Taylor (1968:182) states that an information professional (librarian) can be characterised as an information system as well.

One can deduce from the literature that information need is a vague concept, lacking a clear definition. Even though it has been discussed more often in earlier information science literature (Taylor 1968; Allen 1969; Belkin 1980; Ford 1980) and more rigorously with the emergence of information seeking and information behaviour research (Wilson1981; Belkin et al. 1982; Marchionini 1995; Foster 2004). For example, Ikoja-Odongo and Mostert (2006:147) simply view information needs as a "requirement that drives people into information seeking". Along the same path, Cole (2012:3) asserted that an information need is the "motivation people think and feel to seek information." It would seem that the understanding of the definition differs amongst individuals, depending on the context in which it is presented. In their review of user information needs, Faibisoff and Ely (1976:9) discovered that information needs studies were conducted around the following groups irrespective of the population under investigation:

- The behaviour of the user;
- The nature, amount and the source of the information being sought;
- The quality of information; and

- The timeliness of the information.

In a similar manner, Wilson (2000:51) and Kaniki (1992:84) simply describe information needs within the notion of:

- what information is needed;
- what steps can be taken to satisfy the need; and
- at what level can information be supplied?

The next section will further explore the antecedents of information needs, which basically looks at the background factors that influence the occurrence of a need.

3.4.1 Antecedents of information need

Antecedents are those events that take place before information needs arise amongst individuals (Timmins 2006:377). There are various shared and complementary conditions that result in the information needs that are identified in literature. For instance, Wilson (1981) and Nicholas (2000) view the emergence of information needs from fundamental human needs lens which may be physiological, cognitive, or psychological/affective in nature. Wilson (1997:552) has stated that the circumstances that give rise to a need for information are linked to the person, role and environment. According to Timmins (2006:377), an information need is personal, and for it to arise, the individual must react to a stimulus that could be life threatening, or perceived as a challenge, depending on the level of uncertainty. Timmins echoes the view of many other scholars that information needs arise as soon as an individual realises a gap or discrepancy in what he or she knows, and what is not known (Wilson 1981; Belkin et al., 1982; Krikelas 1983). In general Wilson (1999:252); Du Preez (2015:42) and Robson and Robinson (2013:186) have suggested that the information needs of individuals are triggered by an interaction between personal and environmental factors. In addition, Meyer (2016) has added that information and technology components as building blocks in the information needs "paradox" (Cole 2011:1217), as represented in Figure 3.4. The double pointed arrow represents interaction or back-and-forth process between the components.

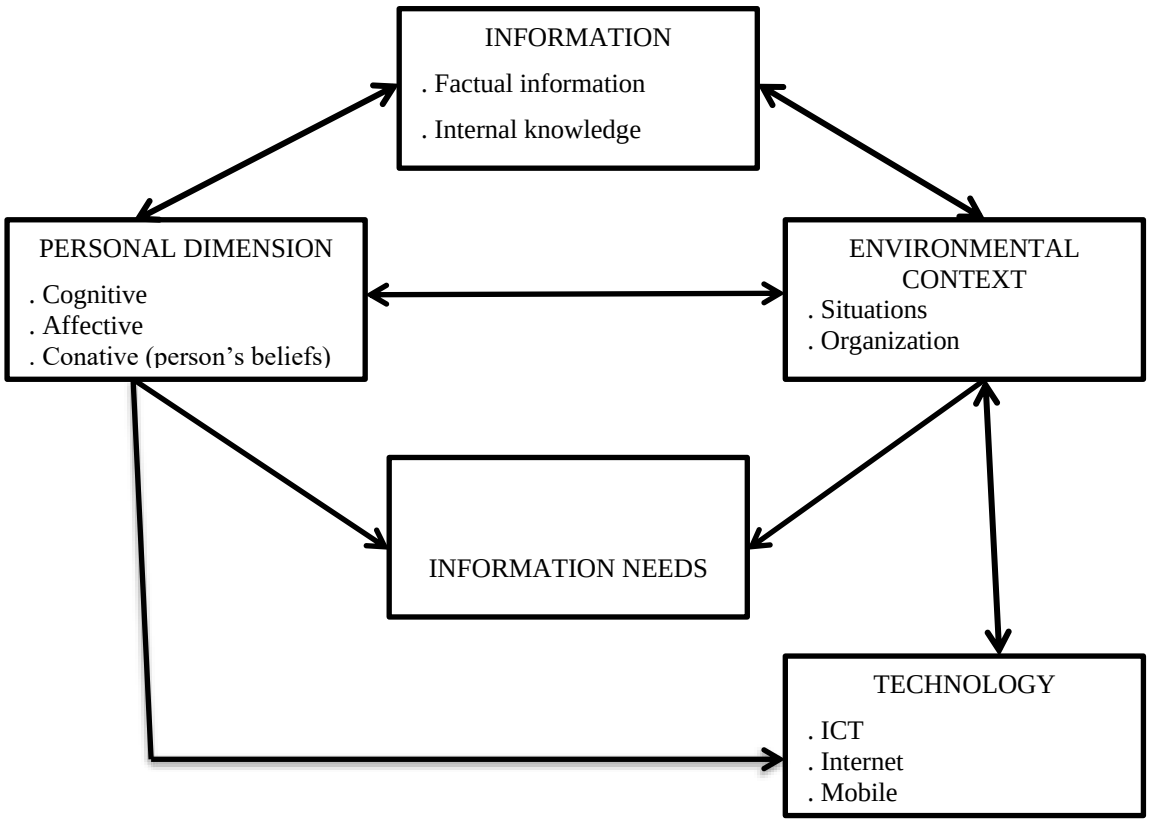

Figure 3.5: Components that trigger information needs (adapted from Meyer 2016 and Du Preez 2015:296)

Personal Dimension

Personal factors are physiological, affective, and cognitive in nature (Wilson 1999:252). According to Robson and Robinson (2013:184), personal factors include: demographics, expertise, and psychological factors. The demographic factors include amongst others, an individual's age, sex, ethnicity, socio-economic status; whereas expertise involves individuals' knowledge, education, training, subject specialisation, career stage and work roles. Psychological factors, on the other hand, refer to individual's personality and mental processes, which include: self-perception and self-efficacy; perceptions of others; perception of the knowledge gap; cognitive dissonance or cognitive avoidance; perception of risk; and ability to cope with stress. Likewise, Watson and Cavanah (2015:661) state that information need is dependent on individuals' degree of previous experience, demographic characteristics, level of

education, and the general socioeconomic status. This suggests that an individual who is educationally and economically empowered may have prominent levels of information need.

In their discussion of the influences of psychology on information behaviour, Davies and Williams (2013:554) reported that the affect, emotions, and feelings of people are important attributes that have an influence on information need (affective need). Affective needs are triggered by a need for achievement, attainment, and domination (Wilson 1981). The author further acknowledges the role of cognitive needs (need to plan, to learn a skill) as another important attribute that stimulates an information need. Cognitive needs are triggered by the performance of work roles, decision-making and planning. Wilson (1997:557) brought forth another aspect at play within the ambit of cognitive needs that may occur in the mental structures of individuals, called cognitive dissonance. This attribute may manifest itself when an individual has conflicting cognitions. Wilson (1997) further argues that while dissonance may be reduced by seeking information, individuals may resort to seeking for information that is in line with their beliefs and avoid other alternatives. Wilson defined this kind of behaviour as selective exposure, or cognitive avoidance. Putting it in perspective, the inconsistencies in the mental state and new information may compromise the information need. The "need to elucidate beliefs and values held and need to confirm beliefs and values held" are some of the information needs that play themselves at cognitive level and the mode of questioning in quest for information may also give rise to underlying information needs (Wilson 1997:553). This suggests that the information-seeking process itself can facilitate the discovery of information needs, while some individuals try to find more about the nitty-gritties of the topic at hand.

Environmental context

According to Du Preez (2015:42), the environmental context involves elements of people, situations, organisations, rules, space, and time, among others. It may also include location, social influences, culture, finances and technology (Robson & Robinson 2013:184). One can therefore expect that during the planting season for example, farmers' information needs would mimic the growth stages of the crop, and its requirements. Information needs can also be determined by an individual's membership to a professional or social group (Choo & Auster 1993:284; Du Preez 2015:242). The relationship between the context and the individuals cannot be ignored. This is attested to by Dervin (2003:117), who argues that a context is where the meaning of a phenomenon can be found. However, it is important to distinguish between

human action and socio-cultural structures when studying human information action in context, because these may vary (Wikgren 2005:19). While there is general emphasis in conceptualising context in the study of information needs, seeking and use, Courtright (2007:273-77) argued that literature "fails to address it theoretically". The author, however, acknowledges the role played by context in the analysis of information behaviour.

Information

Information is characterised as something that reduces uncertainty, and plays a pivotal role in decision-making. It manifests through various sources including amongst other data, files, books, people, images, sound, objects, and computers (Faibisoff & Ely 1976; Meyer 2016). Wilson (1981) has observed that the recognition of a need is dependent on the availability of information, which may assist in revealing a need that may have been inert. This is likely to be why Omiunu (2014:42) has suggested that information needs are a result of multiple unplanned and planned activities between an individual and an information systems or source. The interaction between the information and the individual's mental structures give rise to information behaviour (Meyer 2016). The author further noted that existing models of information behaviour have not included information as a major component, yet its role is explicit.

Technological mechanism

Technological mechanisms include both traditional and modern technologies that are used in the delivery of information to prospective users. There are various technological mechanisms employed in delivering information to individuals. These include information sources and resources, social networking tools, mobile technologies, and application software (Meyer 2016). The author further argues that it is befitting to include technology as a building block in information behaviour, given the role it plays on an individual's preferences, competencies and enhancing decision-making. Audio-visual technological mediums such as the internet, telephone lines, mobile phones, radio, television, letters, brochures and newspapers are used for delivering information to farmers (Al Musawi 2013:19; Haruna & Baba 2017:1).

3.4.2 Antecedents' subordinate to components affecting information need

Watson and Cavan (2015:662-3) articulated four antecedents of information needs pertinent communities:

- Cost/benefit analysis: Watson and Cavan (2015:662) claim that for information needs to be produced, there must be a consensus amongst individuals that the potential benefits of addressing the issue in question will offset the costs that may accrue. Without an agreement in the group about how they will benefit from prioritising that issue or need, their information need will not be exposed. This means individuals should calculate the costs and potential benefits of the information before they demand a service. Various researchers state that some farmers are even willing to pay for information services if they understand the benefits attached to the service at hand (Wolter 2008; Babu et al. 2012).

- Collective efficacy is another antecedent influencing information needs, which are particularly prevalent in community settings. Collective efficacy has been defined by Sampson, Morenoff and Gannon-Rowley (2002:459) as a community's "shared expectations for action". This antecedent is based on the premise that community members affected by a specific issue will be willing and able to intervene to become part of the common cause to address that challenge. This expectation supersedes any ties between the neighbours and members of the community who are expected to partake for the greater good of the community to address the pending need. As a result, the information need of the community will emerge because, as a community, they share similar faith and common interests (Watson and Cavan 2015:662).

- Institutional trust: Watson and Cavanah (2015:663) explained that while there are many general community needs fulfilled by government and institutions, the stewardship of those needs subsequently contributes to an increase or decrease in institutional trust. In situations where institutional trust is low or in the absence of institutional involvement in the affairs of the community, information needs increase. Griffin, Neuwirth, Dunwoody and Giese (2004:30) view institutional trust as "judgement of the amount of trust the respondent has in the ability of others", which in this case, refers to trusting an institution to provide an information service. This suggests that an individual's information need will be determined by how much trust the community has on the information provider. Furthermore, the use of an information service by farmers depends on their perceptions of the accuracy and credibility of the agricultural

information source (Al Musawi 2013:84). This means that farmers would embrace an information source if it can be trusted.

- Informational subjective norms: this is viewed as the "degree to which there is perceived social pressure to be informed about a community issue". Watson and Cavanah (2015:663) suggest that this antecedent is positively related to information needs because greater social pressure is created when there is belief that a greater majority of individuals are well-informed about an issue, and hence, that more people will want to be similarly informed. Griffin, Neuwirth, Dunwoody and Giese (2004:30) define information subjective norms as "perceived social normative influences that may motivate the desire for information sufficiency" (that is, increased information need).

The information needs antecedents by Watson and Cavanah support the assertion by Timmins (2006) that information needs are a "natural occurrence spurned on by a major life event" which helps in alleviating the situation or problem at hand. In other words, information needs, for example are more likely to arise in an agribusiness set
ting, in response to the challenges of the moment. In the cultivation of sugarcane, information needs would arise within the set of activities involved in the production of sugarcane, such land preparation, planting, pest control, harvesting, marketing, and the general management of the business.

While information needs are largely viewed in the literature as shaped by internal human cognitive processes, Gwizdka (2006) argues that external cognitive processes also play a role. External cognition is described as the cognitive interactions among internal and external factors (Navarro-Prieto, Scaife & Rogers 1999). These authors argue that individuals bridge their information gaps by using external information resources to support what they know (cognition). This is perhaps the reason why Gwizdka (2006) concluded that the nature of individual's knowledge is determined by what is needed, anticipated need, and by the availability of information resources.

The assertion by Gwizdka (2006) supports the construct by Bruce (2005) called Personal, Anticipated Information Need (PAIN), which suggests that an individual's interaction with an information resource does not only influence immediate information needs, but also anticipated

information needs. Bruce (2005) examined information needs and information-seeking literature and came up with propositions that underpinned the process of personal information collection on expectation of future use of an information resource. These propositions shed some light on the events that happen in our mental states and the physical world, as information professionals evaluate new information resources for their collections. Personal information collection is described by Bruce (2005) as the space that we turn first to when we need information to do a task or pursue an interest". Bruce (2005) refers to personal information collection as "public and personal information spaces", acknowledging that information needs are individual, and that nature comes forth when dealing with what he termed the "information world". The personal information world is the subset of the information world and individuals use it to meet their information needs. He argued that an individual's ability to respond to the information world would be personal, situational, multidimensional and dynamic. Bruce (2005) noted that individuals have both cognitive and affective responses; and evaluate information differently depending on the context. He was then convinced that people do not only engage in information activities to meet their immediate needs, but also to prepare for future anticipated information needs. The five propositions that elaborate PAIN elucidate the complex nature of information needs which are described as "idiosyncratic and unpredictable". These propositions are as follows:

i. Personal, anticipated information need is triggered by information events: Bruce (2005) explained that an individual's encounter with a new information source or channel, whether intentional or unintentional may trigger an evaluation that may result in the immediate use or delayed use – an anticipated time. The information event or encounter which leads to evaluation of the information resource stimulated the PAIN.

ii. Individuals have differential sensitivity and reactions to personal, anticipated information needs: This proposition acknowledges that individual's response to PAIN is differs between individuals and is influenced by time and space within the context of the information event. This suggest that the ultimate use of an information resource is to address individual's immediate or future needs depending on the individual's abilities to make sense and determine the usefulness of the information resource.

iii. Personal, anticipated information need predicts, but does not guarantee, future information use: Bruce stated that individuals sometimes make mistakes when

anticipating the future use of an information resource or information channel because of changes in space and time. This suggests that one can organise and keep a personal collection for future use, only to later realise that it is useless or falls short of the mark.

iv. Personal, anticipated information need informs the investments and valuations that underpin the process of personal information collection: this notion implies that the acquisition of information resources to meet certain information needs relies on the how much time and cognitive effort has been invested. This means that a well-defined PAIN requires less cognitive effort and time than a less defined PAIN.

v. Sensitivity to personal, anticipated information need is a critical component of information literacy: this notion suggests that information literacy influences the way individuals respond to PAIN. The individual's sensitivity to his or her information needs, or anticipated information needs, is therefore crucial for effective personal information collection.

Yen, Fan and Volz (2004) concur with Bruce (2005) that anticipating information needs is important in the proactive delivery of relevant information. However, for an information professional to effectively do that, he/she is required to understand the information needs and information activities of his or her clients. The authors suggest that "information needs should be treated as first class object" (Yen, Fan & Volz 2004:231). Yen, Fan and Volz (2004:245) refer to the ability of information professionals to anticipate the information needs of their clients as "proactive information delivery behaviour", explaining the benefits of the PAIN construct as follows:

- It allows information professionals to meet the information needs of clients who may either have limited abilities to make sense of an information resource or not knowledgeable about their environments. Bruce (2005) further observed that individuals have different sensing capabilities regarding an information resource which may inadvertently impact its anticipated use.
- It enables information professionals to overcome information overloads by only concentrating on the information that will be relevant to their clients.
- It enables information professionals to detect the changes in their information environments that would impact the information needs of their clients.

- It allows information professionals to stop monitoring the activity of their clients when the information need becomes irrelevant.
- The information professional will "establish a shared mental model" regarding the information needs of clients.

The explanation by Bruce (2005); Yen, Fan and Volz (2004) and Gwizdka (2006) broadens our understanding of the role of external cognition in anticipating or proactively meeting information needs of individuals. The interactions between an individual and the information resource or channel complement cognition of the information needs of an individual. Understanding and anticipating the information needs of a group is paramount to ensuing that appropriate information services are provided (Kaniki 1992:88).

In his study of scientist's approach to information, Voigt (1959:183) described three approaches to the information needs of scientists: current, everyday, and the exhaustive approach. The current approach implies that scientists need to be up-to-date with what is happening in their field. Likewise, farmers need stay abreast with developments in farming technology. The everyday approach is explained as the need for some piece of information important for completing the experiment or task at hand. Leckie et al. (1996), Jarvellin and Ingwersen (2004) as well as Du Preez (2015) corroborate this view by suggesting that worker's tasks influence the information needs and information activities of individuals by imposing information requirements. Moreover, the complexity of the information needs increase relative to the task's complexity (Bystrom & Jarvelin 1995:211). Farms are considered to be agricultural laboratories (Shoulders 2012:124). Farmers therefore need information regarding the activities they embark on. For example, the farmer may need information to decide on how much to irrigate that day.

The last approach regarding the information needs of scientists is the "exhaustive approach", which implies that the scientists needs to exhaust and review all the relevant literature on a specific subject area they are working on to assist during reporting of the results of their project. The exhaustive approach is less important to farmers because in general they are only interested in production and selling of the produce, as opposed to reporting about outcomes of their activities. Voigt's information approach maps the information needs of the scientist to the

problem at hand and suggests that the nature of the problem invariably determines the extent of information activity.

It is evident from the available literature that information needs arise in all spheres of life. These could be at home, community, school, farm, or at work. There are also hosts of factors that affect information needs, which include individual characteristics, as well as the trust and credibility of information source (Watson & Cavanah 2015:662). While the information resource may be available and perhaps accessible, these authors suggest that it is important to consider "trust and credibility" of that service, as this may affect user information needs. Other factors include context; expertise; psychological factors; user needs, wants and goals; and information provider needs (Robson & Robinson 2013: 184-5). Information needs can also be affected by the range of available information resources, proposed use of information, background, motivation, professional characteristics, as well as other individual characteristics of information users, such as the social, political, economic, legal and regulatory systems surrounding the user, and the consequences of information usage (Devadason & Lingham 1996). These authors further opined that information flow and channels of communications also add further dimensions that affect information need. It can thus be noted that most of the antecedents are embedded in the concept of information behaviour, as reflected by the antecedents appearing in the various models.

3.4.3 Importance of information needs studies of farmers

Many researchers in the literature have addressed the question of why to bother with information needs. Information needs of farmers change in response to changes in the agriculture industry and policy. As a result, farmers would need to address issues related to strategic positioning, capacity building, performance monitoring, evaluating new technology, managing information, and accountability (Klair, Boggia & Richardson 1998). It is no doubt in this case that changes in the agriculture landscape would impact the role of information providers and the way information services are delivered. The involvement of smallholder sugarcane farmers in the sugarcane growing sector in Swaziland exposed farmers to a new competitive agribusiness terrain which requires high level of decision making (Terry 1997). Hepworth (2007:39) has argued that it is important for scholars and system developers to understand how people interact with information in their environments. This is because several systems developed in the past have failed in the past to satisfy individual's perceived needs without being supported by empirical evidence (Faibisoff & Ely 1976:3). The authors further

noted that there are external benefits that accrue from the continued study of people's information needs. For example, some studies have been conducted by practitioners on groups with the objective of improving and planning information services. As a result, a great deal of knowledge is amassed on how information agencies can develop services that address the needs of populations. Choo and Auster (1993:284) have emphasised the importance of studying information needs of individuals in a sociological group or as a collective to ensure the proper development of an information system that will concurrently serve their needs. This is because the information needs of individuals are linked to the social or professional groups to which they belong. Therefore, to adequately meet the agricultural information needs of the smallholder sugar cane farmers, they must be studied as a collective, as categorised in sugar industry.

Apart from improving services, knowledge is also developed to determine how to go about in ascertaining users' information needs (Hepworth 2007:39). For example, Wilson (1994) is one scholar amongst many that has tried to develop tools to determine information needs of businesses. Wilson (1994:22) reported that it is counterproductive to blindly offer information services without ensuring that the information product is relevant for a specific group of people. Chiware (2008) also reported the importance of analysing business information needs for the improvement of information service delivery to the Namibian SMMEs sector that would support the development of a vibrant economy. Likewise, smallholder sugarcane farmers' information needs has to be identified so that policies related to agribusiness and information services can be developed and implemented accordingly. The continuous involvement of smallholder sugarcane farmers in the Swazi sugar industry invariably resulted in hunger for agricultural information on a previously unparalleled scale. This has undoubtedly impacted emerging or existing information providers with regards to the intensification and development of new modes of information services delivery. In this instance, the government of Swaziland would need information to guide her on which information services ought to be provided, by whom (independent or state), and which services should be subsidised by the State.

Agricultural activities are seasonal in nature, hence "time" is a variable that determines yields. Perhaps in cognisance of the agribusiness environment, Bothma and Bergenholtz (2013:32) found it worthwhile to elaborate extensively on the concept of the phrase "changing information needs over time", which the present study likewise observes. In their analysis, the

authors concluded that the phrase is not ambiguous and it's contingent upon the reader to deduce the meaning of the phrase "over time" in the broader context of the article, without the author providing any explicit indication of the expected understanding of the term. In other words, information needs are unstable in nature, and may change from time to time in relation to a particular context, which can be personal, role-related, or environmental. This notion is supported by Ter Huurne (2008:149), in the assertion that "information needs of people vary across time and context" relative to the intensity of the need.

Case (2002) identified four contexts in literature that have been used by scholars to approach information needs: seeking answers, reducing uncertainty, making sense and as a motivation for information seeking. In support, Brittain (1975:3) has contended that most of the studies that sought to investigate information needs turned out to be studies of information use. Perhaps, this is the case because information needs trigger and drive the information-seeking behaviour of individuals (Savolainen 2017:2) This study seeks answers regarding the information needs of smallholder sugarcane farmers, with a view to develop a strategy to improve their information services. Along the line of determining their actual information needs, the study aims to establish how farmers acquire information, and how best to improve the information delivery mechanisms in their perspective. Wilson (1994:22) concluded that the key to the development of an effective information policy is largely dependent on the identification of information needs as a secure base for providing that service, without which less can be achieved.

It can be deduced from the above arguments that information needs studies are vital in the development of effective information systems and services for all categories of populations, including farmers. While information is viewed in general as a public good (Phali-Shikhulu, Keregero & Zwane 2008), one cannot imagine the impact of a good flow of agricultural information to farmers in their quest to reduce food insecurity in communities.

3.4.4 Information needs of farmers

The information needs of farmers in Swaziland are hardly covered in both the information science and agricultural literature. While fewer studies in agricultural literature allude to the general needs of rural farmers (Jibowo & Dube 2008; Phali-Shikhulu et al. 2008; Jibowo, Dube & Dlamini 2014), these studies focused on the role of the agricultural extension services in attending to the general needs of subsistence farmers in the perspective of intermediaries

particularly extension officers. Due to the exiguous knowledge of the subject in the Swaziland context, this study reviews literature mainly from other developing countries and the world at large. Hence, this section discusses information needs specific to farmers, and the factors that trigger their information needs.

Wilson (1994:19) stated that it is important to identify and forecast information needs of businesses to assist in the development of appropriate information services. Likewise, farmers are considered great players in the agribusiness industry, and they therefore cannot be ignored. Msoffe and Ngulube (2016:1085) mentioned that it is important to assess the information needs of farmers before the implementation of an information service. Literature shows that the information needs of farmers in general revolve around their work roles and the resolution of problems related to agricultural activities (Ukachi 2007; Csótó 2010:26; Ozowa 1995). These authors aptly highlight that farm managers are engulfed by an information overload that clouds their information behaviour. Csótó (2010:26) graphically presented the information cloud as a rich picture (as presented in Figure 3.6 below). The information cloud presents many opportunities and perhaps challenges for the farmer. For example, the farm manager in the environment presented by Figure 3.6 must deal with environmental issues, weather, agronomic operations, input and equipment supplies, human resource, research institutions, researchers, administration of business, government and donors among others.

Consequently, agricultural projects (such as smallholder sugarcane farming in Swaziland) funded by donors such as the European Union, must adhere to donor's policies of commercialising food production. According to Wolter (2009:37) donors and recipients of funds must ensure access and compliance to international markets; deal with legal, regulatory and policy issues; as well as observe the quality and level of support services. Moreover, Wolter (2009:38) argues that donors such as the EU are oriented towards the commercialisation of agriculture, and linking smallholder farmers to international markets, however smallholder farmers are directly involved in the beginning of the value chain, up to the end. The value chain includes procurement of inputs; production/processing; logistics; agro-food markets; and securing local, regional, and international markets. Therefore, farmers' information needs would invariably be linked to the elements of this value chain.

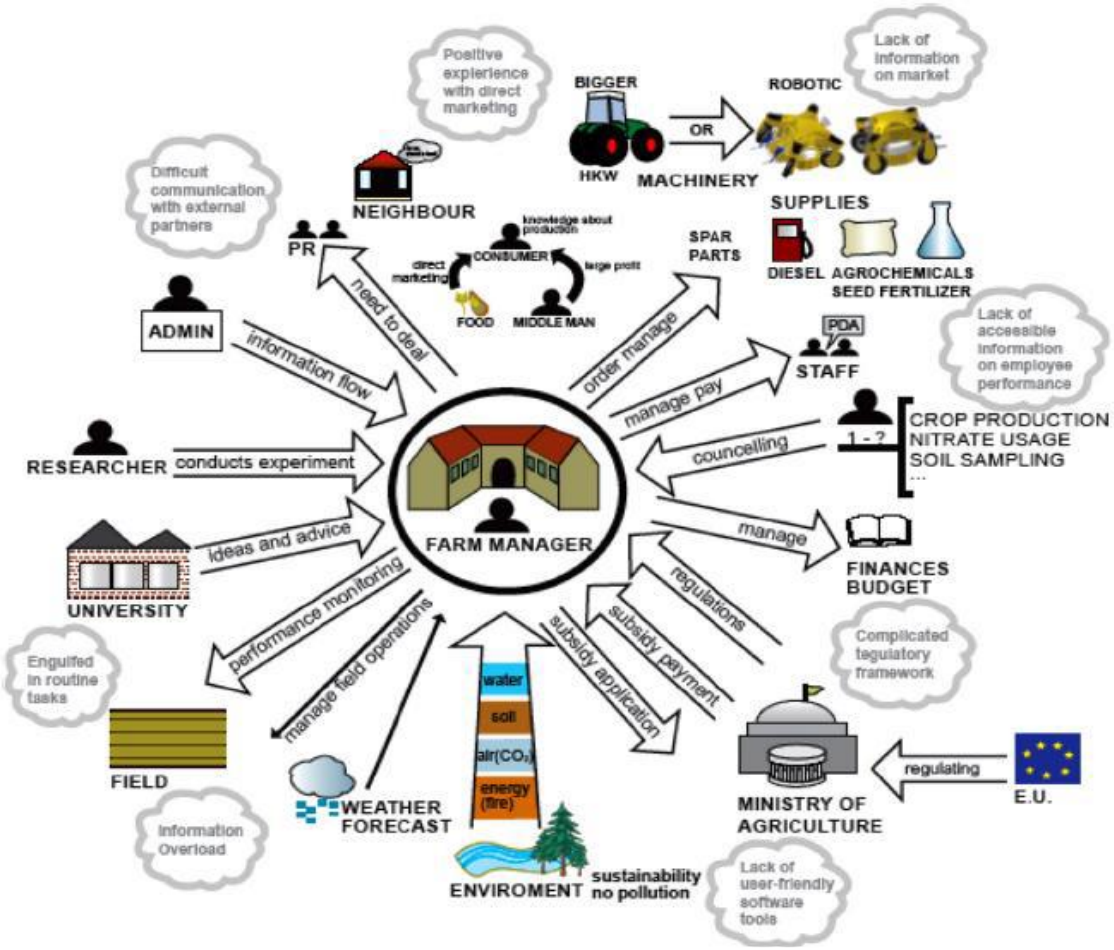

Figure 3.6: Farm management, "the rich picture" (Csótó 2010:26)

Advocating for an inclusive approach to decision-making, Dankwah and Hawa (2014:11) opined that "decisions regarding the information needs of farmers should never be taken without their input." Underscoring the importance of conducting information studies on farmers, Babu et al. (2012:8) asserted that understanding information needs and services helped in designing appropriate policies, programmes, and spearhead organisational innovations. Ozowa (1995) grouped the information needs of small-scale farmers as extension education, agriculture technology, agriculture credit, and marketing.

In the same vein, Hallam, Bowden and Kasprzyk (2012:12) has noted that the adoption of new farming technologies and practices by farmers can be influenced by range of economic, external, internal, and social factors. Equally, Mtega (2012) has suggested that the choice of information sources were influenced by cultural, demographic, economic, educational, and social factors.

Bachhav (2012:8) studied the information needs of farmers in rural India, and found that the information needs of farmers were very specific and related to their agricultural work. These information needs included new crop production skills, seeds, insecticides, water management, fertiliser, weather information, and new agricultural equipment. On the other hand, Momodu (2013:1) indicates that farmers do not only require information on agriculture, but also information relating to health, economy, politics, educational matters, and community services.

3.4.4.1 Aspects on which information is needed by farmers

This section covers some aspects on which information is needed by farmers in their farming enterprise.

3.4.4.1.1 Financial consideration

Agricultural financing is important in the sugar industry in Swaziland, particularly because the farmers are transitioning from traditional to modern agriculture, where farming is run like a business. Admittedly, smallholder sugarcane farmers need money to make money; and given that sugarcane is capital intensive (Samuel 2008:81), they have no choice but to rely on credit to improve productivity and efficiency. In general, farmers need credit to purchase new inputs (fertilizers, herbicides, etc), implements (tractors, ploughs, etc), land improvement (land reclamation), and for the capacity to face crises resulting from crop failure caused by droughts and floods. For farmers to remain in business, they need to understand monetary issues such as credit, possible sources of loans, available financial institutions, and modes of payment (Srinivas 2017, Ozowa 1992:1-2)

3.4.4.1.2 Weather forecast

Farmers require reliable and timely weather information to maximise the potential of good weather and reduce the impact of bad weather on their crop on a day-to-day basis, or for long-term planning. Short- and medium-range forecasts allow farmers to plan for agronomic operations such as land preparation, planting, application of herbicides, irrigation, and harvesting, among others (Rathore 2013:90; Oyekale 2015:14599)

3.4.4.1.3 Agronomic practices

Agronomic practices such as fertilizer applications vary from crop to crop, and from region to region. One way to improve agricultural productivity is through the provision of information on modern agronomic practices to farmers so that they maximise productivity of their sugarcane crop. For example, the growing of sugarcane involves several agronomic activities,

which include, amongst others, land preparation, planting, irrigation, fertilizer application, and harvesting (Dlamini & Dlamini 2012; Tena, Mekbib, Shimelis & Mwadzingeni 2016). For farmers to grow a successful crop, they need to have access to current information on improved agronomic practices for their sugarcane crop.

3.4.4.1.4 Sources of agricultural inputs

Information on credible sources of agricultural inputs is needed to ensure that farmers get genuine goods that have a reasonable guarantee. It is vital that goods purchased as agricultural input meet top quality requirement, and can be traced back to the manufacturer. Agricultural inputs range from seeds, fertilizer, crop chemicals, agricultural equipment, and machinery. Information on where to source these agricultural inputs ought to be readily available to farmers, in addition to input trade fairs and agricultural shows, so that they get the best possible inputs for their farms. Hence, farmers need to know where to buy, the costs of items, their quality, and their availability (Ozowa 1992:1-2; Kaniki 1992:85; Mashinini, Sithole & Mabuza 2011:2438).

3.5.4.1.6 Disease and pest control

Smallholder farmers require actionable information on combatting diseases and pests of economic importance. They will need information on how to identify, prevent and control the different types of pests and diseases. Information needs to be provided on what causes a particular disease, and how much damage it will exert on the crop. Information on the different management options ought to be available for farmers such as the types of chemicals used (pesticides) to control specific pests, as well as possible sources of additional information (Boa, Chernoh & Jackson 2015:6).

3.4.4.1.7 Transportation

For sugarcane to reach the mill, reliable transport is an important link. The availability of information on transport contractors within the vicinity of specific farms is essential to ensuring that sugarcane is sent to the mill as soon as it is harvested. Transport information ought not only to include a directory of available contractors, but also information on specific dealings with contractors. Transport information for sugarcane haulage services includes costs per kilometre, agreements on service terms such as daily delivery requirement, delivery invoices, and the contractor's business records. According to Nothard, Ortmann and Meyer (2005:402-403); and Babu et al. (2012), without the availability of transport information, farms may cease

to exist, because successful farmers make money from the successful delivery of sugarcane to the mills.

3.4.4.1.8 Training

Farmers require extensive capacity building regarding how to effectively run their farming businesses. They need skills such as financial management; and training information on modern agronomic practices as well as crop management operations such as weed control, to improve farm productivity (Gondwe, Alamu, Musonda, Geresomu & Maziya-Dixon 2017). Farmers also need to be aware of any available training workshops, field days, training schedules, and conferences.

3.4.4.1.9 Marketing

At the point of harvesting, farmers worry about where, when, how and whom to sell their crops to. Information on prevailing market prices, and the quantity of traded agricultural produce, will empower farmers to bargain effectively at the markets. If the information is available, farmers can plan the proper allocation of production resources to take advantage of areas where production is minimal. In addition to prices of sugarcane, farmers need to know about transportation, mill crushing scheduling, and agencies involved in the marketing of cane. Fortunately, the marketing of sugar in Swaziland to the international markets is done by the SSA on behalf of farmers. Farmers, however, need to stay informed as to any current developments, so that they can have an idea on what to expect in terms of income. The market information may include the price per tonnage of sugar, which influences pricing at the local mills (SSA 2015:11; Shepherd 2004:2-3; Chen & Tang 2015:1441).

3.4.4.1.10 Legal consideration

There are many policies and laws in Swaziland that have much relevance to the agricultural sector, which farmers ought to familiarise themselves with. These include: National Development Strategy (1999), Comprehensive Agriculture Sector Policy (2005), Water Policy (2009), Food Security Policy (2005), Resettlement Policy (2003) and Irrigation Policy (2006), among others.

Farmers need to be familiar with smallholder farmers' development related information including government support, best management practices, and support from non-governmental organisation programmes on farmer development. Laws including regulatory laws on quality assurance, environmental (climate smart agriculture policy) and trade laws have implications for farming businesses. In addition, information on legislation regarding the basic

conditions of employment for farm workers should be made available so that farmers can operate within the prescribed legal frameworks to avoid legal problems. Information on agricultural policies and laws should not only include the domestic ones, but also those from regional blocks, such as the Southern African Development Community which are of key importance in agriculture, such as the SADC Declaration on Agriculture and Food Security of 2004 (Dlamini 2010:3; Manyatsi & Mhazo 2014:8; Kaniki 1992:85).

All the above-mentioned factors represent strategic information required by all farmers in general at various levels of crop production business, including smallholder sugarcane farmers. The demand for correct information at different levels of production is all the more critical to sugarcane farming in Swaziland, because the SSA exercises an oversight role in the farm's agronomic activities. For instance, if the farmer fails to adhere to certain regulatory requirements, such as diseases and pest control, their cane may not be accepted for crushing at the mills. Therefore, appropriate information ought to be made available and timeously reach farmers to enable them to make decisions fundamental to their income.

3.4.5 Information delivery mechanisms for farmers

The information needs of farmers are not only centred around new content, but also around new ways of delivering information (Klair, Boggia & Richardson 1998). The literature refers to information delivery mechanisms as communication channels (Bitso 2011:60; Hebel 2013:7). There are numerous ways to provide information services to farmers, and these are becoming complex, owing to the advancement in communication technologies (Al Musawi 2013:19). Careful selection of an information delivery channel is essential in the dissemination of information to farmers (Hebel 2013:25). An information services should have the ability to assist users to access the relevant information (Ju 2006:354). As a result, information providers engage in complex activities to ensure that individual's information needs are met (Davies & Williams 2013:546). These authors further state that information providers need to adapt to change and be flexible as they address the needs of individuals since the information environment is constantly changing.

Ernst and Ernst (2011) have opined that managing a successful agribusiness requires information and acquiring such information poses certain challenges to agribusiness managers. The human brain can only cope with processing a relatively limited amount of information. There is also a limitation on our ability to acquire information as well as the knowledge to

interpret this information. Hence, information and communication technologies have emerged as mediating channels between information providers and farmers; and a vehicle for the creation of new services (Csótó 2010:25)

Many studies (Ju 2006; Lwoga et al. 2011; Assefa, Alemneh & Rorissa 2014) have indicated the value, role and the importance of ICT in the effective delivery of public information, especially to farmers. Nowadays, agricultural information can easily be accessed using ICTs (Purnomo & Lee 2010:19). Information and communication technologies (ICTs) generally refer the expanding assembly of technologies that are used to handle information and aid communication. These include hardware, software, media for collection, storage, processing, transmission, and presentation of information in any format (Asenso-Okyere & Mekonnen 2012:1). Audio-visual information can be delivered electronically using modern ICTs such as the internet, radio, telephones lines, and mobile phone technologies. The more traditional method of such information delivery includes the use of printed material such as letters, brochures and newspapers (Al Musawi 2013:19).

In Swaziland, the most common ICT devices used in rendering agricultural extension service to small-scale rural (subsistence) farmers include the telephone (fixed line), television and radio (Jibowo & Dube 2008:62). However, these agricultural information dissemination tools represent a traditional mechanism of delivering information services, while ignoring modern ICT platforms that come with advancements in technology. Likewise, Csótó (2010:27) grouped channels of delivering information, such as personal network, printed media, and electronic media.

According to Zhang, Wang and Duan (2016:17-20) the agriculture sector in China was transformed by the application of ICTs in the dissemination of agricultural information. The models that were employed in the transformation of agricultural information services included web portal, voice-based service, text services (SMS), self-support online community, interactive video conferencing service, mobile internet-based service, and the unified multi-channel service model. Fawole and Olajide (2012:326) examined the awareness and use of ICTs by farmers in Nigeria and reported that farmers were more accustomed to older ICTs like radio and television, as compared to newer ICTs like the internet, and cable television. On the other hand, face-to-face communication superseded all other means in Bangladesh, as reported

by Lokanathan and Kapugama (2012), who studied smallholder farmers and agricultural micro-enterprises. They further reported that the use of mobile phones and the internet was negligible. Spurk et al. (2013:37) surveyed 600 small-scale farmer households in Kenya, reporting that radio was by far the media channel mostly used for receiving agricultural information. The mobile phone was much less used for receiving agricultural information. Elly and Silayo (2013:547) reported that Tanzanian rural farmers mostly relied on old traditional means of communication, such as radio for agricultural information, while modern communication technology like mobile phones and the internet would be used for other non-agricultural information. Mtega (2012) reported on factors that influence rural communities' preference of information channel, which include demographic characteristics, income, and socio-cultural division of labour.

According to the World Bank Report (2011a), ICT has found traction even in resource-challenged smallholder farms, due to flourishing wireless, internet, and mobile industries. In Africa, there were more than 600 million mobile phone subscribers in 2012 (Yonazi, Kelly, Halewood & Blackman 2012:22). Singh, Kumar and Singh (2015) reported that the application of information and communication technology (ICT) in agriculture was increasingly important. The authors further noted the permeation of ICTs into agriculture had resulted in the emergence of a new field called e-agriculture, focused on the development of agriculture in rural areas through ICT deployment. Ernst and Ernst (2011) note that the adoption of information technology in agriculture has become indispensable as more agribusiness managers embrace the use of these technologies. Meanwhile, Owuor, Raburu, Onditi and Rambim (2016:92) suggest that there is need to integrate all ICT-in-agriculture tools taking into consideration those that are within the farmers reach such as mobile phones and the internet.

While the growth of new ICTs in agriculture is encouraging, Dankwah and Hawa (2014:11) suggest that the effective use of such tools would require continuous training on how to use the resources. Ntokwane and Mosweu (2016:272) agree to the effectiveness of using mobile technology, where in Botswana farmers are sent messages using short message service (SMS) informing them about events, outbreaks and other urgent news. However, the deployment of ICT services in rural communities was still of some concern. Simpson and Calitz (2014:105) reported that South African commercial farmers largely embraced mobile technologies, and more than 70 percent indicated that they use their mobile phones to sources information from the internet. According to Zulkhairi et al. (2009), as cited in Yusop, Ibrahim, Yusof, Aji,

Dahalin, Ghazali, Saad and Abu (2013), the penetration of ICT in rural communities was hampered by issues including the lack of computers, lack of ICT knowledge and skills, lack of knowledge about existing online applications, and the lack of interest in ICT and online applications.

3.4.6 Information sources used by farmers

Farmers obtain information from a variety of sources. These include browsing the internet (e-learning, social media), excursions (field days), colleagues (other farmers), exhibitions (fairs), workshops, agricultural courses or trainings, seminars or conferences and consulting farmers' journals (Zondag, Koppert, De Lauwere, Sloot & Pauer 2015: 70). In their study of farmers from rural Tanzania, Msoffe and Ngulube (2016:1085) reported that farmers mostly preferred sources of information including family, friends, neighbours, extension officers, researchers and radio. Similarly, Al Musawi (2013:84) reported that farmers have a propensity to use sources of information they are familiar with or rely on sources used by their neighbours. Embracing the digital world, Haruna and Baba (2017) reported on the harnessing of internet services for access to agricultural information in Nigeria, however the major sources of agricultural information are extension agents, radio and television (Ajadi, Oladele, Ikegami & Tsuruta 2016:257). In Pakistan, most small-scale sugarcane farmers obtain information about sugarcane production technologies from fellow farmers and progressive farmers (Abbas et al. 2003:202). According to Sifundza and Ntuli (2001:194) smallholder sugarcane farmers in Swaziland obtained the latest sugarcane production information from newsletters and bulletins published by the Swaziland Sugar Association (SSA), millers, SSA extension officers, smallholder administrators, and the Ministry of Agriculture.

3.4.7 Information delivery barriers

While there are many ways of delivering information services to farmers, there are barriers limiting farmers' from using agricultural information. Wilson (1999:252) has averred that the barriers could be environmental, social and personal. In a review of literature Zondag et al. (2015:10) found that in developed countries, the knowledge barriers are economic, territorial and environmental in nature. Economic barriers may include price volatility, whereas territorial barriers may include demographic, economic, and social developments. Environmental barriers may include resource efficiency. The challenges in developing countries appear to be broad. The barriers identified in developing countries relate to demographics, inadequate ICT

infrastructure, poor awareness and reliability of available information, human resources, economic, political and geographic (Fawole & Olajide 2012; Babu et al. 2012).

However, these barriers to optimal utilisation of agricultural information seem to cut across regional lines. Mase and Prokopy (2014:56) reported that barriers to the use of climate information broadly fall into three categories: aspects of the forecasts itself such as skill, scale and lead time; farmers and advisor's perceptions such as interpretation of the information and urban bias; and contextual factors such as lack of resources. Other factors or barriers cited in literature include lack of awareness and access to available agricultural information (Sokoya, Adefunke & Fagbola 2014; Csótó 2009); trust (credibility, accuracy) of source of information and advisors/extension officers (Mase & Prokopy 2014:54); and inadequate personnel to attend to the needs of all farmers (Fawole & Olajide 2012:326). Farmers are literally unaware of the benefits obtained from the digital world (Csótó 2009). One of the major barrier or constraints to the deployment of ICTs to enhance communication of agricultural information is e-readiness (Oladele 2015:38; Csótó 2009). E-readiness is described by Oladele (2015:39) as a "composite of access, availability, competence and use of ICT tools". In the same vein, Aydin and Tasci (2005) describes e-readiness as the ability of an institution to leverage ICT for learning purposes. According to Csótó (2009) the rural background of the many farmers is a crippling factor, which contributes to the digital divide that affects e-readiness. Furthermore, Purnomo and Lee (2010:29-30) revealed that barriers towards the use of ICT as a tool to access agricultural information include organisational culture, as well as individual, technological and policy barriers. The authors argued that e-readiness and barriers towards ICT ought to be assessed before implementation of ICT-based programmes to farmers. Unfortunately, literature was scarce on the electronic readiness of SSFs in Swaziland, and the present study would do justice in this regard by including this component.

In rural China, ICT-based information services are constrained by poor ICT infrastructure, internet coverage, lack of technical support staff, limited information and knowledge sources, underutilisation of management and monitoring systems, lack of rigorous information governance, and quality controls (Zhong 2004:27-29). The World Bank Report (2011b:35) highlighted the neglect of the public extension service by many developing countries, Swaziland included (Keregero 2000; Phali-Shikhulu et al. 2008). The ITU Report (2009) noted that African countries were facing a number of challenges in expanding their ICT level,

rendering the continent out of reach on some of the new developments in ICT like broadband. These challenges include lack of infrastructure, which has resulted in the escalation of prices for internet broadband services. Exacerbating the information bottlenecks is the lack of synergy between information providers and farmers. According to Msoffe and Ngulube, (2016:1085) information providers were unable to identify and prioritise farmers' information needs, citing constraints such as insufficient resources, poor working conditions, lack of facilities, and lack of support from government.

3.5 Agricultural information service

Agricultural information services are described by Al Musawi (2013:60) as "purposed services designed to disseminate relevant information into and within farming communities". However, this description was coined in the context of agricultural extension, which is an advisory service concerned with the dissemination of research information through farmer education by information agents referred to as extension workers (Keregero & Phali-Shikhulu 2010). Culhane (2012) mentions that the needs of clients are changing, and they require comprehensive information from several of sources, available in a single information service. A huge investment is required therefore to deliver such a federated information system.

Notably, the largest emerging and developing economies, such as India and China, recognised that digitally held information is a central pillar and an asset in knowledge-based agricultural organisations. Behera, Das, Jishnu, Behera, Behera and Jena (2015:623) stated that the Indian government has embraced electronic governance (e-governance) mediated agriculture information systems to enhance agricultural development through improved information services. In the same way, China transformed its agriculture sector using ICT-based information services, to disseminate agricultural information to farmers so as to improve agricultural productivity and sustainability (Zhang et al. 2016:17). Developing countries, including Swaziland, can greatly transform their agricultural sectors, just like China, by exploiting the advantages of embracing the latest appropriate ICTs that can facilitate the efficient dissemination of agricultural information. Literature however, has revealed that agricultural information is poorly disseminated in Swaziland, a situation which has resulted in the country continuously importing food items, including the staple food, which could easily be produced locally (Keregero 2000; FAO 2011; Phali-Shikhulu et al. 2008).

While information service models from other countries can be easily adopted for farmers from Swaziland, there is the need for empirical evidence supporting their applicability to the local

context. Furthermore, the adoption of appropriate models requires the following considerations: information infrastructure, operating costs, farmers' capabilities, and establishing his/her information behaviour. Within this context, this study will make inroads in understanding the information behaviour aspect by investigating the information needs of smallholder sugarcane farmers in Swaziland. The following subsection further reviews literature on designs of information services model.

3.5.1 Design and implementation of an information service strategy

In the era of information explosion catapulted by the consistent technological advancement and further development of information and communication technologies, the number of information services are continually growing. However, farmers have problems keeping up-to-date with the latest advancements in the agriculture sector. A major cause of these problems is the lack of an information service that meets the needs of farmers in their respective environments. To improve the situation and keep farmers updated, there is need to set up a quality information service. The present research study investigates the information needs of smallholder sugarcane farmers in Swaziland, with the aim that the findings will guide the design and implementation of an information service relevant to them. In view of the above, the researcher will review literature in information service, design, implementation and the evaluation of existing models.

3.6.1.1 Design of an information service

Designing an information service is a process that demands extensive planning (Chattopadhyay, Tannery, Silverman, Bergen & Epstein 2006:307). This ensures the effective distribution of resources (Bailey, Banwell, Kinghorn, McFarlanes & Walton 2000:71). The process generally requires inputs from the subjects, although it can also be accomplished without their input (Ralitsa, De la Harpe & Mugendi (2017: S2120). Nonetheless, the benchmark is the user (Schumann and Stock 2014:2). This suggests that the design of an information service ought to be human-centred, which logically makes sense because it's the person-in-context that will either accept or reject the service. Many studies on the design of information services revealed that user needs assessments ought to be conducted to determine whether users need to incorporate the information in the design and development stages (Bailey et al. 2000:71; Schumann & Stock 2014:2; Ralitsa et al. 2017: S2120; Wilson 1994:19; De Rouw & Johnson 2017). According to the guidelines for information services developed by the Reference and User Service Association (RUSA) (2013) of the American Library Association,

the information needs of the members of a community need to be precisely established so as to ensure that the right information is given. This further highlights the importance of service providers being ethical, service available in multiple technological platforms, trustworthy and accessible resources as well as the integration of evaluation aspects in the process.

Furthermore, the user needs analysis includes a literature search, development of questionnaire and interviews (Bailey et al. 2000:71). Other salient considerations in the design process include taking stock of the information resources, staff, existing information services, and information technology (IT) strategy. During the design process, the researcher can then use probes and toolkits to address the user's needs since probes are a useful research tools when dealing with users in the African context (Ralitsa et al. 2017: S2120).

In addition, the design process should be collaborative, because the stakeholders are those who understand the enterprise. De Rouw and Johnson (2017) designed and developed an IT driven business information service and categorised the design process into four phases:

(i) preparation;
(ii) service outcome assessment;
(iii) analysis and synthesis; and
(iv) translating output from the above three phases into the service design statement, architectural description and the terms of design reference (agreements and allocations).

In Culhane's (2012) information services model, the key components include information access, information resource management, and information systems. The model proposes that the programme designer knows how information will be efficiently accessed and managed as well as the type of information system that will facilitate the efficient access to content. The areas of responsibility (as illustrated in Figure 3.7 below) under each component are diverse, yet directly related to core concept of information service provision.

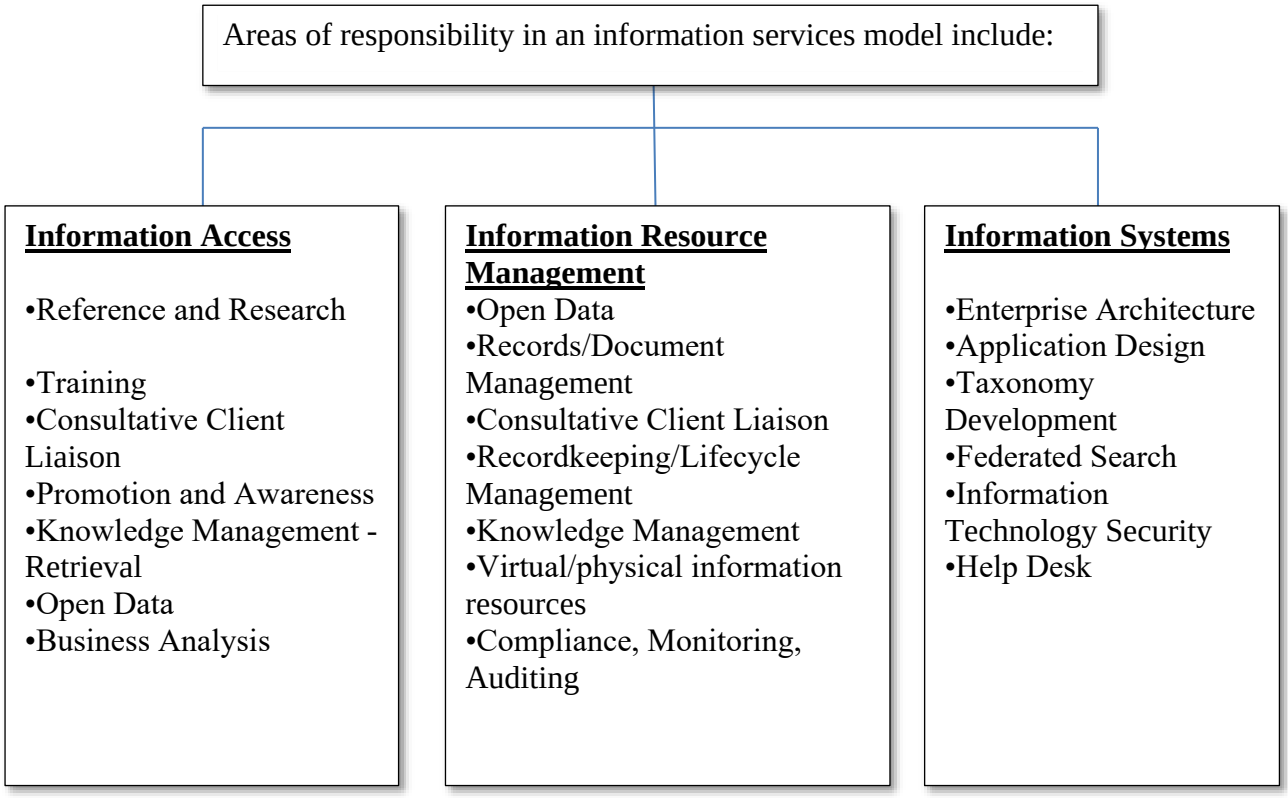

Figure 3.7: Culhane's model of information services

The areas of responsibility highlighted in the model indicate that an information service can be transformed by paying attention to the organisation of information while at the same time leveraging technology. The information access, resource management and systems functions can be performed seamlessly in both the physical space and the virtual space to meet the changing needs of users.

It is clear from the literature that designing an information service is a process that requires preparatory work including determining users' information needs to inform the design and development activities. This also includes taking stock of the available information resources, human resources, available technologies and cooperation with other stakeholders so asto ensure a successful information service.

One of the recommendations at the Marie Curie Centre in Newcastle, for example, was that the library should include information literacy skills training in its proposed library and information service strategies to maximise the usage of the provided resources (Bailey et al. 2000:75). Perhaps this could be relevant in the context of farmers, because the information strategies of farmers are different, and it is difficult to find a solution that fits all the farmers. Strategies for acquiring information are embedded in information literacy (Csótó 2010). Csótó

(2010:28-32) describes information literacy as a skill to enable the effective access and use of information. Such skills are important to farmers to ensure that they recognise when they need information and how to use the information sharing platform where required. This means farmers should whet their appetite for learning.

According to Owuor et al. (2016:83), meeting the farmers' information needs hinges on two strategies, that is, the participatory approach, and the collaborative approach. In the participatory approach, farmers should be involved in designing and developing the programmes. According to Mase and Prokopy (2014:57), the participatory approach holds great potential facilitating the development of information services for sustainable agricultural output. The collaborative approach emphasises the need to ensure that all information providers have a common understanding of their role as providers of information and can timeously provide information. Moreover, information providers must understand farmers' decision-making processes so as to ensure that information services tools are used as expected (Öhlmér, Olson & Brehmer 1998:273).

While e-readiness may be a great challenge, Csótó (2009) and Oladele (2015) have suggested that government ought to develop effective programmes and policies on the provision of ICT tools to farmers and extension officers. Perhaps such ICT programmes and policies would narrow the digital divide that is mostly prevalent in rural areas, particularly those that are characterised by poor infrastructure. In addition, Csótó (2010:33) has recommended the use of intermediaries for those farmers, who may not immediately adopt ICT so that the benefits of the technology can be felt by everyone. Jibowo et al. (2008) reported on the utilisation of local leaders in the provision of extension services to rural farmers in Swaziland. Mtega (2012) suggested that information strategies for rural information services ought to consider the factors influencing the information source of that group. This means that the context and farmers' different environments ought to be carefully studied so as to ascertain the factors that hinder or drive information delivery and usage. The study addresses this knowledge gap in the context of smallholder sugarcane farmers of Swaziland.

Another popular technique used in business environment for the formulation of strategic frameworks is the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis technique (Dergisi 2017; Ommani 2011). According to Ommani (2011:9448), the SWOT analysis technique evaluates what an organization can explore in advancing its mandate, while

cognisant of the imminent opportunities and threats. Hence, the SWOT analysis technique can be used as a preliminary step in the formulation of a strategic framework by first assessing the current constraints and opportunities that smallholder sugarcane farmers can leverage to enhance access to information. Dergisi (2017:1006) asserts that a SWOT analysis can be strengthened with the use of quantitative and qualitative research techniques.

3.6.1.2 Implementation

After designing the information services, the next phase is implementation involves putting the information services strategy into effect. This phase has its own challenges, which include resistance against the information service strategy. Esteves and Alves (2013:505) reported that they encountered resistance and adversity to change during the implementation of an information technology infrastructure library (ITIL) in a Portuguese public organisation. Indeed, Chen and Chou (2010:17) acknowledge that barriers can be met during the implementation phase of a service strategy, however, note that it is important to proactively identify these barriers and effectively deal with them at the design stage. In the same vein, Das (2014:207) has emphasised the importance of studying the factors that influence the adoption of both ICT and non-ICT based information services as information source. Reflecting on the stages of the design process, one can assume that the opportune time to detect any challenges and ways to eliminate them would be during the information need analysis stage as it is more collaborative.

3.6.1.3 Evaluation

Following the design and implementation of the information service, it is crucial that the impact of introducing the service be determined so as to establish whether to continue investing in it. There are different evaluation models in the literature that are used to establish the acceptance of an information services. A comprehensive model is presented by Schumann and Stock (2014:8), in the form of the Information Service Evaluation (ISE) model. The model proposes five aspects that ought to be considered in the evaluation of an information service: (i) information service quality; (ii) information user; (iii) information acceptance; (iv) information environment; and (v) time. These five aspects are dependent on how the user perceives the information system quality, content quality, and further applying user-independent scales of service quality. In this section, one can deduce that it is important to involve all stakeholders in the design of an information service strategy so as to increase chances of acceptance of the system during implementation. Hence, after designing and implementing the information

service for the smallholder sugarcane farmers in Swaziland, evaluations will be done to gauge its impact.

3.6 Summary

This chapter reviewed literature regarding the study. The literature reviewed the Wilson's 1996 model of information behaviour and the theory of planned behaviour, which were combined to form the conceptual framework underpinning the study. Furthermore, literature was reviewed on the key concepts that make up the study, and these includs: information need, information source, information delivery mechanism, and information service. The next chapter will address the research methods applied in the study.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter focuses on the research design and the methodology used in this study, discussing the beliefs, views, values, principles, and assumptions that guide researcher's actions, which are referred to as a paradigm. This is essential, since researchers develop different philosophical assumptions about the way research is conducted. An extensive review of core paradigms and justifications for the choice of paradigms guiding specific research methodologies is presented.

4.2 Research paradigm

Paradigms are largely viewed as foundational beliefs that shape research decisions in all research endeavours (Maxwell 2011:27). Guba (1990:17) has defined a paradigm as a "world view", in terms of a "basic set of beliefs that guide action". Likewise, Weaver and Olson (2006:459) defined a paradigm as sets of beliefs and practices, shared by communities of researchers that regulate inquiry within a discipline. Thomas Kuhn coined the term paradigm, and described it as a set of fundamental beliefs and agreements that provide a shared model for working on scientific problems and providing solutions to a community of researchers (Kuhn 1962: viii). One can thus deduce from the definitions that the beliefs or worldviews held by individual researchers, whether consciously or not, constitute a paradigm.

The use of term "paradigm" by different scholars has nonetheless, evolved over the years, with some scholars referring to paradigms as "tools" (Biesta 2010); "mind models" or "stances" (Greene & Hall 2010); and "frameworks" (Silverman 2000). Silverman (2000:77) described paradigms as models that give an "overall framework for how we look at reality". Ngulube (2015) contends that it is inappropriate to refer to paradigms as theoretical frameworks because they are just parts of a given theory, rather than complete theories themselves. Other scholars on the other hand, use the term paradigms interchangeably with research methodology, which ought to be discouraged (Shannon-Baker 2016:320). The misuse of the term 'research paradigm' may be due to limitations in Kuhn's original formulation (Ngulube & Ngulube 2017:131).

This study conceptualises the term "paradigm" based on Morgan (2007:49), who defines paradigms as "systems of beliefs and practices that influence how researchers select both the questions they study and methods they use to study them". In other words, paradigms guide

researchers as they study research problems and develop means of adequately addressing them based on the philosophical assumptions at play. This view is echoed by Mackenzie and Knipe (2006), who assert that the decision made on the type of research paradigm to employ establishes the purpose, motivation and expectation for the study. Paradigm establishes the baseline from which the researcher distinguishes the type of research design and methodology to be used (Eusafzai 2014:177). Shannon-Baker (2016:320) argues that empirical research should include explicit discussions about what characterises a paradigm, and how it can be applied in a study, while Ngulube (2015:138) argues that identifying paradigms of a study contributes to its quality and raises awareness about the research milestone achieved in the social science field.

Ontology and epistemology are the two key philosophical dimensions that define and distinguish existing research paradigms. These two key philosophical assumptions are complemented by another two sets of beliefs that define the ways of investigating reality, viz. axiology and methodology. Axiology examines "ethics, encompassing the roles of values in the research and the researcher's stance in relation to the studied subject. Methodology is concerned with the "model of undertaking a research process" (Wahymi 2012:69).

Some authors however, believe that paradigms are distinguished by a three-pronged level of their questioning (Guba 2010; Tuli 2010; Krauss 2005). Research paradigms can be characterised through their ontology (beliefs about nature of reality), epistemology (the theory of knowledge that informs research), and methodology (how that knowledge may be gained). In other words, a study's ontology and epistemology gives a perspective of how knowledge is conceptualised, how a study can identify knowledge, and the methodological strategies that enable the satisfactory investigation of social phenomenon within the context of a chosen paradigm (Tuli 2010:99). While Scotland (2012:9) embraced the tripartite divisions that constitute a paradigm, he however added "methods" as a component that define it. He described methods as the "techniques and procedures used to collect and analyse data", which can either be qualitative or quantitative. In support of the inclusion of the "methods" component in the paradigm equation, Eusafzi (2014:177) stated that the philosophical (ontological and epistemological) dimensions of paradigms eventually shape the practical dimension of methodology, as well as the choice of methods.

Ontology poses the following questions: what is the nature of the "knowable"? and what is the nature of "reality"? (Guba 2010:18). This suggests that researchers need to take a stance so as

to know what constitutes reality in their own context, regarding how one perceives the phenomenon and the nature of things. Epistemology, on the other hand, poses the following questions: what is the relationship between the knower and what is known; how do we know what we know; and what counts as knowledge? (Krauss 2005:759). Methodology asks questions such as: how should the enquirer go about finding out knowledge? (Guba 2010:18). This author opined that answers to these questions define the paradigm adopted by a specific study.

Wahyuni (2012:69) has stated that it is important for a researcher to be aware of the philosophical assumptions to be applied when conducting social research, as this defines the discourse of understanding a social phenomenon. This is because ontology and epistemology make up the paradigmatic base of research in a subject field, particularly in social research (Ngulube 2015:127). The author continues on to explain that these philosophical assumptions go a long way in assisting researchers in selecting their topics as well as the theoretical framework to be used in their knowledge enquiry.

There are many paradigms (adversarial, judgemental, religious and many more) that guide our actions daily. However, researchers are more concerned "with those paradigms that guide disciplined enquiry" (Guba 2010:18). The broader literature is awash with the theoretical paradigms employed in social science research, which have emerged due to the extensive expansion and growth of research in the social sciences. Each one of these paradigms has its own distinct ontological and epistemological perspectives. These include positivist/empiricist/functionalist, postpositivist, interpretivist, emancipatory, constructivist, pragmatism, transformative, deconstructivist, and critical social theory. According to Ngulube (2015:127), positivism and interpretivism represent the main paradigms according to which social science research is conducted. A "third paradigm" has emerged in the mixed methods community, namely pragmatism (Maxwell 2011:27). Consequently, this section discusses in detail three core paradigms, namely positivism, interpretivism and pragmatism; and further substantiates why positivism was selected as the paradigm that informs the study.

4.2.1 Positivism

Positivism applies the lens of natural science to social science. It emphasises that only technical and scientific facts can justify reality and truth (Aliyu, Bello, Kasim & Martin 2014:82). In other words, a social phenomenon could be scientifically studied to establish valid insights and knowledge. The truth within positivism is absolute (Bless, Higson-Smith & Sithole 2013:15).

This means that reality is assumed to be the same for everyone. The focus of the positivist approach is to determine relationships among different variables (Wahyuni 2012:71). Objective generalisable truth is established deductively, by subjecting contextual variables to stringent statistical tools (Weaver & Olson 2006:461). The generalisability of results from positivists' research is dependent on the reliability and validity of measurement instruments (Eusafzai 2014:179). Axiologically, the researcher should be objective and detached from the studied participants, by taking on the stance of an outsider (Wahyuni 2012:71; Blaxter, Hughes & Tight 2006:60). In other words, the understanding of phenomena is independent of the assumptions, bias and prejudices of researchers.

Positivists depend on quantitative methodology to discover and study social phenomenon (Ngulube 2015:127). Positivists can capture social reality using quantitative research instruments, including amongst others, questionnaires, tests, inventories, and checklists (Tubey, Rotich & Bengat 2015:227). The positivism paradigm relies on probabilistic sampling (Ngulube 2005:130). There are advantages associated with the element of efficiency in positivist research studies, such as the ability to collect large amounts of data from large populations within a given time (McCusker & Gunaydin 2015:540). The positivism paradigm has, however, been criticised for treating human beings as natural objects, and ignoring the fact that a human being is a "sum of his/her environment, culture and context, which cannot be reduced to a controllable variable" (Eusafzi 2014:179). This study nonetheless, accepts the assumptions of the positivism paradigm for the efficient execution of the research objectives.

4.2.2 Interpretivism

Interpretivism emphasises the subjectivist approach to studying social phenomena, where reality is construed to be "out there" in the contextual environment of the people (Tuli 2010:101). Axiologically, the researcher is not removed from the studied participants; hence he/she takes the stance of an insider. In this case, social reality is studied from the perspective of the people particularly how they interact with the contextual environment (Wahyuni 2012:71), where axiology suggests that there is a mutual influence between the researcher and study subjects. Interpretivists therefore depend on qualitative methodology to discover and study social phenomenon (Ngulube 2015:127). Hence, sampling within the interpretivist paradigm is purposive or judgemental (Ngulube 2005:130).

4.2.3 Pragmatism

Pragmatism is the third core paradigm that emerged after commentators in the methodological "paradigm wars" in the social sciences concluded that quantitative and qualitative research sit squarely within the positivism and interpretivism paradigms, respectively. The question of whether research is qualitative or quantitative is no longer at centre stage, but what is more important is to consider issues like science, validity, causality, and multiverse (Hanson 2008:110). Consensus has been reached that the appropriate philosophical paradigm for mixed methods research is pragmatism (Maxwell 2011:27). The pragmatist research paradigm therefore underpins the mixed method methodology. Pragmatists embraces both quantitative and qualitative methodologies to solve social phenomena. Hence, they bridge the philosophical divide by capitalising on the strength of each paradigm, while taking research as a "continuum, rather than an option that stands in opposite positions" (Wahyuni 2012:71). In other words, objectivist and subjectivist views are not mutually exclusive.

4.2.4 Paradigm guiding the research methodology of the study

This study was underpinned by the positivist paradigm, which supports the view that there is one objective reality. The study follows a quantitative methodology, taking pains to base its findings on well-defined concepts, variables and empirical testing (Weaver & Olson 2006:461). The positivist paradigm was deemed appropriate for this study since it asks questions that seek to establish relationships among dependent and independent variables, such as the factors affecting the information needs and information services of the smallholder sugarcane farmers.

While a positivist paradigm was judged to be befitting to satisfactorily deal with almost all the methodological aspects of this study, some elements of qualitative data were also incorporated. McCusker and Gunaydin (2015:539) reported on the supportive role of qualitative research in positivist research, arguing that it could be used as a "lead in" even before beginning a quantitative enquiry. Although some aspects of the study will employ qualitative methods as a complementary research method to the quantitative aspect of the study, Jones (2004) argues that using a single method to complement another does not always amount to using two different paradigms, even though the selected research approaches may be different. Jones has further argued that even though quantitative and qualitative research are not the same, however they represent a single research paradigm in many aspects. On the same note, Ngulube (2013:13) has noted that triangulating methods in one study is not new, however what needs to be understood is that in triangulation, the mixing of quantitative and qualitative methods is

done at “methodological or application levels (including collecting, analysing and interpreting data)”. According to Creswell and Tashakkori (2007), as cited in Ngulube (2013:13), at the method perspective level most studies remain silent about paradigms. In view of these arguments, the researcher found it logical to adopt a positivism paradigm to underpin the study.

4.3 Research methodologies

There are basically three approaches to research that inform social research, namely quantitative, qualitative, and mixed-methods research (Ngulube 2015:129; Creswell 2014:3). While quantitative and qualitative research approaches are the two major approaches to social research, Creswell (2005:39) has stated that most studies are rarely framed based on one approach, and instead tend to lean more on one approach than the other. This suggests that positivists tend to place more emphasis on quantitative elements than on qualitative elements in their study. The section below therefore discusses the three research approaches, as well as their application in the study in the following order: quantitative, qualitative, and mixed methods research.

4.3.1 Quantitative research

Quantitative research relies on statistical and mathematical based methods to study phenomena (Ngulube 2005:130; Creswell 2012:15). This type of research essentially involves the collection of numeric data from participants in an unbiased and objective manner to explain a phenomenon. Such data is subsequently analysed statistically (Creswell 2005:47). According to Stainback & Stainback (1988:317), the basic functions of quantitative research is to describe, compare and attribute causality. Thus, quantitative studies are categorised under empirical or statistical studies (Newman & Ridenour 1998:10). The researcher asks narrow and specific questions to find data relating to variables (Creswell 2005:47). Quantitative research includes descriptive, discretional, correlational, and exploratory studies, surveys, experiments, quasi-experiments, bibliometrics, and citation analysis (Gall, Gall & Borg 2003:287; Ary, Jacobs & Razavieh 2002:24-25; Ngulube 2005:130; Creswell 2005:41; Pandey & Pandey 2015:12). One feature of quantitative research is that the researcher carries research based on definitive objectives, research questions, or hypotheses (McCusker et al. 2015:539). After the analysis of quantitative data using statistical software, results can either confirm or disprove a hypothesis about a phenomenon (ACAPS 2012:5).

Quantitative research methodology has two major advantages. First, it can be administered within a short period of time, and secondly, data can be used for comparisons between different

communities, for instance when comparing the extents of agreements or disagreements amongst groups or organisations (Choy 2014:101; McCusker et al. 2015:539; ACAPS 2012:7). Moreover, quantitative research provides data that is easy to analyse and verify (ACAPS 2012:7). The weaknesses inherent in quantitative research are that they take "snapshots of a phenomenon" and in the processes ignore the in-depth experiences of respondents (Rahman 2017:102). Broadly speaking, quantitative data fails to provide an in-depth description of "why" and "how" a particular phenomenon impacts upon the affected community. To fill up this gap in information, ACAPS (2012:7) pointed out that researchers need to include open-ended questions in their questionnaires in order to obtain qualitative data to consolidate the quantitative data. McCusker et al. (2015:539) embraced the supporting role of qualitative research when used alongside quantitative research to comprehensively interrogate subtle aspects of a phenomenon. Johnson, Onwuenegbuzie and Turner (2007:113) opined that the complementary nature of these approaches helps in focusing attention on multiple viewpoints, perspectives, positions, and standpoints. Mackenzie and Knipe (2006) stated that the use of both methods helps researchers to take advantage of the perculiar charecterictics available from each research method.

For the purposes of this study, the quantitative research approach was predominantly used, and complemented by the qualitative approach to adequately answer the study's research questions. This approach was appropriate since the study involved all smallholder sugarcane farmers in Swaziland, who are a large group. To gather a representative picture of such a population, the researcher therefore had to first determine an adequate sample size and develop an appropriate and efficient data collection. Development of a good instrument would ensure that the results generated from the data are usable and generalisable to the whole group of smallholder sugarcane farmers (Labaree 2009). The nature of the study warranted the use of a quantitative approach, because one of the research questions intended to compare the factors affecting the information needs and information services of the smallholder farmers among the different mill groups. As a result, quantitative analysis was inevitable.

While this study was largely quantitative, partial or restricted qualitative data was also collected from farmers and support agricultural organizations. This ultimately expanded the interpretations of the findings (Leech & Onwuegbuzie 2007; Lowenthal & Leech 2009).

4.3.2 Qualitative research

Qualitative research is an inquiry in which researchers "describe and understand social phenomena in terms of the meanings people bring to them" (Boeije 2010:11). Qualitative research relies on the views of the participants (Creswell 2005:39) and focuses on the entire picture of the phenomenon under investigation as opposed to breaking it down to variables (Ary et al. 2002:25). In other words, this type of research is more concerned with describing in detail all the nuances involved within that phenomenon or activity. Hence researchers collect data in a face-to-face setup with selected individuals in their natural settings (MacMillan & Schumacher 2006:315; Leedy & Ormrod 2010:94). The goal is to have a deep understanding of the qualities of a specific phenomenon (Williams 2003:5), as well as quality of the relationships, activities, situations, and materials associated with it (Fraenkel & Wallen 2006:430). The researcher usually asks broad and general questions and collects data from participants in the form of words as opposed to numbers (Creswell 2005:39). The data collection takes place by means of interviews and observations (Ngulube 2005:130). Qualitative studies rely on non-probability sampling procedures, such as judgement, purposive, quota, and incidental or accidental sampling (Pandey & Pandey 2015:46). The nature of data collected from this type of research includes interview transcripts, field notes, photographs, audio recordings, videotapes, diaries, personal comments, confessions, memos, official records, and textbook passages (Fraenkel & Wallen 2006:431; Pandey & Pandey 2015:79). Data is analysed inductively, hence the data collection process tends to accompany the measuring and creation of new concepts (Neuman 2014:203). This perhaps means that qualitative researchers collect their data, for example through interviews or observations, and the concepts used slowly emerge and take shape as they examine the finer details of the subject.

According to Boeije (2010:13), while each cycle of the enquiry in the interviewing process fuels the next one to build knowledge, the proper execution of this research approach largely depends on thorough preparation. Such preparations include the review of relevant literature, well-formulated research questions, instruments and a well-structured analysis plan. Qualitative traditions rely on non-probability sampling techniques; hence statistical representativeness of the population under investigation is not an important consideration (Ngulube 2005:130). Thus, the findings of qualitative studies cannot be generalised beyond the setting or organisation being studied. On the contrary, Polit and Beck (2010:1451) disagreed on the issue at hand and argued that "generalization in relation to knowledge merits careful

attention". This suggests that generalisation can be achieved, but to a certain extent. The authors contended that even though generalization is "widely-acknowledged as a quality standard in quantitative research, it is more controversial in qualitative research" (Polit & Beck 2010:1451). In this study qualitative data will be used to complement the quantitative strategy that forms the cornerstone of the study. Qualitative data was collected from agricultural support organisations to obtain their insights on how agricultural information can be adequately delivered to smallholder sugarcane farmers.

4.3.3 Mixed methods research

According to Leech and Onwuegbuzie (2009:267), mixed methods research (MMR) "represents research that involves collecting, analysing, and interpreting quantitative and qualitative data in a single study or in a series of studies that investigate the same underlying phenomenon". Lending support to the MMR approach, Hanson (2008:42) argues that qualitative and quantitative approaches have converged. The main types of MMR designs are exploratory, explanatory, embedded, and triangulation (Creswell & Plano Clark 2007:59; Creswell 2005). MMR basically involves integrating quantitative and qualitative research approaches (Creswell 2003:18). The integration of quantitative and qualitative research methods could be done at any level ranging from: the selection of research objectives; the types of data and operations; and the types of analysis or inferences. The researcher could choose to employ qualitative research methods in one phase of the study and quantitative research methods for another other phase. Alternatively, the mixing of the research methods can be done within more phases of the research process and across these phases. Hence, the mixing of the quantitative and qualitative research techniques could run sequentially or concurrently, or prior to mixing results at the data interpretation phase (Leech and Onwuegbuzie 2009:267). Mixed methods research provides the opportunity to enrich data by extracting the strengths and diminishing weaknesses of quantitative and qualitative approaches within a single study, not a case of one method replacing either qualitative or quantitative research (Andrew & Halcomb 2006:146). Hence, MMR can be construed as a research approach that in general maximises the various strengths entrenched in the different methods to explain a phenomenon. The authors further encouraged researchers to provide a clear justification for using MMR to answer research questions rather than using a single research approach. According to Creswell (2012:535) the MMR approach is an "advanced methods procedure" because it involves merging, integrating, linking, or embedding both qualitative and quantitative data.

Moreover, MMR is time-consuming, because it requires the extensive collection of quantitative and qualitative data. This perhaps explains its low prevalence in the Sub-Saharan Africa (SSA). Ngulube (2010:258) reported that studies conducted using this method in Sub-Saharan Africa including in education, library sciences and businesses averaged 14-15 percent. Furthermore, in his exploration of the use of MMR in library and information journals in the SSA region, Ngulube reported that its use was limited, averaging seven percent. Notwithstanding the inroads made in the use of the MMR approach in library sciences in SSA, the author seemed to take the methodologies of the scholars with a proverbial pinch of salt, stating that "most of the mixing in the articles that were evaluated happened during data collection or analysis" (Ngulube 2010:258), insinuating that only triangulation was employed rather than MMR techniques. According to Ngulube (2013:13), the mixing of qualitative and quantitative data at application level is merely a triangulation of methods, which is a practice that has been in existence since time immemorial. In contrast, MMR transcends triangulation boundaries (Ngulube 2015:127) since it combines quantitative and qualitative methodologies in the same research design.

Although, quantitative and qualitative data was collected for the study, MMR techniques were not used. The methods were triangulated, employing primarily quantitative research techniques, coupled with limited elements of qualitative research techniques. The purpose of the triangulation was to reinforce the validity of the results.

4.4 Research design

The study used survey research design to investigate the agricultural information needs and information services of smallholder sugarcane farmers in Swaziland. A research design constitutes procedures involved in data collection, analysis, and report writing (Creswell 2005:51). A good design gives the researcher the liberty to make valid inferences, generalisation, associations or relationships and casualties of findings (Oppenheim 1992:6). In addition, a good design should minimise bias and maximise the reliability of the data collected from respondents (Kothari 2004:33). According to Ngulube (2015:128), a research design influences the data collection and analysis phase. Ngulube identified three major research designs associated with quantitative research methodology, which include the survey, experiment and case study. Surveys are quantitative research procedures that are widely used to collect data to identify trends in attitudes, opinions and human behaviours (Creswell 2005:52).

The choice of a research design guiding a specific study hinges on contextual features and research problems (Dovona-Ope 2008:59). The factors that may be considered include the culture of the organisation, and the personality or thinking styles of the researcher (McCusker et al. 2015:541). These authors further caution researchers not to over-emphasise the debate of "quantitative versus qualitative", but rather to look at how these research methods can augment one another. Hence, researchers must consider important factors such as the context and sociocultural environments before deciding on the research design to use.

Given that the study focused on smallholder sugarcane farmers who are large in numbers and geographically dispersed throughout the lowveld and some parts of the middle veld of Swaziland, the survey research method was deemed the most appropriate option to guarantee an effective assessment of the research problem. The survey research method was complemented by the triangulation of data collection methods. Both concepts, that is, survey research and triangulation, are described in the following sections.

4.4.1 Survey Research

Survey research describes research that "involves administering questionnaires or interviews to collect data from a sample" (Gall et al. 2003:223). There are two major types of surveys identified in the literature – a cross sectional survey and a longitudinal survey. In cross-sectional surveys, data collection is conducted at the same point in time whereas in longitudinal surveys data collection is conducted at various points in time ((Neuman 2014:44; Fraenkel & Wallen 2006:398, Dooley 2001:119). Survey research involves a systematic way of soliciting information about people's personal information, preferences, thoughts, and behaviours (Bhattacherjee 2012:73). The respondents' characteristics can further be used to determine their association with a social issue (Ary et al. 2006:400). In survey research, respondents provide written answers on standardised questionnaires or rely on an interview schedule where answers are either written down or recorded electronically by the researcher (Baker 1999:203-204). Creswell (2003:153) has stated that a survey research provides a numeric description of opinions of a population by studying a sample of the population. Data is collected by means of small-scale experiments, attitude scales, projective techniques, interviews, observations, and questionnaires (Pandey & Pandey 2015:87; Neuman 2014:316).

The two primary modes of eliciting information in a survey research are using questionnaires, and administering interviews (Baker 1999: 203). Survey studies are concerned with assessing preferences, demographics, practices and procedures (Gay, Mills & Airasian 2006:159).

Surveys are an excellent medium for measuring several unobservable data such as people's preferences, traits, attitudes, beliefs, and behaviours (Bhattacherjee 2012:73). According to Dooley (2001:119), the alternatives to sample surveys are either census or no information at all, because it would be costly to survey everyone in the population. In other words, the census method is impractical where the population is large.

Survey research is ideally suited for studies that involve individuals as units of analysis, although it can also be used to study groups or organisations where knowledgeable individuals are used as key informants for the groups or organizations (Bhattacherjee 2012:73). The unit of analysis are the individuals that respond to a survey (Sekaran 2003:368). Survey research has many strengths that set it apart from other research methods. Surveys are a feasible medium for soliciting information from large samples of respondents (Glasow 2005:1-1). A survey can allow the researcher to interrogate several variables from many people with minimal investment (Glasow 2005:1-1). One of the key strengths of surveys identified by Ngoepe (2012:100) is the rapid turn-around in data collection and this attribute warrants its use in the present study.

Surveys however, have some weaknesses which include the non-response bias, sampling bias, social desirability bias, recall bias, and common method bias (Bhattacherjee 2012:80-82). Nonetheless, Moser and Kalton (1971:4) argued that these weaknesses do not underrate the importance of surveys in social science research, hence, this method is one of the approaches adopted for this study.

4.4.2 Triangulation

Triangulation is defined as the use of "multiple methods to develop a comprehensive understanding of phenomena" (Carter, Bryant-Lukosius, DiCenso, Blythe & Neville 2014:545). Similarly, Ary, Jacobs, Razavieh and Sorensen (2006:505) defined triangulation as the "use of multiple sources of data, multiple observers, and or multiple methods" to study a phenomenon. In a study triangulation involves the use of different kinds of combined quantitative and qualitative data on the same phenomena for better understanding the research problem (Creswell 2005:511). The purpose of triangulation is to amalgamate the strengths of quantitative methods with the different but complementary strengths of qualitative methods (Creswell & Plano Clark 2007:62). Moreover, triangulation can provide an enriched explanation of phenomena under investigation more especially when dealing with complex environments (Holtzhausen 2001). Specifically, triangulation gives credence to research

findings and inferences made pertaining to the phenomena under investigation (Jogulu & Pansiri 2011:687). This means that triangulation strengthens the reliability and validity of results if more than one research method and data collection instruments are used in a study.

In the available literature, five types of triangulation have been identified, these include: the use multiple sources of data (data triangulation), use of a number of different researchers (investigator triangulation), use of multiple methods mainly quantitative and qualitative methods (methodological triangulation), use of different locations (environmental triangulation) and the use of multiple theory perspective (theory triangulation) to study the same phenomena (Ary et al. 2006; Guion, Diehl & McDonald 2011; Becket & Zauszniewski 2012; Carter et al. 2014; Tibben 2015). These authors stated that triangulation is basically used to check and establish validity by using multiple perspectives and platforms to source data. According to Yeasmin and Rahman (2012:158), triangulation facilitates the validation of quantitative data and assists in the deeper and wider understanding of a subject. The authors further argued that triangulation supports interdisciplinary research which is one of the characteristics of the present study. This study applied methodological and data triangulation. Each of these methods were explored and their application in this study are discussed.

4.4.2.1 Methodological triangulation

According to Holtzhausen (2001), methodological triangulation is a process that entails combining quantitative and qualitative data collection methods based on the premise that a single data collection method may be insufficient in investigating a phenomenon. This approach enables researchers to establish corroborative evidence, contingency, convergence and confirm findings from using multiple methods, which is a luxury that cannot be achieved by using any single research method (Jack & Raturi 2006:346; Creswell 2003:96; Teddlie & Tashakkori 2006). According to Becket and Zauszniewski (2012:40), methodological triangulation includes two types: across-method and within-method. Across-method type of methodological triangulation involves combining more than one research method, quantitative or qualitative (that is questionnaires and interviews). Within-method methodological triangulation involves combining two or more data collection procedures, quantitative or qualitative, but not both.

In this study across-method methodological triangulation was used in data collection. Hence, data from survey questionnaires was triangulated with data from interviews to increase the

validity of the study. The methodological triangulation technique is common in information science studies (Msoffe & Ngulube 2016; Chiware & Dick 2008) where quantitative findings are validated by means of qualitative techniques. According to Ngulube (2015:136), the advantage of methodological triangulation is that it has the potential to address issues of reliability and validity.

4.4.2.2 Data triangulation

Data triangulation is described by Ary et al. (2006:505) as the use of different sources of data to compare different views and perceptions of the same phenomenon. This method was well suited for the study, because the subjects of the study have stakeholder groups with vested interest in the activities of the group (Guion et al. 2011). In this study, data triangulation entailed the comparison of quantitative data from questionnaires administered to smallholder sugarcane farmers and qualitative data obtained from semi-structured interviews, which were administered to agricultural support organisations.

4.5 Population

The population of a study is defined as a "collection of all the units or elements from which a sample is drawn" (Baker 1999:142). It is important for the researcher to have a clear picture of the units that make up the target population before a sample can be drawn to determine which cases to include and exclude (Singleton & Straits 2005:113-115). While the researcher may not exactly know the true population, it is important to define it as narrow as possible (Glasow 2005:2-1).

The study population was made up of all smallholder sugarcane farmers in Swaziland, who were registered with the Swaziland Sugar Association (N=437) (SSA 2016). The names of the farmers on the list represented the population. The list from SSA was considered complete because sugarcane farmers are bound by legislation to apply for a sucrose quota (licence) with the association before sugarcane is grown to ensure the control of pests and diseases (UNCTAD 2000:16-17). The population consisted of individual farmers and farmers associations carrying out their activities collectively. The number of farmers within each group is shown in Table 4.1 below.

Table 4.1: Populations of study (Source: Swaziland Sugar Association 2016)

Mill Group	Number of farmers
Mhlume	296
Simunye	20

Big Bend	121
Total	437

In researching, cases that involve development matters, Munyua and Stiwell (2010:6-7) suggested that the researcher ought not only to rely on information from the subjects of the inquiry, but also involve stakeholders. In view of the above recommendation, the study included the agricultural support organisations (N=6) involved in the development of smallholder sugarcane farmers. The support organisations included financial institutions, commercial banks, and government agencies. The agricultural support organisations were included in the study because they have first-hand experience in dealing with farmers (Holtzhausen 2001).

4.6 Sampling method and procedure

The section introduces the sampling methods, frame and size that will be followed in the study.

4.6.1 Sampling methods

Sampling entails the selection of a small subset of a larger population to survey (Fricker 2008:195). The reason for sampling is to study in detail the selected individuals so that one can understand the entire population (Neuman 2014:246). Each member of the population is given an equal chance of being selected to obtain reliable and credible data (Fowler 2014:4). According to Neuman (2014:250) probability sampling is a hallmark for coming up with a representative sample. The most important prerequisite to sample selection, no matter the methodology you choose, is to increase the validity of the data to be collected (Leedy & Ormrod 2015:103). A survey carried out on a portion of the population (sample) has more benefits than one administered on the whole population. Such benefits include reduced costs, less effort to administer, better response rates and greater accuracy (Fricker 2008:196; Olsen 2012:24). There are two broad types of sampling methods, namely probability sampling, and non-probability sampling (Singleton & Straits 2005:118).

Probability sampling involves the use of mathematics in probabilities, whereas non-probability sampling uses dissimilar strategies that do not involve mathematical application (Neuman 2014:247-248). Probability sampling methods include simple random sampling, stratified random sampling, cluster sampling, and systematic sampling (Fricker 2008:199-200; Sekaran 2003:280). Simple random sampling is the most basic method of coming up with a truly representative sample that enables the determination of the relationship between the sample

and the entire population. This method can be accomplished by using a lottery, random numbers table and computer-generated list of random numbers (Salant & Dillman 1994:61; Dooley 2001:128). According to Baker (1999:154) simple random sampling involves the numbering of the elements of a population and then drawing a sample against the random numbers that have been generated.

Non-probability sampling techniques include convenience sampling, quota sampling, snowball sampling and judgement sampling (Fricker 2008:199-200). The author further noted that with probability sampling the individuals in the population have no influence in the selection process, whereas in the non-probability sampling individuals are selected based on convenience. According to Fowler (2014:6), sampling involves determining the sampling technique, sample frame, sample size, sample design, and the response rate.

Various research sampling errors, such as random sampling error and systematic error, can occur in a survey. Random sampling errors occur due to chance variation in the selected sample, and can be minimised by drawing a sufficiently large sample. Systematic error occurs due to imperfections in the research design. Examples of systematic error includes sample frame error and sample selection error (Hyman & Sierra 2015:1-3)

Since the population under investigation was large, and classified geographically into mill groups, this study employed a stratified random sampling method. The mill groups where farmers send their cane for processing include Mhlume, Simunye and Big Bend. The main reason for using stratified random sampling method was to ensure adequate sample size for each mill group, that is, making sure that all the mill groups are proportionately represented in the sample. The researcher wanted to have control over the sample sizes in the mill groups rather than being randomly determined by the sampling process. Hence, the stratified sampling method provided a highly representative sample of the smallholder farmers across the mill groups. The sampling process entailed capturing the names of farmers from each mill group on a spread sheet, sorting them in alphabetical order and thereafter numbering them. Then a random sample was taken from each mill group in direct proportion to the number of smallholder farmers in the population. The website www.random.org was used to generate random numbers for isolating individual participants to be included in the sample by matching the numbered spreadsheet (Christensen, Johnson & Turner 2011:153; Baker 1999:154). The sample subsets from each mill group were then combined to create a stratified random sample.

4.6.2 Sampling frame

A sampling frame is a list of the entire population or sampling units from which the sample is drawn (Rakotsoane 2012:54-55). This study adopted a list-based sampling frame (N=437). According to Fricker (2008:202), the list-based sampling frame approach can be implemented to large homogenous groups that can be easily constituted. The list of the names of all active smallholder sugarcane farmers was obtained from the Swaziland Sugar Association (SSA); hence, frame error was controlled. While it is convenient to use an existing list of the target population, Salant and Dillman (1994:60) caution that some lists may not be perfect. Some lists are prone to coverage error, where you find that members of the group are either omitted, included more than once or include people who are not relevant for the study at hand.

The inclusion criteria of the sample group included those: (i) registration with SSA; (ii) classification by SSA as smallholder farmer; and (iii) having supplied sugarcane to Mhlume, Simunye or Big Bend sugar mills at least once. The inclusion criteria were compiled to minimise variations within the sample frame. For example, inclusion criteria three (iii) stated that farmers need to have at least once successfully grown and supplied the sugarcane crop to a mill. The researcher believed that farmers who have had the opportunity to complete a one-year cycle of tendering crops would be better informed than those who are completely new to the enterprise. The involvement of such individuals would thus compromise the study because of the likelihood that they might give insufficient data due to inadequate experience.

The exclusion criteria comprised: (i) farmers with farm sizes of above 50 hectares; (ii) farmers growing sugarcane for farm gate sale; (iii) farmers without a quota or licence to grow sugarcane; and (iv) farmers with less than a year of farming experience. Exclusion criteria number one (i) is an attribute that was used by the SSA to categorise farmers in the Swaziland sugar industry, hence it was also found to be appropriate for this study (SSA 2016). SSA classified farmers with land area above fifty hectares as medium or large scale and this category of farmers is beyond the scope of the study.

A composite list was obtained from SSA, which considered both the inclusion and exclusion criteria. The list contained all smallholder sugarcane farmers engaged in sugarcane farming in the years 2015/2016. The list was thereafter purged for the duplication of names to control selection errors. The sample to be studied was then drawn from the list frame of the 2015/2016 smallholder sugarcane farmers without being concerned about under or oversampling specific groups (Salant & Dillman 1994:58-61).

Stakeholders who were either directly involved or who by virtue of their professional responsibilities as identified in literature were involved with smallholder sugarcane farmers were included in the composite list of agricultural support organisations (N=8). Another stakeholder group that was included in the study was the Swaziland Cane Grower Association, due to its direct involvement with members in uplifting their common economic, social and cultural needs (Kumar, Wankhede & Gena 2015:1258).

4.6.3 Sampling size

A sample size refers to the number of participants in a sample (Kadam & Bhalerao 2010:55). One of the questions that researchers must answer is "how large a sample to draw" to enable the generalisation of results to a population (Ary et al. 2006:419). Ideally, a set of participants that adequately represents the whole population is selected to enable objective statistical inferences to the target population. If a sample has few or inadequate subjects, the utility of results diminishes since the results cannot be generalised to the entire population (Ngulube 2005:134; Kadam & Bhalerao 2010:55). On the other hand, a study with a large sample would be unethical, and could potentially be costly to the researcher (Kadam & Bhalerao 2010:55).

The determination of an optimum sample size is crucial (Ngulube 2005; Neuman 2014; Kadam & Bhalerao 2010; Salkind 2009). Consequently, the researcher would know how many questionnaires must be completed to ensure an adequate sample that is statistically representative of the total population, and capable of providing credible outcomes (Shaw 1993:26). In general, the calculation of a sample size depends on the desired margin of error, variance of the hypothesised proportion and confidence levels (Ary et al. 2006:419). One of the major factors that may dictate the size of a sample include costs (Shaw 1993:26). However, the cost of collecting data as well as the cost of incorrect inferences resulting from data whose findings cannot be inferred back to the population compounds the costs (Kothari 2004:56).

The participants in the study were smallholder sugarcane farmers in Swaziland. The researcher came across several online software packages and statistics textbooks providing formulas for the calculation of a sample size. This study used the following formula as suggested by Israel (2009) to determine the sample size:

$$n = \frac{N}{1 + N(e)^2}$$

Where n = sample size

N = total number of smallholder sugarcane farmers (437)

e = maximum allowed error (5%)

Therefore,

$$n = \frac{437}{1 + 437(0.05)^2}$$

$= 208.84 \approx 209$

For the purposes of this study, a sample of 209 was found to be an adequate size to represent the population of smallholder sugarcane farmers. The sample size was based on the population size, a five percent level of precision and 95 percent confidence level (Ngulube 2005:135; Ary et al. 2006:419; Ngoepe 2012:104). The margin of error or degree of precision required between the sample and the total population that can be generally tolerated in most studies is of approximately three percent (Ary et al. 2006:418). According to Ngulube (2005:135), this margin of error can only be attained by pegging the confidence level at 95 percent. The confidence level is the degree of assurance that the characteristics of the sample drawn truly represented the target population. Kothari (2004:58) emphasises the importance of selecting a sampling procedure that keeps sampling error at relatively minimal levels. Therefore, the researcher used the stratified random sampling procedure that required that each mill group sample size is calculated before random samples can be taken.

Based on the calculation above, the researcher sampled 209 respondents of smallholder sugarcane farmers, bearing in mind that the ingredients of calculating an adequate sample size were adequately addressed as recommended in the literature. The mill group sample sizes represented the proportion of each mill group relative to the proportion of the whole population that was required. In addition to the above sample, a total of six agricultural support organisations were purposively selected and included in the study because of their involvement with smallholder farmers. These support organisations are described as key informants under the interview section.

4.7 Data collection methods and instruments

There are various methods of collecting data in a social survey. These include mail surveys, face-to-face interviews, telephone interviews and drop-off/pick-up (DOPU) method (Salant & Dillman 1994:33-34; Allred & Ross-Davis 2011:305). Other methods may include direct observation, electronic data reporting, administrative data (Statistics Canada 2010:49) and web

surveys (Nueman 2014:346). Although each data collection method has its own inherent advantages, the choice of a data collection method hinges on the study design, availability of resources, expertise of the researcher, degree of accuracy required, study timeframe (Sekaran 2003:224; Rakotsoane 2012:48), subject matter, and the scale of the survey (Moser & Kalton 1971:45).

There are two main sources of data in research, namely primary and secondary data. Primary data entails unpublished data the researcher gathers from people or organisations through surveys, interviews, meetings, focus groups discussions, and experiments, whereas secondary data comprises previously published or documented materials such as books journals, archival record, and institutional publications (Rakotsoane 2012:48). The author advised that where possible, researchers ought to strive to use both sources of data to consolidate their study findings and arguments.

For the purposes of this study survey questionnaires and interviews were used as data collection instruments to obtain primary data from the target population. The use of more than one data collection instrument was important in consolidating the benefits of each instrument while downplaying the disadvantages of using a single data collection instrument within the study. The sections below discuss each of these data collection methods and instruments namely questionnaire and interviews.

4.7.1 Questionnaire

In this study a self-administered questionnaire was used as the main instrument for data collection. A questionnaire is precisely described by Remenyi (2013:91) as a "data or evidence collecting device that consists of a list or series of specific questions which when answered by an appropriate informant or group of informants, will help lead a researcher to a greater understanding of the research question/s and provide insights to possible answers". In social science research, a questionnaire is the most popular tool for obtaining information from participants or informants (Bulmer 2004; Baker 1999; Dooley 2001; Neuman 2014). Questionnaires can be administered to the intended respondents by mail, telephone, or face-to-face and through the internet (Blaxter, Hughes & Tight 2006:179). However, in developing countries, mail questionnaires are hardly used (Bulmer 1983:9).

The questionnaire has many advantages as a data collection instrument, which include amongst others, the possibility of covering wider geographical contexts (Ngoepe 2016:342);

the possibility of answering questions without assistance from the researcher; and the fact that questionnaires are cheap and economical since money is only spent on their preparation and sending to respondents (Kothari 2004:104-5). Questionnaires can be completed anonymously and at a time convenient to the respondent (Sarantakos 2005:224). They are also very effective in collecting data about complex ideas which could not be easily quantified, such as behaviours, attitudes, opinions and beliefs (Artino, La Rochele, Dezee & Gehlbach 2014:464). Questionnaires, however, also have disadvantages, which include high non-response rates; not knowing individual's responses to specific questions; lack of personal contact with respondents; and the fact that questionnaires can only be used with literate and cooperative respondents (Kothari 2004: 105).

Apart from being a popular data collection method, Bulmer (2004: ix) and Bird (2009:1307) are concerned that researchers provide insufficient methodological descriptions of questionnaires to enable comparisons with studies of the same nature. Hence, Bulmer (2009:93) states that questionnaire design descriptions are relatively neglected in literature. In addition, the ways in which questionnaires are developed do not adhere to consistent and rigorous standards (Artino et al. 2014:463). Bird (2009:1322) therefore suggests the need for researchers to overcome this shortcoming by providing sufficient details of the key features of questionnaires, such as the: response format, delivery mode, sampling techniques, and response rates. Bird further suggested that questionnaires ought to be made available as appendices or electronically referenced. These features are fundamental in ensuring that the results obtained from questionnaires are replicable, reliable and valid. Therefore, the researcher developed the study's questionnaire with all the suggested key features, issues and variables firmly in mind.

Moreover, in literature, there are different types of questions that can be used in questionnaires, for example, open and close-ended, single responses, multiple responses, as well as ranking and rating questions. Wiersma and Jurs (2005:169) revealed two general types of item formats that are used in developing a questionnaire: (i) selected-response or forced-choice items; and (ii) open-ended items. In the literature, these two general types of formats are referred to as closed (selected response) and open-ended questions (open-ended items). The survey questionnaire that was used for this study included both closed and open-ended questions, with the aim of obtaining quantifiable and in-depth results.

The study did not rely on a previously tested questionnaire; therefore, the researcher was required to specifically develop and validate a questionnaire to be administered to smallholder

sugarcane farmers. Central to the development of the questionnaire was ensuring that it was valid and reliable (Neuman 2014:211). This included pretesting the questionnaire with the aim of determining its usefulness in gathering meaningful information for the study. The questionnaire was developed after a thorough review of information science literature and reflections based on the researcher's professional experience as an agronomist and a librarian.

Close-ended questions

Closed-ended questions ask respondents to make choices from fixed answer options such as yes or no; low, medium, or high. Respondents are expected to evaluate the given possible answer options and thereafter select the most suitable option for their situation (Sekaran 2003:239; Dooley 2001:135; Salant & Dillman 1994:83). These types of questions can be used when all the possible, relevant responses to a questionnaire can be specified in a fixed set of responses, and the number of likely responses is limited (Ary et al. 2006:421). However, bias can creep in from the list of possible answer choices particularly if the such choices exclude a possible answer that closely reflects the respondent's situation (Dooley 2001:135). One way of dealing with this issue is to include an "other, and please specify" category at the end of the list of possible choices. This enables respondents to specify any possible responses other than those from the fixed sets (Neuman 2014:332; Ary et al. 2006:421; Salant & Dillman 1994:84).

Multiple choice questions

In this study, there were thirteen questions accompanied with multiple choice answers. The multiples choice questions were provided with a list of possible answer choices as revealed in the literature. Some of the multiple-choice answer options had a final choice "other, please specify", where participants could provide answers that were not available in the list provided. Some of the questions required the participant to choose between "yes" and "no" answers.

Likert scales

In survey research, a Likert scale is one of the measurement tools used to determine people's attitudes (Neuman 2014:230). An attitude is defined as a positive or negative effect toward something (Ary et al. 2006:226). A Likert scale begins with a statement about the phenomena, immediately followed by several possible levels of agreement, which could range from "strongly agree" to "strongly disagree" (Dooley 2001:100). This means respondents would indicate whether they agree or disagree with the statements. Weaved into the scale is the ability to allow respondents to express their extent of agreement or disagreement by adding categories such as "somewhat agree", or "very strongly agree" depending on the items being measured

(Neuman 2014:231). Hence, after each statement, five or more levels of agreement or disagreement are developed. In the absence of an existing attitude scale, Ary et al. (2006:226) suggested that researchers should develop their own.

In this study, a five-point Likert-scale was used to determine smallholder sugarcane farmer's perceptions of the accuracy of information sources and their perceptions regarding the usage of ICT. The respondents had to choose a category that best suited the way they felt about each statement from categories including: (1) strongly agree; (2) agree; (3) neither agree or disagree; (4) disagree; and (5) strongly disagree.

Open-ended questions

Three open-ended questions were included at the end of the questionnaire regarding respondents' opinions about challenges they have faced when accessing agricultural information. Respondents were also requested to give comments or suggestions on strategies that can be used to effectively deliver agricultural information in the future to support decision making in the sugarcane enterprise.

Open-ended questions give respondents the opportunity to freely answer questions in any way they want without relying on a fixed set of answers from which to choose (Neuman 2014:331; Salant & Dillman 1994:79; Sekaran 2003:239). A question is posed, and a specific number of lines are left for respondents to write answers to the question (Baker 1999:209). Even though these types of questions are easier to write, they have several shortcomings that researchers ought not to overlook. This is in the sense that they tend to be difficult for respondents, as they are required to write responses in their own words. Open-ended questions also produce a variety of responses, and their coding can be very time-consuming to those who analyse the data (Salant & Dillman 1994:81). Researchers are therefore advised to avoid the use of numerous open-ended questions, as this may lead to a decreased response rate (Baker 1999:210). The best way to circumvent the drawbacks associated with open-ended questions, which was also used in this study, was to include a few (two) open ended questions in the survey questionnaire (Salant & Dillman 1994:81). Another way is to make open-ended questions optional for respondents (Al Musawi 2014:42). On the contrary, Neuman (2014:332) cautions against the total reliance on a single question format since this might results in the distortion of study findings. He thus suggested the mixing of the question formats to reduce the disadvantages associated with using a single question format. This means that while a questionnaire could be designed mainly to collect quantitative data, a researcher can

incorporate a limited number of open-ended questions with the intent of collecting qualitative data. This study adopted this approach.

Instrument validation

According to Bhattacherjee (2012:58), validity is defined as the extent to which an instrument, such as a questionnaire, sufficiently measures the construct it intended to measure. Artino et al. (2014:464) define a construct as the given model, idea or theory that is being investigated. One of the seven-step survey design process described by Artino et al. (2014:463) includes collecting feedback on questionnaire items through an expert's validation exercise, which emphasises the importance of prioritising the process of careful questionnaire item development. According to Lynn (1986), the recommended that the number of content experts to assist in validating a questionnaire ought to be between 3 and 10.

The four different types of validity that must be considered in research include construct, criterion, content, and face validity (Meadows 2003a:523-4). Of these types of validity assessment, only two relevant and practical validity assessment methods were considered for this study. These are face validity and content validity. The former refers to whether an indicator appears to be an adequate measure of a construct, on the face of it. The latter refers to how well a measure adequately represents all facets of the underlying concept (Singleton & Straits 2005:98-99). A panel of expert judges are engaged in social research to examine the face and content validity of constructs. This approach is very useful in addressing complex or abstract concepts of a construct that may require detailed descriptions of its content domain for it to be clearly understood and separated (Bhattacherjee 2012:58). The process of instrument validation is fundamental in social science research, because there are a few established operational definitions of concepts (Singleton & Straits 2005:98). Therefore, depending on the purpose of the measurement, the researcher would be required to establish a measure's validity, by ensuring that it appears valid and that items in a construct are covered proportionately to its content domain.

In congruence with Lynn's (1986) recommendation, a panel of four experts, consisting of two experts from the University of South Africa, Information Science Department, and the University of Swaziland's Department of Agricultural Education and Extension were asked to establish the face and content validity of this study's questionnaire. The panel of experts were to assist in identifying technical errors, omissions and subsequently suggest improvements on

the questionnaire's items. The content experts revised the items and made suggestions based on the components of the respective subject domains, which are agriculture, and information science. This was to ensure that the content adequately covered the breath of the desired content. Furthermore, the academic experts assisted in the assessment of clarity and the relevance of the formulated questionnaire items to the information needs and information services of smallholder sugarcane farmers in Swaziland.

Instrument reliability

One of the useful aspects that an instrument must have is reliability (Neuman 2014; Bhattacherjee 2012; Creswell 2014). According to Neuman (2014:212), reliability refers to the degree to which an instrument is dependable or consistent even when it is reused several times under very similar conditions. Therefore, the researcher ought to strive to produce an instrument that is without bias or error free to guarantee credible findings. There are various types of reliability in quantitative research. The three main types of reliability include stability, representative and equivalence reliability (Neuman 2014:212). Stability reliability refers to reliability across time. Representative reliability refers to reliability across different types of cases. Equivalence reliability refers to reliability across different indicators when a construct is measured with multiple specific measures. There are also different ways that can be used to estimate the reliability of an instrument, which include inter-rater, test-retest, split-half and internal consistency reliability (Bhattacherjee 2012:57). According to Neuman (2014:213), there are four ways to improve the reliability of an instrument. These include: (i) proper conceptualisation of constructs; (ii) use of precise levels of measurement; (iii) use of multiple indicators; and (v) use of pilot tests.

One of the common ways of evaluating a questionnaire is determining internal consistency reliability (Tavakol & Dennick 2011:53). This entails calculating Cronbach's alpha to objectively measure the reliability of the instrument (Tavakol & Dennick 2011:53; Neuman, 2014:212). Cronbach's alpha measures the internal consistency of a test or scale (Tavakol & Dennick 2011:53). It is sometimes viewed as only a measure of scale reliability not a statistical test per se; hence the coefficient of reliability is usually computed. In social science research, a reliability coefficient of 0.70 or above is tolerated (UCLA 2017). It is mandatory that researchers should establish the internal consistency of an instrument before it is used for research (Tavakol & Dennick 2011:54). In this study, the internal consistency and instrument reliability were determined by calculating Cronbach's alpha for various items within the

questionnaire. The results of the analysis of the questionnaire or instrument were reported in chapter five of this study.

Pre-testing of questionnaire

Notwithstanding the validation of the questionnaire by academic experts, pretesting of the questionnaire was also conducted to establish its reliability. This was necessary because the experience and understanding of academic experts might not always mirror that of the smallholder sugarcane farmers. A questionnaire relating to the information needs and information services of smallholder sugar farmers was developed, and a pre-test survey was conducted during the middle of 2018 to test the questionnaire before it was administered in the main survey. The main purpose of the pre-test test was to establish the reliability of the instrument, that is, to determine whether there were any design flaws, unfamiliar words, or unclear questions and ambiguities that required rectification before the finalising the questionnaire. Ngulube (2005:136) argued that the process of pre-testing an instrument is a fundamental aspect without which even an experienced researcher would be administering a faulty survey that would generate questionable results.

Moreover, a pre-test study can also provide the researcher with alternative recommendations once the researcher has a clear picture of how questions are interpreted by respondents (Greasley 2008:6). This means that researchers could use the pretesting phase to experience and understand their subjects before the full-scale survey. Such a pre-test run may uncover deficiencies that may not be apparent by simply reviewing the items in the questionnaire (Wiersma & Jurs 2005:171). Overall, it is important for the researcher to conduct a pre-test of the instrument to establish the level of understanding and suitability of the various items in the questionnaire, such that issues can be addressed in the final version of the questionnaire. Meadows (2003b:568) recommended that pilot testing ought to pay attention to the whole procedure of administering questionnaires, testing the entire questionnaire, letter(s) of introduction, instructions to participants, and reminder letters.

For pretesting purposes, in this study, copies of the developed questionnaire were given to professional in the information science field to read and make comments. These comments were then used to modify and improve the quality of the instrument. Moreover, questionnaires were administered to 30 selected smallholder sugarcane farmers from the three respective mill groups (Mhlume, Simunye and Big Bend) to refine the instrument for clarity and further establish the ease of completing the questionnaire. The sample size used to pre-test the

questionnaire was based on Perneger, Courvoisier, Hudelson and Gayet-Ageron (2015:151) findings from a study which aimed to provide guidance on the desirable sample size for pre-testing questionnaires, to enable the identification of problems participants may encounter when using questionnaires. After extensive computations, the authors recommended that a default sample size of 30 participants would be ideal to adequately pre-test a survey questionnaire. Though, the small group on which the pre-test test was run were drawn from the pool of smallholder farmers, it was not a random sample. While it is important to use a group like the prospective respondents in the main sample, Wiersma and Jurs (2005:171) argue that the pre-test run group need not be a random sample of the population of interest it is drawn from. Considering the above, the researcher conveniently used smallholder sugarcane farmers that were near his place of residence to pre-test the instrument. The suggestions drawn from the pretesting were used in revising the questionnaire. The members of the pre-test run group were subsequently excluded in the sample of smallholder sugarcane farmers who served as respondents to the final questionnaire.

Administration of the questionnaire

Prior to the administration of the questionnaire, a letter of introduction to the farmers was obtained from the Swaziland Sugar Association to request their cooperation in the study, explaining the purpose of the study and further giving them assurance that their contributions or responses will be safely guarded. This letter accompanied the questionnaire. Each individual questionnaire was uniquely identified by letters and numbers. The purpose of creating unique identification codes was to enable the easy tracking of queries back to the respective respondents, while preserving anonymity. Moreover, the researcher enclosed pens for respondents to use for completing questionnaires as an expression of appreciation for the participants of the study.

This study involved the use of drop-off/pick-up method in administering the questionnaire. While the researcher targeted occasionally meetings between the farmers and the SCGA, those farmers that could not be accessed through this kind of arrangement were physically sent questionnaires in their respective farms. This method was feasible because the farms are located along the Komati and Great Usutu river corridors. Due to the length of the questionnaire, and the nature of the job in which smallholder sugarcane farmers are engaged, the drop-off/pickup method was the most appropriate. Meadows (2003a:564) highlighted the importance of selecting an appropriate mode of questionnaire administration, emphasising that

researchers should consider the following: (i) objectives of the survey; (ii) availability of resources; (iii) characteristics of target population; and (iv) the impact of the mode of administration on the quality of data collected.

The drop-off/pick-up method involves going door-to-door to personally deliver the questionnaires to individual persons or organisation for self-completion. Once the questionnaires have been completed, they are either returned by mail or alternatively the surveyor would arrange for their collection (Salant & Dillman 1994:33-34). The researcher chose to personally collect the completed questionnaires from the respondents to reduce non-response issues or questionnaires getting lost due to exchanging many hands. The DOPU method tends to outperform the other traditional methods in terms of reducing non-response error or bias, where individuals do not respond to a questionnaire (Allred & Ross-Davis 2011). Furthermore, the personal interaction with the potential respondents during the delivery of the questionnaire was found to improve survey outcomes of various survey designs (Trentelman, Irwin, Petersen, Ruiz & Szalay 2016:95). The face-to-face contact and verbal communication with potential respondents also gave a chance for the researcher to determine eligibility (Allred & Ross-Davis 2011:305). Moreover, personally dropping-off the questionnaire to the respondents enabled the researcher to become actively involved in the data collection. To increase the effectiveness of the DOPU method, Salant and Dillman (1994:33) recommended that researchers ought to try as much as possible to leave questionnaires only with the relevant respondents to encourage the respondents to complete the questionnaire. According to Neuman (2014:344) the completion rate of self-administered questionnaires is higher compared to when respondents receive questionnaires through a third-party mode of delivery, such as postal mail.

One of the most important tasks in conducting research is gaining and maintaining access to the study area (Blaxter et al. 2006:154). The ability to select an appropriate strategy in gaining access to a study population is crucial in ensuring an adequate response rate (Johl & Ranganathan 2010:50). The task of gaining access to the study area requires the establishment of working relations with the potential study participants or organisations (Neuman 2007:282). Permission documents granting access rights to study participants should be obtained from authorities such as institutional review boards (Salkind 2009:153). In some instances, access to the research site may be denied if the researcher cannot clearly articulate the aims and objectives of the study as well as the potential benefits of the study to the organisation in focus (Johl & Ranganathan 2010:42). Other reasons for denied access may be due to the sensitivity

of the subject being investigated, protected areas and conflicting schedules (Cohen, Manion & Morrison 2007:109). Gaining cooperation with the potential participants needs to be taken into consideration (Blaxter et al. 2006:153). At this level, the researcher may need to engage his/her social skills (Johl & Ranganathan 2010:42).

4.7.2 Interviews

The interview is the most common method of collecting qualitative data. An interview seeks to determine the views, experiences, beliefs and or motivations of the subjects regarding a phenomenon (Gill, Stewart, Treasure & Chadwick 2008:292). There are three types of research interviews: structured, unstructured, and semi-structured interview. Structured interviews are basically verbally administered questionnaires, where respondents are asked predetermined interview questions with minimal or no divergence to probe a response in detail. On the other hand, unstructured interviews lack predetermined interview questions, and are conducted with minimal organisation. Semi-structured interview constitutes a predetermined list of key questions that guide the interview and further allows the researcher to probe the respondent for more details (Gill et al. 2008:291). This means that in a semi-structured interview, a researcher can pursue a line of discussion that emerges on the respondents' side thus opening an in-depth dialogue. According to Edwards and Holland (2013:29), semi-structured interviews give the interviewees flexibility to answer questions on their own terms over and above the interview guide. The interview guide being the list of questions the researcher wants to cover in the duration of the interview. According to Jamshed (2014:87), the interview guide covers the core and related questions that could only be improved through the pilot testing of the interview guide. The author further advises researchers to record the interview sessions to ensure a comprehensive coverage of the interview data. To corroborate quantitative data, this study adopted the semi-structured interview technique and key informants were interviewed. Key informants are people who have knowledge and information on a subject (McKenna & Main 2013:113). The authors emphasise that the selection of key informants must be carefully considered to get the data required.

Administration of interviews

As an additional means of investigating strategies for improving information service delivery to smallholder sugarcane farmers in Swaziland, semi-structured interviews were conducted with eight agricultural support organisations. The main purpose of the interviews was to elicit their perspectives as information providers in the sugarcane production chain. While the

quantitative aspects of reliability were not applicable due to interaction between the interviewer and interviewee, the researcher was expected to validate the interview guide before it could be used (Prescott 2011:32).

An interview guide with eight questions was developed and piloted on a highly experienced colleague who had been working for the Swazi Bank, a development finance institution, as an Agribusiness Manager dealing, with smallholder farmers on many occasions. Piloting an interview guide before the main interview takes place is fundamental in establishing whether the instrument is comprehensible and capable of answering the study's research questions (Gill et al. 2008:292; Perneger, Courvoisier, Hudelson &Gayet-Ageron 2015:147). An electronic recording gadget was used to record the interview, enhancing the researcher's ability to capture the interview data as fully as possible. After completing the pilot interview, the provisional interview guide was revised where necessary, and the amount of time taken to complete the session was noted.

The interview guidelines suggested by Gill et al. (2008) were taken into consideration while conducting interviews. Prior to the interview, the researcher familiarised himself with the interview guide, and further established rapport with interviewees to enhance the flow of dialogue, ensuring that it appears as natural as possible. The purpose of the study was explained to participants. The participants were given assurances about ethical principles and obligations to be fulfilled by the researcher.

4.7.2.1 Key informant interviews

A total of six (6) key informant interviews were undertaken in this study to obtain their perspectives and in-depth answers on the information needs and information services of smallholder sugarcane farmers. These key informants were not necessarily directly involved in the farming of sugarcane but play key social and professional roles in the sugar industry. These stakeholders include financiers, government agencies, and other stakeholders.

The purpose of the key informant interviews was to get information from a wide range of agricultural support organisations that have first-hand knowledge and understanding of the kind of constraints smallholder sugarcane farmers face in accessing agricultural information and could give recommendations on how to improve their information services. Following, are the descriptions of the agricultural support organisations who served as key informants in this study:

Swazi Bank

Swazi Bank is a development and finance institution that was developed by the government of Swaziland to finance development projects and it is a leader in the financing of smallholder sugarcane farmers in Swaziland. The Swazi Bank has funded many smallholder initiatives among others the smallholder sugarcane farmers in the KDDP and LUSIP corridor.

Swaziland Finance Development Corporation

The Swaziland Finance Development Corporation (FINCORP) is one of the major providers of agricultural loans to smallholder sugarcane farmers. It was established in 1995 to provide financial services to Swazi entrepreneurial people. As interview was with one of the Agribusiness Credit Officers for sugarcane projects.

Swaziland Water and Agricultural Development

The Swaziland Water and Agricultural Development (SWADE) is a government company that oversee the planning and implementation of smallholder sugarcane projects such as the KDDP and LUSIP. SWADE plays an important role in ensuring irrigation development and environmental management within the rural areas where smallholder sugarcane farmers operate.

Ministry of Agriculture

The Ministry of Agriculture is the arm of government responsible for the development of the agriculture sector in Swaziland. The ministry plays a crucial role in policy developments that involve issues of importance to the agriculture sector where smallholders are critical players. The ministry further provides information services to smallholder farmers in its quest to improve food security in Swaziland.

Swaziland National Library Services

The Swaziland National Library Services (SNLS) provides information services to all the regions in Swaziland through library centres that provides various collections and supportive environment for reading and learning. The SNLS has 14 branches across Swaziland and these are open for use by the smallholder farmers.

Swaziland Cane Growers Association

Included in the interviews, is the Swaziland Cane Growers Association (SCGA) which is a non-governmental organisation that serves and advances the collective interests of farmers growing sugarcane in Swaziland. This association is funded by the members which includes the smallholder sugarcane farmers. The SGCA provides technical, management, training and governance support to members and further represents the members in sugarcane forums within and outside Swaziland.

4.8 Processing and analysis of data

This section describes and explain in detail the process and rationale of the processing and analysis of captured quantitative data that was collected via questionnaire and qualitative data obtained from semi-structured interviews. Data analysis is described by Sharma (2018:4) as the "process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data". Data analysis forms the outcome of the research irrespective of whether the data is quantitative or qualitative (Flick 2013:3). Once the collection of data was completed, the data was examined for errors and then prepared for further analysis depending on the nature of the data, that is, quantitative or qualitative.

4.8.1 Quantitative data analysis

Quantitative data was captured using the Census and Survey Processing System (CsPro) and analysed using the Statistical Package for Social Sciences (SPSS) version 23. In this study, SPSS was used to generate descriptive statistics and multivariate analysis including exploratory factor analysis and multiple regression analysis. The package (SPSS) is an astounding tool that allows researchers to produce simple, descriptive statistics to complex multivariate statistics (Arkkelin 2014:10). Prior to subjecting the data to factor analysis procedures, reliability analysis was performed on the questionnaire to measure internal consistency of the scales.

Factor analysis

According to Costello and Osborne (2005:1) exploratory factor analysis is a widely used statistical tool in social sciences to develop instruments and determining what type of services should be offered to individuals. In this study, exploratory factor analysis (herein referred as factor analysis) was used to determine the type of information needs required by smallholder farmers. Moreover, factor analysis was used to measure relationship constructs for the perception of farmers' e-readiness and the challenges encountered in accessing information.

Basically, factor analysis was used to exclude redundant variables that were not representative of the intended construct.

As a prerequisite to factor analysis, the dataset was assessed to ensure that it meets the preliminary assumptions for further factor analysis. The first consideration was validation of the sample (sample size). To assess the adequacy of the dataset, the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and Bartlett's test of sphericity were used. The KMO test was used to verify whether the data collected qualify for factor analysis. The acceptable sample sizes to yield acceptable factors were those with a KMO above the threshold of 0.6. Data with values between 0.7 and 0.8 are classified as good (Kaiser 1974:35). The Bartlett's Test of Sphericity test was conducted to assess whether the dataset had patterned relationships. Field (2005:652) suggested that the Bartlett's Test should be significant ($p<0.05$) to be able to employ factor analysis on the data (Field 2005:652).

Secondly, another important test to determine whether issues exist with the dataset is by ensuring that there are patterned relationships between the variables in the correlation matrix. Items that lack patterned relationships have correlation coefficients that are less than $r = 0.3$ (Yong & Pearce 2013:87).

Thirdly, examination of intercorrelations amongst variables was conducted on the correlation matrix to identify variables with multicollinearity problems, with the intention to drop them. This was based on the scale of descriptors for describing the magnitude of relationships in the behavioural sciences: 0.5 and above = large; 0.5-0.3 = medium; 0.3-0.1 = small and below 0.1 = insubstantial (Cohen 1988:79). Variables with correlation coefficients above $r = 0.9$ and determinant score below 0.00001 suffer multicollinearity issues (Yong & Pearce 2013:87-88) because they are unimportant (Dlamini 2004:29).

The fourth determinant of dataset eligibility for a good factor analysis is adequacy of the sample size, that is, the number of valid and usable collected questionnaires or cases. Many researchers have given a wide varying "rules of thumb" relating to the determination of a suitable sample size. Comrey and Lee (1992) classified adequate sample sizes for factor analysis from 50 =very poor, 100 = poor, 200 = fair, 300 = good, 500 = very good, 1000 or more = excellent. However, some authors are not content with these guidelines (MacCallum, Widaman, Zhang & Hong 1999; Worthington & Whittaker 2006). Therefore, Worthington and Whittaker (2006) provided alternative guidelines for determining the minimum necessary sample size, *N*, in factor analysis. One of the overarching guidelines recommends that "sample sizes of 150 to 200 are

likely to be adequate with data sets containing communalities higher than 0.50" (Worthington & Whittaker 2006:817). This view is shared by Pallant (2010), who suggests that ideally, the data should have at least 150 cases. In this study, the number of respondents or cases used were *N*=168 with item communalities ranging between .590 – .918, representing a good fit within the low-to-moderate range characterizing social sciences research (Costello & Osborne 2005:7).

Past studies have used sample sizes between 100 and 200. One of the studies was investigating the information needs and sources of the rural farmers in Tanzania by Elly and Silayo (2013) used *N*=120 cases. Another doctoral study by Woods (2016) on exploratory factor analysis of the positive coaching inventory, carried out at the University of Missouri-Columbia relied on *N*=189 useable cases for its factor analysis. Yet another study by Simelane (2013) investigating the integration of ICT in schools in Swaziland used *N*=149 cases. Comparatively, the response rate of this study was adequate for factor analysis (Table 5.1).

Finally, in running the analysis the following steps were followed (Yong & Pearce 2013: 83-86):

- Computation of correlation matrix to assess existence of patterned relationships on variables.
- Factor extraction was conducted using the principal component analysis (PCA). Costello and Osborne (2005:2) argued that the PCA is the most preferable factor extraction method in factor analysis.
- Factors were rotated for better interpretation of results using the varimax method which help curtail high loadings of variables on a single construct.
- Interpretation of factor loadings to assess the strength of relationships.
- Deciding on the number of factors to retain based on eigen values. Factors with eigenvalues above 1 were retained. A high factor loading was considered representative and important in defining that construct (factor).

The interpretation of the factor analysis was based on the extracted and rotated eigenvalues as well as the total variance explained by the variables. In social science, a solution that represents above 60% of the variance is considered appropriate (Maskey, Fei & Nguyen 2018:97). The higher the value of the factor loading and the total accumulative variance of factor, the better the explanatory power of the data (Asafo-Adjei & Buabeng 2016).

Regression analysis

In this study, regression analysis was used identify and describe the relationship among factors of information needs and information services of smallholder sugarcane farmers versus their demographic variables such as age, education or gender. Regression analysis is a "collection of statistical techniques that serve as a basis for drawing inferences about relationships among interrelated variables" (Golberg & Cho 2010:1). It is a type of statistical technique that allows one to describe and characterise relationships among independent and dependent variables mathematically (Schneider, Hommel & Blettner 2010:776).

Multiple regression analysis was employed to study multiple demographic (independent) variables simultaneously so as to determine the variables that predict and explain the information needs and information services of farmers. The independent variables consisted of gender, age, education, position, farm size, experience, mill group, number of employees and income. The dependent variables included the type of information needs and the information services of farmers. Following the recommendation of Schneider et al. (2010:776), the dependent variables (data) for each construct were transformed and considered as a block into the model. The coefficient of determination (R-squared) was considered a percentage of variance that is explained by the set of predictor variables (Burton, Carrol & Wall 2002:60).

4.8.2 Qualitative analysis

For this study, it was important to analyse data collected through interviews and open-ended question from the survey questionnaire. Qualitative data analysis is described as the classification and interpretation of various text or cases to determine what it represents. The purpose of the analysis is to describe a phenomenon in detail to derive meaning in the material and to compare cases (Flick 2013:5). The qualitative data analysis approach proposed by Creswell (2014:196-200) was taken into consideration while conducting the analysis. Qualitative data was collected from agricultural support organisation by means of personal interviews involving the use of a voice recorder and a notebook. After data was collected from the field, it was then transcribed. The data was then organised in line with the research objectives and questions using tables to enable coding as the themes emerged. Thereafter, the qualitative findings were used to support and consolidate quantitative findings of the survey. Qualitative data from questionnaire (open-ended question) were analysed and seven themes emerged, which were fed into SPSS to produce descriptive statistics such as frequencies. These

themes include: mixed mode, Use of ICT, face-to-face interaction, improved ICT infrastructure, translation of concepts into local language, centralised information hub, and ICT training.

Assessment of e-readiness

E-readiness of farmers towards use of ICT was assessed using the e-learning readiness survey (e-LRS) model by Aydin and Tasci (2005:250) (Figure4.1). The e-LRS model has been used by several studies to assess the level of access to information and communication technology (Hadining & Sukanta 2019; Purnomo & Lee 2010; Afolabi 2015). The model is coded from 1 to 5, just like in a five-point Likert type scale, with a 3.41 mean score being a threshold for readiness. The e-readiness score is grouped into four levels of readiness: (1) not ready, needs a lot of work; (2) not ready, needs some work; (3) ready, but needs a few improvements; (4) ready to go ahead or to be implemented.

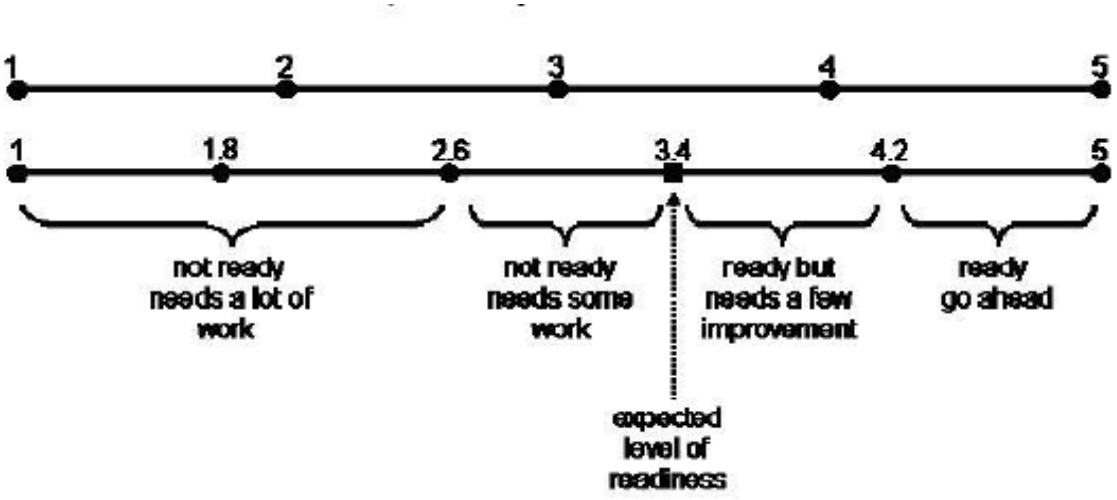

Figure 4.1: Assessment model of the e-Learning Readiness Survey (e-LRS) model (Aydin & Tasci 2005:250)

4.9 Ethical considerations

One of the most important considerations before conducting social research is to establish those aspects of the research that could potential raise ethical and legal dilemmas regarding study participants (Creswell 2014; Baker 1999; Neuman 2014). Neuman (2014:145) describes ethics simply as "what is or not legitimate to do". In other words, the researcher ought to be conscious that he/she is dealing with human beings and that there are ethical implications in designing research procedures for such subjects. The ethical considerations to be anticipated fall within five broad stages which include: prior to conducting the study, beginning of the study,

collecting data, analysing data, and reporting, sharing, and storing data (Creswell 2014:93). According to Neuman (2014:145), researchers have a "moral and professional obligation" to protect their participants from harm even if they may not be aware of their rights. Neuman (2014:147) reveals that the harm can be physical, psychological, or economical.

The University of South Africa (UNISA)'s research ethics policy (2007) emphasises the importance of taking all possible measures to protect participants from harm. In line with the UNISA research ethics policy, the researcher obtained a research ethics clearance from the Department of Information Science Research Ethics Review Committee. There are many ethical issues that could be anticipated, however, the following issues were considered in the study: informed consent, beneficence of participants, confidentiality, anonymity and privacy.

Informed Consent

According to Cohen et al. (2006:318), informed consent is defined as a process by which potential participants can decide if it is worth it to take part in a study despite any risks and costs. Annexed to the informed consent principle is participant's right to withdraw at any stage or not to complete items in the questionnaire. Before completing the questionnaire and conducting interviews, the researcher explained the purpose and procedures of the study. A consent letter was given to each smallholder farmer to request their voluntary agreement to participate in the study (Neuman 2014:151). The information on the consent form was in line with the UNISA guidelines.

Beneficence of participants

Beneficence refers to the potential of the research to improve the situation of participants (Cohen et al. 2006:318). Participants were given ink pens for completing questionnaires as tokens of appreciation for their participation. The researcher thereafter clarified to participants that there would be no further incentives, whether financial or in kind, for participating in the study.

Confidentiality, anonymity and privacy

Confidentiality refers to the non-disclosure of the data collected without the permission of the informant (Ary 2006:585), whereas anonymity refers to the non-disclosure of a participant's identity after data collection (Neuman 2013:154). Privacy refers to the right of the participant to be left alone without unduly probing for private personal information (Neuman 2013:154). The researcher made all possible efforts to keep all the research data private and confidential,

ensuring that it did not fall on the hands of third parties. This included assuring participants that their identities will not be revealed. The original questionnaires were held in a secure place at UNISA for a period of five years, where once this time elapses, the data will be destroyed in accordance with the UNISA guidelines. The audio recordings were erased as soon as data analysis was completed. When reporting the results of the study, individual participants were not identified; rather, they were referred to as a collective. Pseudonyms were used to identify information service providers so as to ensure that information cannot be traced back to informants.

4.10 Evaluation of the research methodology

This section sought to evaluate the research methodology used to shed light on the merits of using certain research procedures to conduct the study. This is important because there is hardly any research method that is perfect, hence, researchers must evaluate their investigation procedures in order to explain what information was required, how it was obtained cost effectively, and how it was analysed (Ngulube 2005:139). The current study used a survey research design supplemented by methodological triangulation to gain an in-depth understanding of the information behaviour of smallholder farmers in the sugar industry. Survey research is more effective when supplemented with other qualitative research methods (Leedy & Ormrod 2015; Creswell 2014; ACAPS 2012; Choy 2014). This implies that the individual methods are incomplete without the other.

The study adopted a quantitative approach that emphasises quantitative analysis of data, and was supplemented with qualitative data to consolidate findings. Quantitative data and some qualitative data were collected via questionnaire. Moreover, interviews were used to collect more qualitative data to supplement quantitative data. The mixing of survey data and interviews (triangulation) in the study helped in validating assumptions and claims made in research literature regarding the information behaviour of farmers. Choy (2014) and McCusker & Gunaydin (2015) have contended that the advantage of a survey research is that it can be administered in a short period of time, and data can easily be analysed and verified. The researcher was confined in terms of time and financial resources, where this approach was more favourable. Interviews were also conducted with stakeholders actively involved with farmers in the Swaziland sugar industry. The reliability of the data was strengthened in the study by using triangulation. Questionnaires were distributed using the drop-off method.

Challenges were encountered during data collection, which made it difficult to obtain a hundred percent feedback from some farmers, despite repeated follow ups, because of a number of factors: farmers were not available in their offices; refused to answer a questionnaire because they were busy, or saw no direct benefit derived from doing so. One farmers association was reluctant to receive the questionnaire unless the researcher came to sit down with the executive committee to explain the purpose and implication of their responses in the study. Notwithstanding the above challenges, the response rate reached eighty percent, due to an introductory letter from the CEO of the SCGA, andpersistent follow up. The researcher also benefitted from farmers attending mill group meetings, where some farmers claim to have lost the questionnaire during collection, hence the researcher had to photocopy additional questionnaires. While the drop-off method of delivering the questionnaire was helpful, some farmers voluntarily provided their mobile phone numbers to contact them when coming to collect the questionnaire. Another challenge was that some farmers were located far away from tarred roads, which slowed down the data collection process. Overall, the questionnaire was the best data collection tool for collecting data from farmers.

Despite enthusiasm on the part of agricultural support organisations to take the interview, bureaucracy was faced in obtaining permission to interview officers, as well as scheduling these interviews. As expected, the interviews were arranged at the convenience of the interviewee, hence the researcher had to force matters sometimes to make sure that the opportunity was not missed. On some occasions, meetings would be rescheduled several times. Despite all the above-mentioned challenges, data was successfully collected to enable the researcher to adequately address the study's research questions.

4.11 Summary

This chapter discussed in detail the research methodology used in this study which is divided in the following thematic section: research paradigms, research methodologies, research design, population of study, sampling methods and procedures, data collection methods and instruments, processing and analysis of data, ethical considerations, evaluation of research methodology, and summary. It was necessary to explain the broader research methodologies and the relevant research method that was used in the study of information needs and information services of smallholder sugarcane farmers in Swaziland. The specific research method that was discussed in detail was the survey research method. It was important to examine the ethical issues that were likely to arise regarding the study population in view of

the research method chosen. The following chapter (Chapter Five) analyses data and presents the findings pertaining to this study.

CHAPTER FIVE

PRESENTATION OF DATA

5.1 Introduction

This chapter presents the results of the data generated from both quantitative and qualitative research processes which specifically includes data obtained from questionnaires and interviews. Data is presented based on the research objectives and questions of the study as outlined in Chapter One (section 1.5). The study sought to answer the following research sub-questions that emanated from the research problem:

- What kind of information do smallholder farmers require?
- What are the information needs differences between the milling groups and smallholder farmers?
- What are the explanatory and predictor factors that influence the information needs of smallholder sugarcane farmers?
- What agricultural support organisations are available to meet the agricultural information needs of smallholder sugarcane farmers?
- What are the preferred communication channels for agricultural information to smallholder sugarcane farmers?
- What is the frequency with which information communication channels are utilised by smallholder farmers? What is the relationship between demographic factors and the frequency with which smallholder farmers utilise ICT resources?
- What are the differences in information services between the milling groups and smallholder farmers?
- What are the explanatory and predictor variables for access to agricultural information services by smallholder sugarcane farmers?
- What is the state of e-readiness of smallholder sugarcane farmers?
- What challenges are encountered by smallholder farmers in accessing agricultural information from agricultural support organisations?
- What barriers are encountered by smallholder farmers in using information and communication technologies channels?
- What are the strategies for enhancing access to information services by smallholder sugarcane farmers?

The Data derived from smallholder sugarcane farmers was incorporated with data derived from representatives of agricultural support organisations who are major stakeholders in the smallholder sugarcane farming sector in Swaziland. The data was collected as follows:

- Questionnaires for smallholder sugarcane farmers from Mhlume, Simunye and Big-Bend mill groups.
- Interviews with some officials from agricultural support organisations involved with smallholder sugarcane farmers in Swaziland.

The questionnaire and interview guide are attached as Appendices 2 and 3 at the end of the thesis.

Data from the survey was processed and analysed as follows:

- The Census and Survey Processing System (CSPro) version 7.1 was used for entering and editing data before exported to SPSS for analysis.
- SPSS (Statistical Package for the Social Sciences) software version 23 was used to analyse quantitative data. The data was presented graphically and in tables using frequencies and percentages to vary the presentation instead of using a single monotonous style of data presentation. For data analysis, factor analysis was used to reduce data to identify a few numbers of factors that explain most of the variance observed in the information needs and information services of the farmers.
- Qualitative data from open ended questions and interviews was analysed using thematic content analysis where the researcher categorised data based on the themes that emerged.

5.2 Response rate

A response rate is important to consider in a study because it provides a guide to the adequacy, representativeness and validity of collected questionnaires for data analysis (Won, Wan & Sharif 2017:118). While an adequate response rate depends on the purpose of the survey, a response rate should be large enough to provide satisfactory inferences for generalisation to the entire population (Nulty 2008:301-6). A response rate of 50% is acceptable in social research, however a response rate of 60% and 70% is desirable (Richardson 2005:406). This is also underscored by Babbie and Mouton (2001:261), who argue that 50% is large enough for analysis, while 60% and 70% are good and very good, respectively.

In this study, a stratified sample size of 168 smallholder sugarcane farmers was successfully surveyed. This sample size represents 80% of the total of 209 targeted farmers from Mhlume, Simunye and Big-bend mill groups. Of the total of 168 respondents, 87 (69%) farmers were from Mhlume, 14 (100%) were from Simunye, and 67 (100%) were from Big-bend. In addition, interviews were also conducted with officials from 6 (75%) out of the target eight agricultural support organisations.

The questionnaires were directly administered solely by the researcher without employing assistants and this helped the study to achieve a substantial response rate despite the rigidity shown by some potential respondents. Table 5.1 below shows the survey mill groups and the number of respondents in each of the surveyed mill groups.

Table 5.1: Number of respondents in the surveyed mill groups

Mill group	**Number of respondents (questionnaire)**
Mhlume	87
Simunye	14
Big Bend	67
Total	168

5.3 Characteristics of respondents

The data presented in this sub-section provides a summary of the characteristics of the smallholder sugarcane farmers that were surveyed and interview participants, being officials from agricultural support organisations. It was important to portray a clear understanding of the respondents based on their demographic characteristics as outlined in the conceptual framework of this study.

5.3.1 Characteristics of respondents: Survey questionnaire

The respondents were described based on their gender, age, education, position, farm size, farming experience, staff employed and the approximate annual income of their enterprises.

Gender

The survey respondents comprised of 106 (63%) males and 62 (37%) females as shown in Figure 5.1. The data presented shows that the number of males who responded to the questionnaires is significantly higher than that of female farmers. This shows that agriculture is a male-dominated enterprise.

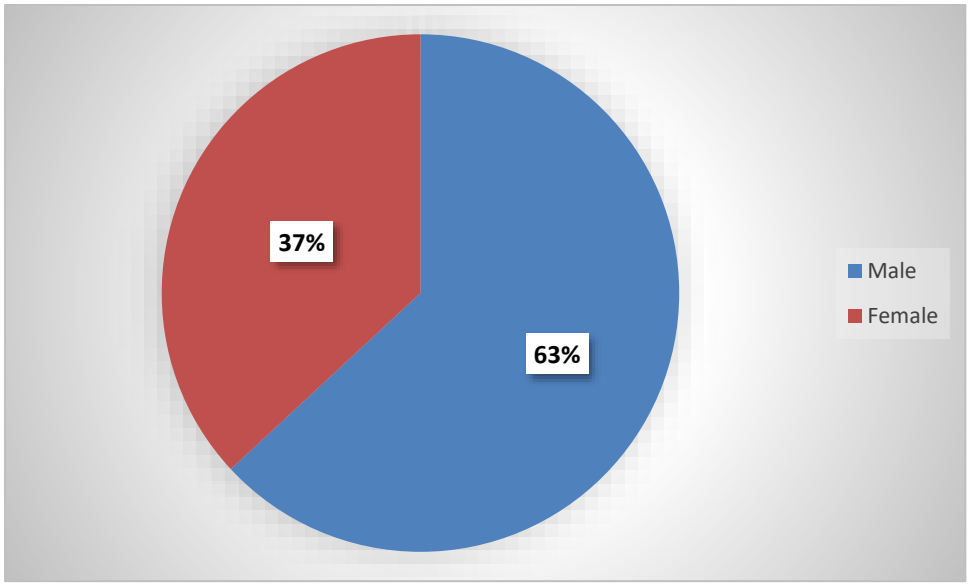

Figure 5.1: Gender of the farmers in the survey

Age distribution and gender

The farmers' age was considered in the survey to establish if there are was any relationships between their age and use of ICT tools. Figure 5.2 below shows the proportion of respondents in the survey regarding their age distribution and gender. The largest proportion of farmers was between 41 and 50 years old (66, 39%) representing 23% male and 16% female. The second largest proportion was between 31 and 40 years old (41, 24%) representing 16% male and 8% female, followed by 51-60 years (36, 21%) representing 13% male and 8% female. The age groups that are least represented in the study were 20-30 years and those above 60 years old totalling 15% (13). The data also shows that farmers between the ages of 31 and 60, adults were over-represented in the survey sample, while young people between the ages 20 and 30 were underrepresented. With respect to age distribution by gender, Figure 5.2 indicates that females were least represented in all the group ranges.

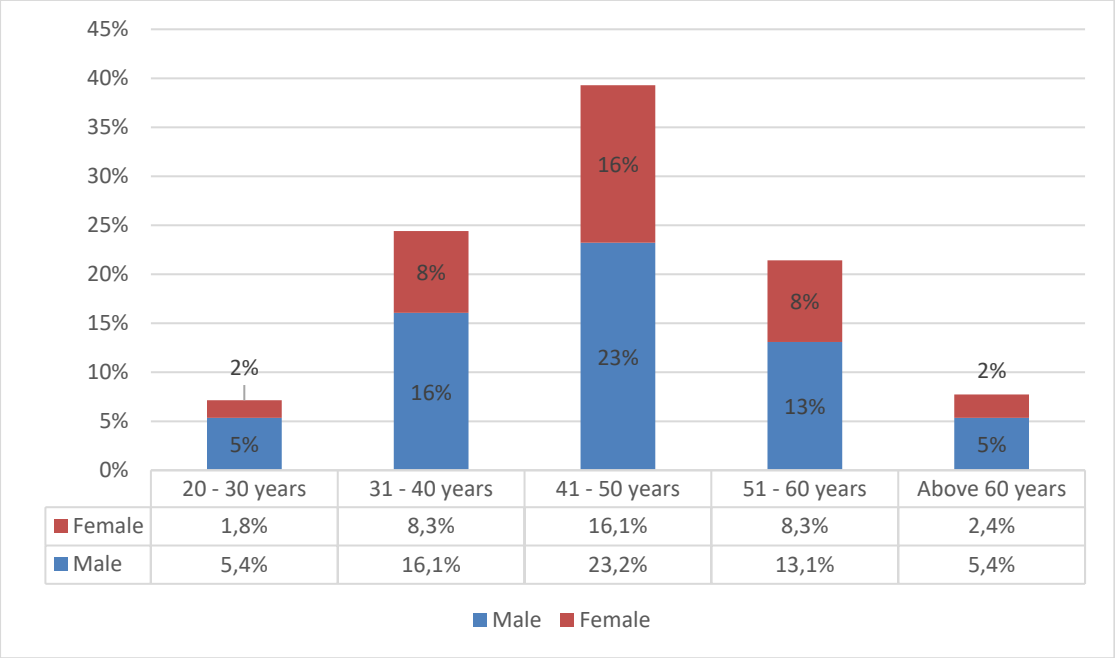

Figure 5.2: Age and gender of respondent in the survey

Educational background

Literature has revealed that the dissemination of information and use of ICTs by farmers can be greatly influenced by the level of education attained. Therefore, farmers were asked to state the highest level of education attained. Educational levels attained by farmers were captured to help confirm or verify the above assertion by determining if there are any relationships between the educational level and the use of ICT tools to access agricultural information. Figure 5.3 presents the level of education of the respondents.

The data presented in Figure 5.2 shows that most of the farmers have gone through high school (61, 36.3%), followed by 32.7% (55) with certificates and 12.5% (21) had undergraduate diploma. The lowest levels as indicated were from informal schooling (2.4%), bachelor's degree (4, 2.4%) and postgraduate degree (1, 0.6%). The results indicate that most of the farmers have gone through formal education (164, 97.6%) and that a further 48.2% (81) have gone past post-high school level. The number of educated smallholder sugarcane farmers seems to be growing much against the negative stereotype that smallholder farming mostly attracts uneducated people.

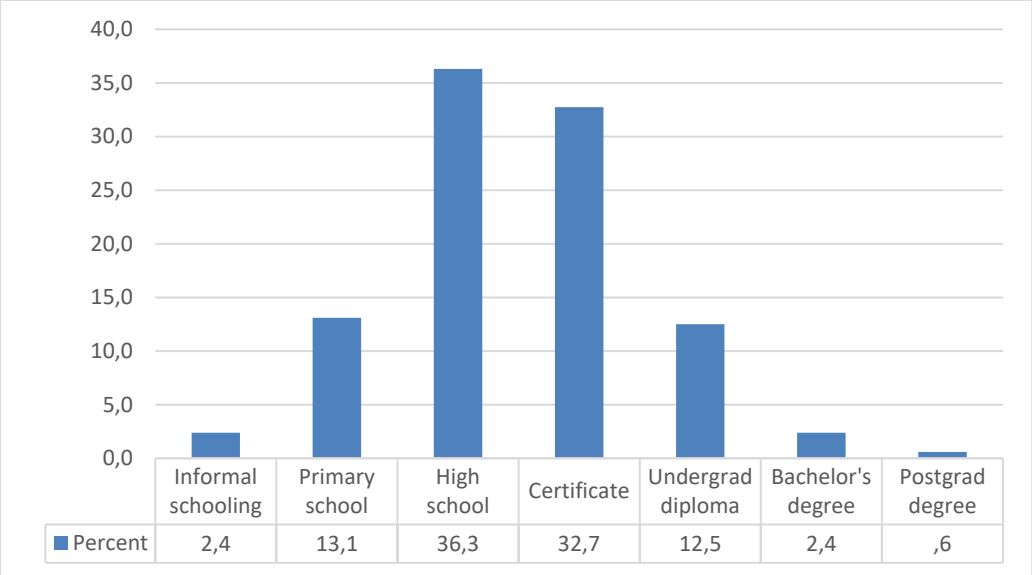

Figure 5.3: Educational level of farmers

Contrary to the results presented in Figure 5.3, a majority of responses from interviews with officials (Table 5.2) from agricultural support organisation dealing with smallholder sugarcane farmers confirmed the stereotype that smallholder sugarcane farmers are uneducated. The corresponding responses from officials representing agricultural support organisations are summarised and presented in Table 5.2 below.

Table 5.2: Education levels of small holder sugarcane farmers

Respondent	**Response**
SNLS (Female, Branch Librarian, in 40s)	*Most of the farmers are not that educated, so they don't think that libraries have a role to play in farming.*
MOA (Male, Economist, in 40s)	*Farmers are not that eloquent in reading and writing, so the mode of communicating with them has to be face-to-face.*
FINCORP (Male, Branch Manager, in 40s)	*Not all of them are literate, so we need to downsize information to a level where it could be well understood and try to find the right SiSwati word to use.*
SCGA (Male, CEO, in 50s)	*Some of them are basic farmers who are not highly educated to be able to understand some of the information they receive especially from government and other stakeholders who are not necessarily trained to communicate with farmers.*
Swazi Bank (Male, Manager Agribusiness, in 40s)	*The mode of disseminating information is not along high technology areas for now due to the nature of customers we have. Even if we use newspapers, this approach won't reach some of our customers because of their literacy levels.*

Position in the company

According to Vagnani and Volpe (2017:109), the hierarchical position of the decision maker has an influence in the use and adoption of an innovation in organisations. Therefore, this study collected data regarding the occupational position held by the farmer in the business enterprise to see whether it might impact their information behaviour. Figure 5.4 presents data on the respondents' position. The respondents' positions included manager, supervisor, chairman and executive committee member. As reflected in the figure below, a larger proportion of the questionnaires were completed by supervisors (110,65.5%), followed by managers (40, 23.8%) and the least by chairman and executive committee members, accounting for nine (5.4%) each. The larger proportion of respondents from both supervisors and managers (150, 89.3%) could perhaps be attributed to the fact that the researcher primarily targeted individuals who were responsible for running the daily operations of the farms.

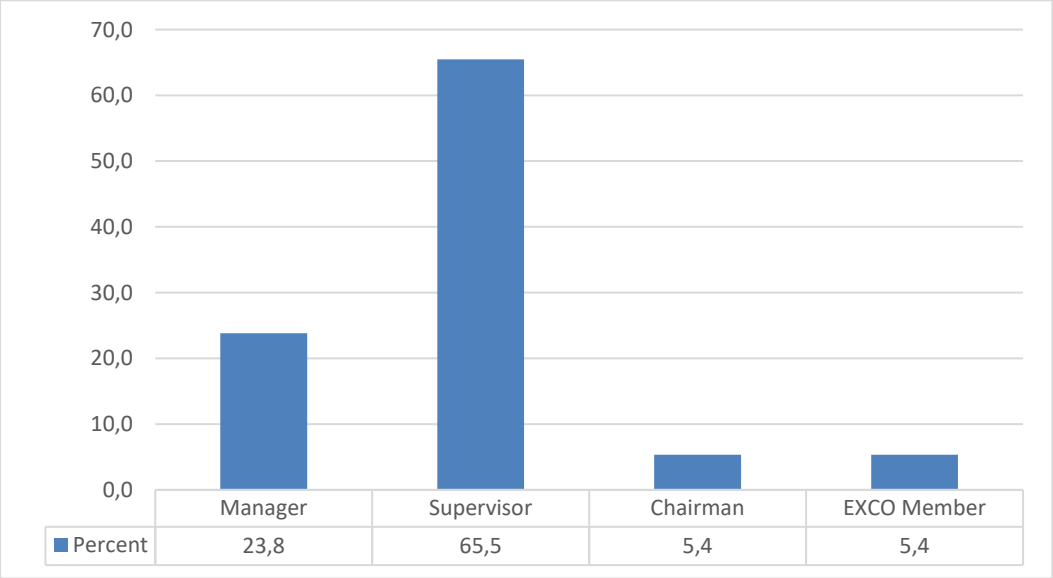

Figure 5.4: Position of the farmer in the company

Farm size

The study collected information on farm size to establish if there were any differences in the agricultural information needs and utilisation of agricultural information services by smallholder sugarcane farmers, due to different farm sizes. It has been reported that there is a strong relationship between size, location, type of farm and the usage of ICT for accessing agricultural information (Olaniyi & Ismaila 2016:1; Al Musawi 2013:49). Therefore, respondents were asked to provide the actual size of their farms in hectares, and these were then grouped into six groups as per their responses. The group ranges were defined as follows,

as highlighted in Figure 5.5 below: 1-10 hectares were categorised as very small farms; 11-50 hectares as small farms; 51-100 hectares as medium farms; 101-200 as medium-to-large farms; 201-500 hectares as large farms and 501-700 hectares as very large farms. The categorisation of data into farm size ranges or groups enabled the researcher to summarise the data for cross-tabulation with information behaviour constructs in the study. The mean average farm size in this survey was 47.726 hectares, which is close to the threshold of 50 hectares used by SSA to classify smallholder sugarcane farmers. While the average distance suggests that most of the farms are small, it is worth noting that some farmers have bigger farm sizes, more especially those that are farming under cooperatives. The minimum size of the farms is two hectares, while the maximum farm size is 650 hectares. Figure 5.5 also indicates that 33.4% (56) of the farms were above 50 hectares, which technically puts them in the medium scale category when following the SSA classification. Most respondents were farmers from very small and small farms accounting for 112 (66.6%) (46.4% very small and 20.2% small) and the least being large and very large farms which accounted for nine (5.4%) (4.8% large and 0.6% very large farms).

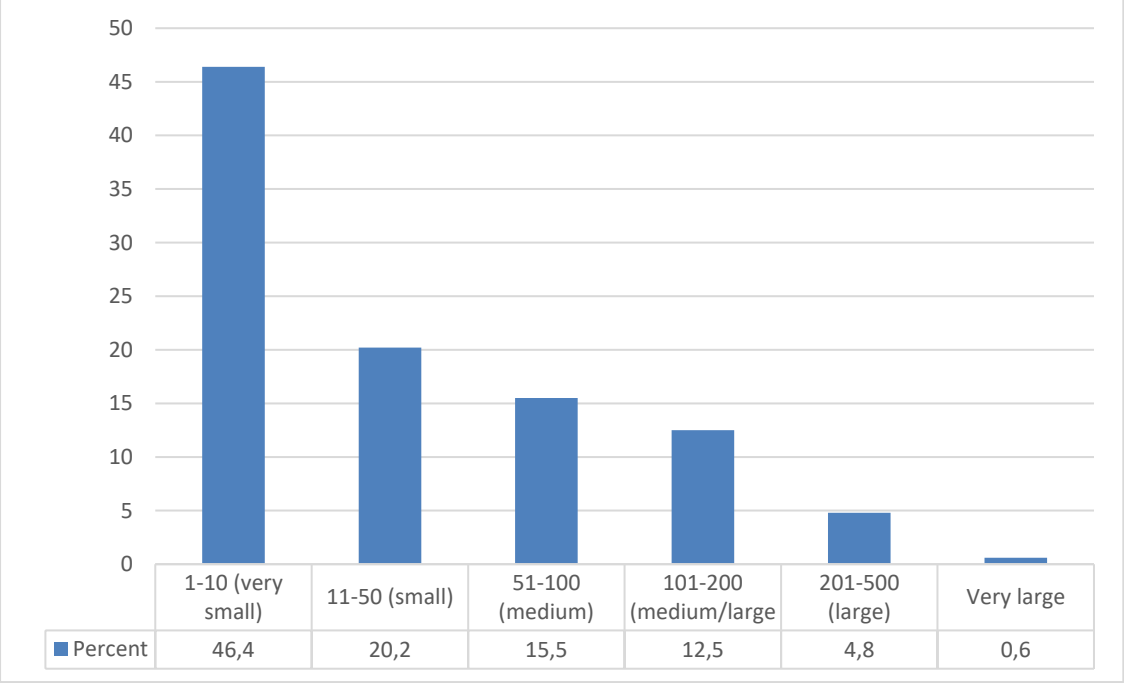

Figure 5.5: Farm size

Farming experience

The level of sugarcane farming experience of the respondents was captured in the study to ascertain whether the length (years) of their involvement in the sugarcane production enterprise

might have influence on the farmer's information behaviour. As reflected in Figure 5.6, a larger proportion of the respondents had more than 5 years farming experience (153, 91%) in the sugar industry, followed by those with 2-5 years (14, 8%), where very few respondents were below two years (1, 1%).

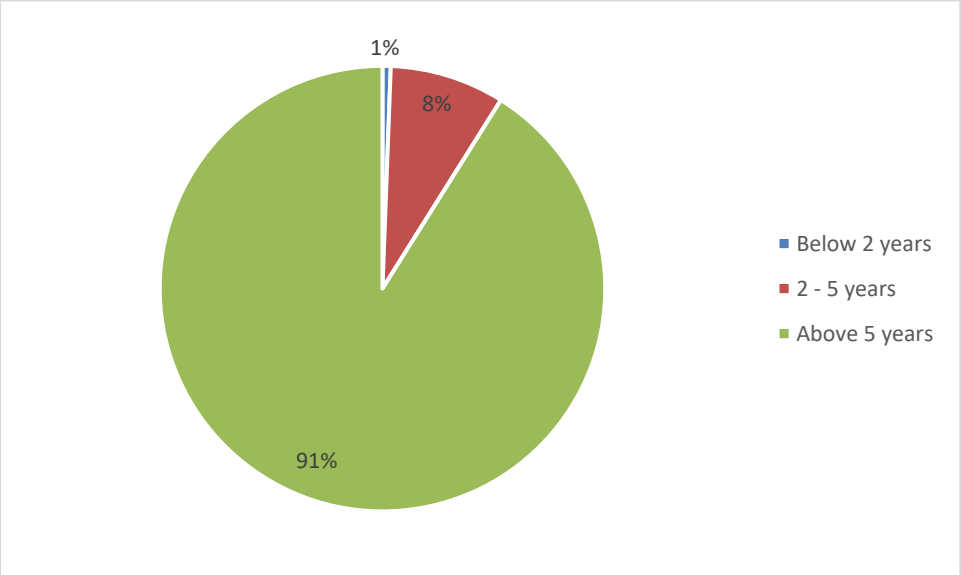

Figure 5.6: Sugarcane farming experience

Employment levels

The data on Figure 5.7 indicates that 67% (113) of the surveyed farmers had below 10 fulltime employees, whereas the rest of the farmers (55, 33%) had more than 10 fulltime employees.

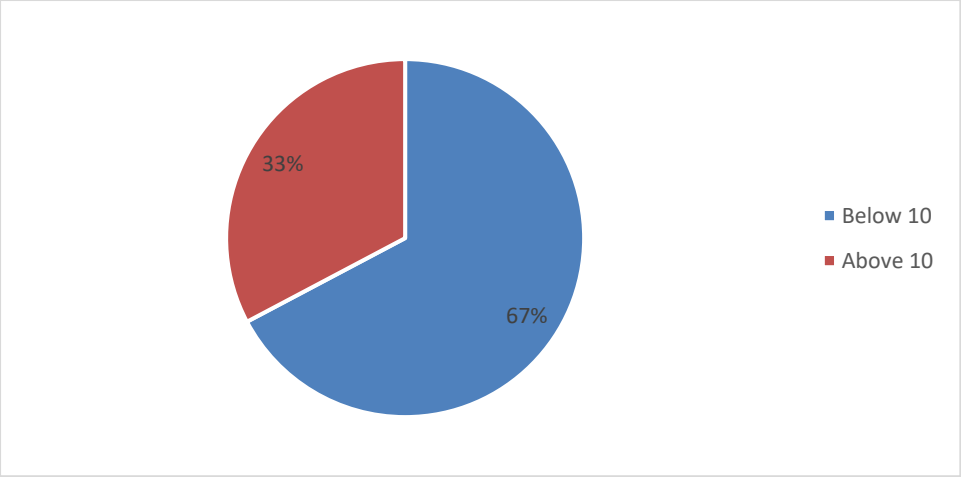

Figure 5.7 Number of employees

Annual income

The other important aspect to establish about the farmer companies survey was their annual income levels. The results presented in Figure 5.8 shows that a majority (107, 63.7%) of the farmer companies have an annual income of up-to E1 million, followed by 26.2% (44) with an income greater than E1 million up to E5 million. About 7.1% (12) of the farmers had an income of greater than E5 million up to 10 million and 3% (5) had an income of above 10 million.

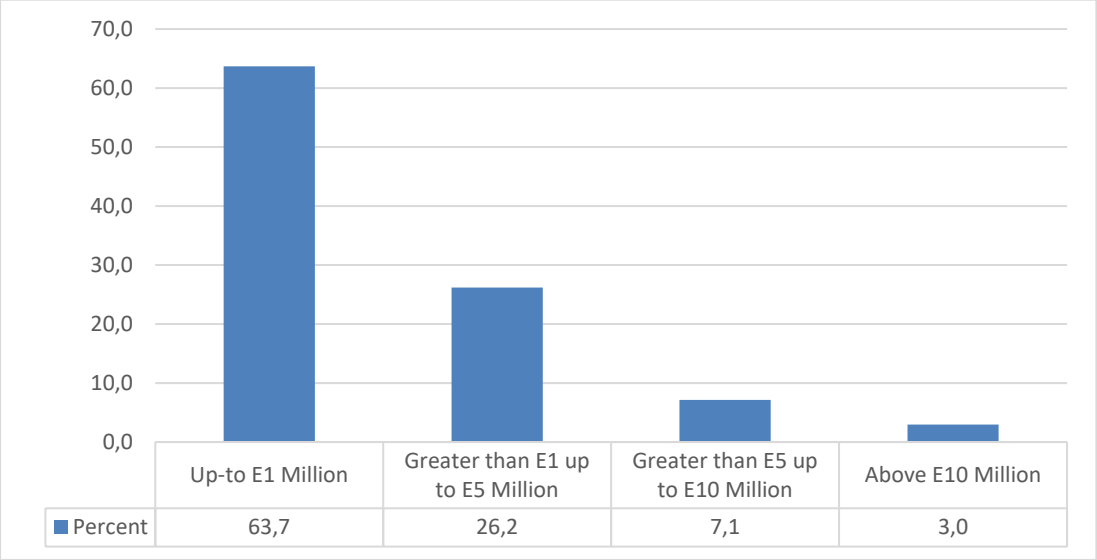

Figure 5.8: Annual income level among farmers

5.3.2 Characteristics of respondents: interviews

Officials from organisations that are directly involved with smallholder sugar farmers in the sugar industry in Swaziland were interviewed to inform the present study on the type of information request they receive from farmers, the way they disseminate information to farmers, information delivery channels and ways to improve the delivery of information to SSFs. The interview guide is attached as Appendix 3. Table 5.3 present data on the profile of the officials who participated in the interview. Out of the eight institutions identified, six participated in the study. The researcher's personal knowledge as a former agronomist and information obtained from sugar industry literature were used to identify the individuals to be interviewed. These individuals are involved in disseminating information products related to the production, finance and management of sugarcane.

Table 5.3: Profile of the officials from agricultural support organisations interviewed

Organization	Designation	Qualification	Gender	Age	Work Experience
Swazi Bank	Manager Agribusiness	B.Sc. Agric.	Male	41-50 years	10 years
FINCORP	Branch Manager	B.Sc. Agric.	Male	41-50 years	16 years
MOA	Agriculture Economist	M.Sc. Agric.	Male	41-50 years	8 years
SWADE	Extension Officer	B.Sc. Agric	Male	31-40 years	4 years
SNLS	Branch Librarian	MLIS	Female	41-50 years	21 years
SCGA	Chief Executive Officer	PhD	Male	51-60 years	3.5 years

Key: FINCORP - Swaziland Development Finance Corporation
MOA - Ministry of Agriculture
SWADE - Swaziland Water and Agricultural Development Enterprise
SNLS - Swaziland National Library Services
SCGA - Swaziland Cane Growers Association

Six agricultural support organisations participated in the interviews, where the majority were males (5, 83%), and one female (1, 17%). The majority of the participants (4, 67%) were between 41 and 50 years, whereas the age groups 31-40 and 51-60 years old had one individual each who accounted for 17% each. One half (3, 50%) of the group had undergraduate qualification, while the other half had post graduate qualification. Two out of 6 (33%) of the participants had less than five years working experience, whereas the other four (67%) had more than five years working experience in the positions they held.

5.4 Information needs of smallholder sugarcane farmers

The first objective of this study was to assess the information needs of smallholder sugarcane farmers (SSFs) in the perspective of both SSFs and support agricultural organisations' officials. Data were collected on the subject from farmers using a questionnaire while an interview schedule was used to collect data from support agricultural organisations' officials.

Farmers were asked to indicate the type of information they required for their sugarcane farming enterprise. Descriptive statistics were generated from the data to obtain a view the type of information required. Figure 5.9 provides an overview of the proportions of the different types of information needs required by farmers. More than 50% of the farmers highly require information on finance and agronomic information. The least required information is transport.

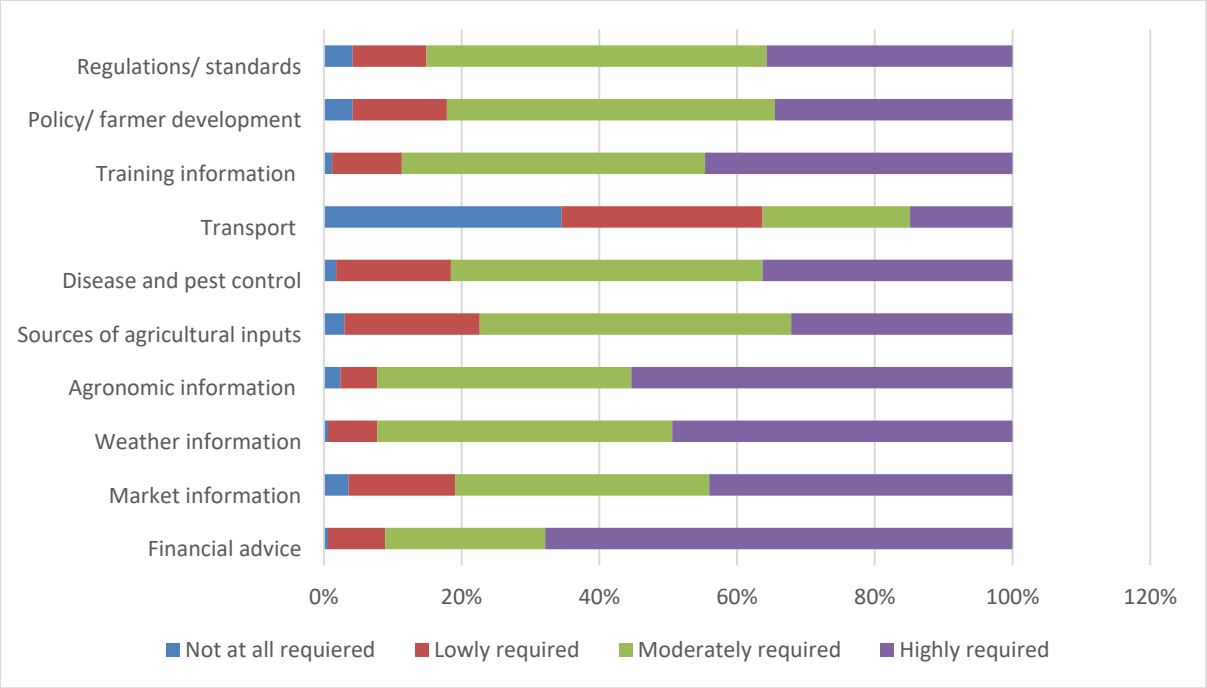

Figure 5.9: Types of agricultural information needs required by farmers

Data was analysed using exploratory factor analysis to determine the information needs of farmers by reducing the large number of variables into a smaller set. First, the researcher conducted reliability analysis of the information needs scale to determine the suitability of the data for factor analysis. A reliability analysis was carried on the information needs scale consisting of 11 items. Cronbach's alpha showed that the Likert scale question on information needs to reach $\alpha = 0.795$. Examining the item-total statistics Cronbach's alpha showed that deleting 3 items would increase the alpha to $\alpha = 0.840$. The items that were considered for removal included market information, transport information and other information. The remaining eight items were retained because the removal of one of them resulted in a decrease in the alpha. These eight items were considered worthy for subjection to factor analysis.

Then, factor analysis was performed using the principal component analysis extraction method to obtain the percent variance explained by the set of variables as indicated in Table 5.4. The results indicate that the cumulative percentage of variance is 67.6 percent.

Table 5.4: Total variance explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.006	50.1	50.1	3.006	50.1	50.1	2.325	38.8	38.8

2	1.052	17.5	67.6	1.052	17.5	67.6	1.733	28.9	67.6
3	.729	12.1	79.8						
4	.532	8.9	88.7						
5	.454	7.6	96.2						
6	.227	3.8	100.0						
Note: Extraction Method: Principal Component Analysis.									

In order to produce a more interpretable and simplified solution, the variables were rotated using the varimax rotational method commonly used for exploratory factor analysis. Table 5.5 shows the rotated component matrix with item loadings on the two extracted factors.

Table 5.5: Rotated component matrix

Type of information need	**Factor**	
	1	**2**
	"Crop husbandry"	**"Farmer Development"**
Agronomic information	.763	
Weather information	.762	
Disease and pest control	.744	
Sources of agricultural inputs	.731	
Policy		.897
Training information		.852

The results presented in Table 5.5 are buttressed by responses to section 2.1 of the interview schedule, where the officials from agricultural support organisations were asked to indicate the kind of requests they receive from smallholder sugarcane farmers. In the same vein, they indicated that most farmers required information related to the management of the sugarcane crop (crop husbandry). Table 5.6 below show the results of the thematic analysis on the type of information needs of farmers in the perspective of agricultural support organisations.

Table 5.6: Categories of information needs request received by agricultural support organisations officials

Participant	**Agronomy**	**Weather**	**Finance**	**Pest& Diseases**	**Market**	**Irrigation**	**Policy**
SNLS	X	-	-	-	-	-	-
MOA	X	-	-	X	-	X	-
FINCORP	-	-	X	-	-	-	-
SCGA	-	-	-	-	X	-	X
SWADE	X	X	-	-	-	X	-
Swazi Bank	-	-	X	X	-	-	-
N=6	50%	16.6%	33.3%	33.3%	16.6%	33.3%	16.6%

It transpired from the data that all the officials who were interviewed confirmed that they receive various information requests from SSFs such as agronomy, weather, finance, pest and disease, market, irrigation and policy related information. Among these information requests agronomic information (3, 50%) emerged as the most important information need category during content analysis. This was followed by finance (2, 33.3%), pest and disease (2, 33.3%), and irrigation (2, 33.3%). The least important request was weather (1, 16.6%) and policy information (1, 16.6%). It is clear from the results that a majority (four out of seven) information need categories fall within the theme *crop husbandry*. These include agronomy, weather, pest and disease, irrigation information. Other themes included *finance*, *market and policy information* however, these emerged as least important.

The following response reflects some of the information request by SSFs that were mentioned by the MOA official:

> "*We ensure that farmers receive the right information in terms of operating irrigation infrastructure, and water saving issues. They also need to know how to plant their crops, what kind of planting material to use, where to source such material, how to manage crops in terms of diseases, how to prevent crop diseases and when to use specific chemicals"* (Male, Economist, in 40s).

Another official from SWADE official stated that:

> *"They ask us for information upon observing that there are pests and diseases that are infesting their cane. They also ask for information on weather forecasts and dam levels"* (Male, Manager Operations, in 40s).

In the same vein, the SCGA official mentioned that:

> *"Most of the time they want to know the price at which they can be paid for their sugarcane. They also want to know about the laws and gazettes that affect them especially the wages gazette. They also have many questions on taxes, and the cost of electricity. They want to know why electricity is increasing and when it is going to increase"* (Male, CEO, 50s).

Moreover, farmers require information related to finance. The following statements from officials from FINCORP and Swazi Bank attest to this:

> "*The information requested by farmers would be mainly around our loan products, especially how we offer loans and how farmers can be assisted"* (Male, Branch Manager, 40s).
>
> *"They request for financial information regarding loans requests, harvesting reports, loan usages and balances, as well as assistance with financial auditing reports for*

Swaziland Revenue Authority. They also request for information on potential business ventures they could diversify to" (Male, Manager Agribusiness, 40s).

On the hand, the type of the information request depended mostly on the nature or business niche of the agricultural support organisation. Notably, all the financial organisations, given that their business niche is finance, they indicated that most of the time farmers required information on business finance, such as loan products, account statements, and possibilities of diversifying their business enterprises. The above statements bear testimony to that.

Overall, the interviewees seemed to indicate that the information needs of the farmers are triggered by the complexity of the task at hand. This is confirmed by the variation in the farmers' information request, which perhaps is caused by lack of a centralised information centre designed to meet the information needs of SSFs.

5.4.1 Degree of information accessibility

The survey respondents were asked to indicate the level of accessibility (highly, moderately, lowly and not accessible) of information related to their agricultural enterprise. The data in Table 5.7 below show that disease and pest control, transport, and agronomic information were accessible, more than four-fifths. Then, sources of agricultural information, market information and weather information follow at slightly below four-fifths, the least accessible being policy and regulations. Disease and pest control was rated more positively, perhaps because of the role played by SSA in monitoring this aspect to ensure acceptability of the final product in international markets. This is despite that it is one aspect of information need required by farmers.

Table 5.7 Level of accessibility to agricultural information (N=168)

Information need	**% Highly and moderately accessible**	**% Lowly and not accessible**
Disease and pest control	151(89.9%)	17(10.1%)
Transport (sugarcane haulage)	142(84.5%)	26(15.5%)
Agronomic information (production, fertilizers)	141(83.9%)	27(16.1%)
Sources of agricultural inputs	133(79.2%)	35(20.8%)
Market information	127(75.6%)	41(24.4%)
Weather information	125(74.4%)	43(25.6%)
Training information (schedules of available workshops, field days)	117(69.6%)	51(30.4%)
Financial advice	107(63.7%)	61(36.3%)
Regulations/ standards (quality, environmental)	78(46.4%)	90(53.6%)
Policy / farmer development information (government support, best practices)	72(42.9%)	96(57.1%)

5.4.2 Information needs differences between the milling groups

An analysis of variance (ANOVA) was computed to determine if there was a statistically significant difference in the information needs of farmers between the mill groups where they belong. As presented in Table 5.78, the results show the significance value (F = .418, p=.659) which is above 0.05. Therefore, there was no statistically significant difference between the information needs of farmers between the three mill groups.

Table 5.8: ANOVA on the information needs of farmers between mill groups

Mill group	N	M	SD	F	P
Mhlume	87	3.155	.465	.418	.659
Simunye	14	3.078	.714		
Big Bend	67	3.200	.447		

5.4.3 Explanatory and predictor factors of information needs of farmers

Multiple regression analysis was used to determine which of the characteristics of farmers explained variance, and predicted information needs of smallholder sugarcane farmers. The coefficient of determination R-squared values and adjusted R-squared values were computed in the regression analysis to measure the amount of cumulative variance accounted for by each characteristic or variable. Table 5.9 presents findings of the regression analysis, which reveal that two characteristics were found to explain and predict information needs of farmers namely: number of employees, and farm size. The total variance (R^2) explained by the two characteristics was 10.9 percent. The number of employees (labour) explained the greatest variance of 8.2%, while farm size accounted for 2.7 percent. The results further show that number of employees (labour) (B=.293, $p<0.05$) and farm size (B= -.001, $p<0.05$) contributed significantly to the model indicating the significance of the regression equation in predicting information needs among smallholder sugarcane growers. A statistical model presented in form of an equation was produced that predict values of information needs based on the predictor variable: $Y = \alpha + B_1X_1 + B_2X_2$

Where:

- Y represents the outcome variable
- α is the intercept
- X_1 represents the first predictor (number of employees)
- X_2 represents the second predictor (farm size)

The following regression equation was produced to measure demographic factors affecting information needs:

Information needs = 2.644 + (B_1 number of employees) + (B_2 farm size)

Table 5.9: Explained variance in information needs by demographic characteristics

Variable	*R*	R^2	R^2 change	*B*	*Beta*	*T*	*P*
Number of employees	.287	.082	.082	.293	.287	3.857	.000
Farm size	.330	.109	.027	-.001	-.222	-2.228	.027

Note. Adjusted R^2 =.098; Standard error = .122; Constant = 2.644; $p \leq .05$

5.5 Agricultural information services for farmers

This section presents data on the awareness of sources, sources of agricultural information, frequency of use of communication channels, differences in information services between groups, relationships between demographic factors and use of information services, factors affecting information use, and the state of e-readiness of SSFs.

5.5.1 Awareness of information sources

The study enquired as to whether farmers were aware about where they can get information related to their sugarcane growing enterprise. An understanding of the awareness of information sources by farmers was viewed as an important undertaking on the survey of information needs, because it one of the factors influencing usage of information services (Olubiyo & Ogunniyi 2017:5). Table 5.10 reveals that a majority (142, 84.5 %) of farmers were aware, whilst 15.5% (26) were not aware about sources of agricultural information.

Table 5.10: Awareness of information sources (N=168)

	Frequency	Percent	Cumulative percent
Aware	142	84.5	84.5
Not aware	26	15.5	100
Total	168	100	

5.5.2 Agricultural support organizations

Agricultural support organisation are critical stakeholders in agribusinesses because they provide a wide range of services crucial for the development of the agriculture sector. A list of organisations involved in the sugar industry was presented to farmers to indicate the organisations that they constantly rely upon to get information related to their businesses. The data in Table 5.11 reveal that farmers primarily relied on information from the respective mill groups (163, 25.8%), Swaziland Cane Growers Association (154, 24.4%) and the Swaziland

Sugar Association (149, 23.6%). Then the Swaziland Water and Agricultural Development Enterprise (62, 9.8%) and the Ministry of Agriculture (62, 9.4%) followed, with not much difference in their ranking. The data also indicated that the first group of support organisations are from the sugar industry while the second group is from the GOS. The least used organisation is the Swaziland National Library Services (SNLS) (1, 0.2%) despite that libraries are institutions that are endowed with a plethora of information resources accumulated over a period.

Table 5.11: Agricultural support organisations utilised to access information

Organizations	Frequency	Percent
Mill Group (Mhlume, Simunye, Illovo)	163	25.8%
Swaziland Cane Growers Association	154	24.4%
Swaziland Sugar Association	149	23.6%
Swaziland Water and Agricultural Development Enterprise (SWADE)	62	9.8%
Ministry of Agriculture (Malkerns Research Station)	59	9.4%
University of Swaziland Research Centre	36	5.7%
Swaziland National Agricultural Union	5	0.8%
Other organization	2	0.3%
Swaziland National Library Services (SNLS)	1	0.2%
Total	631	100%

Note: multiple responses were possible

The results presented in Table 5.11 are strengthened by responses to section 2.1 of the interview schedule where agricultural officials were asked if they received information requests from small holder sugarcane farmers. All officials (6, 100%) from support agricultural organisations on the same note, indicated that they received different types of information requests from smallholder sugarcane farmers.

5.5.3 Sources for agricultural information by mill groups

In the questionnaire, farmers were asked to indicate the sources they currently use to access agricultural information. A list of possible sources was provided, with an option to choose more than one. As indicated in Table 5.12, extension officers (161, 95.8%) and farmer groups (145, 86.3%) were the main sources of information used by farmers. The next most frequently used sources of information were mobile phone (102, 60.7%) and input supplier (91, 54.2%), immediately followed by personal knowledge (83, 49.4%). The least used sources of information that were ranked below 40% were the internet, other farmers, newspaper, radio, and television. The very least used sources were the landline/home phone (3, 1.8%) and local library (2, 1.2%), whilst Simunye mill group was found not to use the landline and library.

Likewise, the Big Bend Mill group did not use the library at all. The data indicated low usage of the internet, despite it being globally touted as a central information dissemination platform.

Table 5.12: Sources of agricultural information by mill group (N=168)

Source of information	Mhlume	Simunye	Big Bend	Total
Extension officers	84 (50.0%)	14 (8.3%)	63 (37.5%)	161 (95.8%)
Farmer group	77 (45.8%)	14 (8.3%)	54 (32.1%)	145 (86.3%)
Mobile phone	47 (28.0%)	10 (6.0%)	45 (26.8%)	102 (60.7%)
Input supplier	44 (26.2%)	9 (5.4%)	38 (22.6%)	91 (54.2%)
Personal knowledge	37 (22.0%)	6 (3.6%)	40 (23.8%)	83 (49.4%)
Internet/ WWW	27 (16.1%)	6 (3.6%)	28 (16.7%)	61 (36.3%)
Other farmers	21 (12.5%)	7 (4.2%)	33 (19.6%)	61 (36.3%)
Newspaper	26 (15.5%)	6 (3.6%)	26 (15.5%)	58 (34.5%)
Radio	30 (17.9%)	5 (3.0%)	17 (10.1%)	52 (31.0%)
Television	23 (13.7%)	3 (1.8)	18 (10.7%)	44 (26.2%)
Landline/Telephone	1 (0.6%)	0 (0.0%)	2 (1.2%)	3 (1.8%)
Local Library	2 (1.2%)	0 (0.0%)	0 (0.0%)	2 (1.2%)

Note: multiple responses were possible

5.5.3.1 Means of receiving agricultural information

Several organisations in Swaziland interact with smallholder sugarcane farmers through sharing of agriculture-related information. These include the sugar industry players like SSA, farmer-based organisations, government agencies and private organisations, such as financial institutions. Therefore, it was seen as important to understand the means or mode by which information is delivered to farmers. Farmers were asked “How do you receive agricultural information from information providers?” Table 5.13 presents the mode of delivery of information to farmers from information providers. As indicated in Table 5.13, workshops (158, 94%) were ranked as the most frequently or frequently used means of delivering information to farmers by service providers, followed by field days (122, 73%) and newsletter (92, 55%). Television, radio, email, CD, DVD were not frequently used as a mode of delivery. The data in Table 5.13 show that agricultural service providers are in favour of face-to-face communication, such as workshops and field days, to showcase their products than relying in the other communication tools generally used and for the most part owned by farmers (Table 5.14).

Table 5.13: Mode of delivery of information to farmers from information providers

Delivery mode	% who receive most frequently or frequently	% who receive moderately or never
Workshops	158(94%)	10(6%)
Field days	122(73%)	46(27%)
Newsletter	92(55%)	72(45%)
TV/Radio	64(38%)	104(62%)
Email	57(34%)	(111)66%

CD/DVD	37(22%)	(131)78%

The results presented in Table 5.13 are supported by responses to section 3.1 of the interview schedule, where agricultural officials were requested to indicate how they disseminated information to smallholder sugarcane farmers. On the same note, they indicated that the commonly used information dissemination strategies were meetings and workshops, and that CDs, DVDs, email and radio were the least used strategies. The results of the qualitative analysis of the data are summarised and presented in Table 5.14 below.

Table 5.14: Information communication channels used by officials from support agricultural organisations

Communication channel	No. of respondents	% Respondents
Meetings	6	100%
Workshops	3	50 %
Letter	2	33.3%
Telephone/mobile phone	2	33.3%
Newsletter	2	33.3%
Email	2	33.3%
Website/internet	2	33.3%
Radio	2	33.3%
WhatsApp	1	16.6%

It transpired during the interviews that information is mostly communicated through face-to-face-mode. Table 5.14 indicates that meetings (6, 100%) and workshops (3, 50%) are the most popular means of communicating information to farmers, because it provides them with an opportunity to ask questions where clarification is required. Interviewees indicated that they organise on-site meetings so that farmers can be in a free and relaxed environment, unlike an office environment where there are limitations in terms of space and time to see everyone. Other means of communicating information include letters (2, 33.3%), telephone/mobile phones (2, 33.3%), newsletter (2, 33.3%), email (2, 33.3%), radio (2, 16.6%), WhatsApp (1, 16.6%).

The face-to-face communication (meeting/workshops) were conducted through the following means:

- Through occasional and quarterly meetings with executive committee members of farmer companies to provide new information or updates on existing issues.

- Through one-on-one meetings with managers/supervisors of farmer companies when requested to do so.
- Attending company's general meetings in their offices or under trees where information is shared directly with the general membership.

It emerged during the interviews that the face-to-face mode of information delivery is the most reliable, because it ensures that the information is delivered directly to the intended audience without being diluted or otherwise blocked along the way. It is also perceived that the level of education of the farmers may be a hindrance to accessing some of the information, if other means were used given that in the rural areas, the oral culture is most dominant.

The use of email and website (internet) is not popular, due to the lack of computer equipment and networking infrastructure in most farmers' offices. However, those farmers that have access to email were using it to communicate with information providers. The use of letters, telephone/mobile phone, newsletter and radio were fairly frequently used, as for email and websites. An official from SWADE (Table 5.15a) indicated he uses social media (WhatsApp) to communicate with farmers who eventually pass on the message to other farmers who are not enrolled in the group. While there are more benefits that come with mobile phone technology, apart from WhatsApp, it seems farmers have limited knowledge on use of mobile application and internet in accessing information. Notably, the age group (31-40 years) of the official predisposes him (male, extension officer) to explore technology related mode of communication, which may tally with other farmers who are within and even beyond this age group. This suggests the need for capacity building regarding the use of mobile technology applications across all age groups to expose everyone to these ICT communication tools.

Table 5.15a: Information dissemination by agricultural support organisations

Respondents	Responses
SNLS (Female, Branch Librarian, in 40s)	• *We disseminate information from the library in the form of hard copy books and eBooks.* • *We also use CD ROMs, and an agricultural database called AGORA.*
MOA (Male, Agriculture Economist, in 40s)	• *We call stakeholder meetings, workshops and field days where we discuss what is happening in the agricultural sector.* • *We also use radio programs. If there are sugarcane related issues, we bring on board relevant people to talk about what is happening in the sugarcane industry.* • *We document information regarding farmer's production in our library and keep reports in our library for anyone who wants information on what is happening in the sugar industry.*
FINCORP (Male, Branch Manager, in 40s)	• *We interact with our farmers through meetings, one on ones. Most of the sugarcane farmers have companies so we meet with their boards of directors to share any information updates on loans.*

	• *We also use workshops. When the general membership wants some clarity on the performance of their farms, we would certainly be invited to farmer's offices where we seat under trees and explain to sugarcane farmers how FINCORP operates.*
SCGA (Male, CEO, in 50s)	• *We have quarterly meetings with small scale growers where we tell them what we have, and they tell us what they want us to get for them in terms of information.* • *We also have a quarterly newsletter which can be accessed via our website. The newsletter tells us what is happening in the industry.* • *We also have annual report that we also post on our website which updates people on what is happening.* • *For those that have emails, we send them information via this mode.*
SWADE (Male, Extension Officer, in 30s)	• *When we want to update them on certain things which we feel they should know, we organise meetings with them. We go to them and we talk to them in those meetings through face to face.* • *Sometimes they call us using their cell phones to ask for information.* • *We also use WhatsApp to disseminate whatever information that we feel is needed by farmers. When calling a meeting, we just post in the WhatsApp group. The farmers then disseminate that information amongst each other.*
Swazi Bank (Male, Manager Agribusiness, in 40s)	• *Our credit supervisors disseminate information to farmers through meetings with farmer companies/ committees.* • *We also have workshops which are conducted once a year where customers are told about products of the bank.* • *We also reach them through emails, and formal letters. We have not reached a stage where CDs and DVDs are used to disseminate information to farmers, but we do have a communications office where each time there is a new product, we publish it through the media.*

5.5.3.2 Ownership of ICT communication tools to farmers

There are many communication tools that have been used to disseminate information to farmers in general, but the advancement of ICT has brought an increased momentum in the way knowledge is managed. Ownership of basic ICT communication tools is considered one of the challenges that hampers access to critical agricultural information by farmers. Therefore, it was essential that an audit of the ICT communication tools owned by farmers was done. In the questionnaire, farmers were asked to indicate the number of ICT communication tools they own on a scale of 1 to 5, above 5, and none. According to Table 5.15b, many of the farmers (139, 83%) have smartphones and 131(78%) have post office boxes. Almost half of the farmers 77(46%) indicated that they have desktop computers, whilst 71(42%) have laptop computers, and 49(29%) have Wi-Fi connectivity. As shown in Table 5.15b, very few farmers indicated that they own a tablet computer (37, 22%), have networked office (29, 17%), and own a fax machine (15, 9%). The data show that there is a widespread ownership of basic ICT communication tools amongst the smallholder sugarcane farmers sector.

Table 5.15b: ICT communication tools owned by farmers

ICT communication tool	Percent who have none	Percent who have 1-5 and above 5
Smartphones	29(17%)	139(83%)
Post Office boxes	37(22%)	131(78%)
Desktop computers	91(54%)	77(46%)
Telephones	97(58%)	71(42%)
Laptops	97(58%)	71(42%)
Wi-Fi/ Hotspot	119(71%)	49(29%)
Tablet computer	131(78%)	37(22%)
Networked office	139(83%)	29(17%)
Fax	153(91%)	15(9%)

5.5.4 Frequency of use of information communication channels

Table 5.16 indicates that farmers frequently use information from extension officer (163, 97%) and farmer groups (156, 93%). The second used information communication channels are personal knowledge (134, 79.8%) and mobile phone (125, 74.4%). and the third frequently used channels are input suppliers and other farmers (96, 57%). The least used communication channels are media, internet, personal friends and family, private company, and local library ranked below 50% (7-81). The data in Table 5.16 further shows consistency with data in Table 5.13 in respect to preferred information sources and the most frequently used communication channel.

Table 5.16: Frequency of use of information communication channels (N=168)

Information source	% used very often or often	% used not very often or never
Extension officers	163(97%)	5(3%)
Farmer group (SCGA, SSA)	156(93%)	12(7%)
Personal knowledge	134(79.8%)	34(20.2%)
Mobile phone	125(74.4%)	43(25.6%)
Input suppliers	106(63%)	62(37%)
Other farmers	96(57%)	72(43%)
Media (Newspaper, Radio, TV)	81(48.2%)	87(51.8%)
Internet /related website/ electronic databases	76(45.2%)	87(54.8%)
Personal friends and family	57(33.9%)	111(66.1%)
Private company	18(10.7%)	150(89.3%)
Local Library	7(4.2%)	161(95.8%)

5.5.4.1 Level of farmer's satisfaction with information sources

While Table 5.16 shows the frequency of use of various communication channels by farmers, the farmers were also asked to indicate their level of satisfaction with the same information communication. According to Table 5.17, farmers are satisfied with the communication channel they prefer and frequently use. Farmer groups and extension officers were respectively rated very high, 165(98.2%) and 163(97.1%). Farmers were also highly satisfied with the use

of personal knowledge (136, 80.9%), mobile phone (130, 77.4%) and input suppliers (117, 73.2%). Interestingly, the data show that they are fairly satisfied with media (94, 56%), Internet (92, 54.8%) and other farmers (88, 52.4%) even though these communication channels are hardly used as indicated in Table 5.13.

Table 5.17: Level of satisfaction with information source

Information source	% who strongly agree or agree	% who neither agree nor disagree	% who disagree or strongly disagree
Farmer group	165(98.2%)	1(0.6%)	2(1.2%)
Extension officers	163(97.1%)	2(1%)	3(1.9%)
Personal knowledge	136(80.9%)	22(13.1%)	10(6%)
Mobile phone	130(77.4%)	18(10.7%)	20(11.9%)
Input suppliers	117(73.2%)	22(9.5%)	29(17.3%)
Media (Newspaper, Radio, TV)	94(56%)	49(29.1%)	25(14.9%)
Internet /related website/ electronic databases	92(54.8%)	29(17.2%)	47(28%)
Other farmers	88(52.4%)	54(32.1%)	26(15.4%)
Personal friends and family	46(27.4%)	68(40.5%)	54(32.1%)
Private company	17(10.1%)	79(47.1%)	72(42.8%)
Local Library	86(3.0%)	39(48.2%)	43(48.8%)

5.5.4.2 Language used in communicating agricultural information

Effective communication and dissemination of agricultural information between farmers and information providers is vital in the sustainability of agricultural enterprises. Evidence suggests that language use plays a key role in the understanding and effective delivery of agricultural information (Simachew, Ogola & Spielman 2010:1819). Therefore, farmers were asked to indicate the type of language used in communicating agricultural information by information providers, as well as the language they would prefer to receive information. The languages farmers were asked to select from were English and Siswati, which are the two official languages in Swaziland, however there was an option for them to specify other languages used. The results (Table 5.18) showed that 95.2% of farmers receive agricultural information from business service providers in English language. While many business services providers mostly use English to communicate information, the results show that many farmers (80.4%) would prefer the use of the local language, Siswati (Table 5.19). The results further showed that while there is wide preference for agricultural concepts to be communicated in Siswati by the farmers collectively, more males (33.9%) were in favour of English, as compared to 17.3% of females. This could possibly be attributed to gender disparities in terms of access to education in developing countries as revealed in literature.

Table 5.18: Language use by gender classification

Language	Male	Female	Total
English	102 (60.7)	58 (34.5)	160 (95.2%)
Siswati	59 (35.1)	39 (23.2)	98 (58.3%)

Table 5.19: Language preference by gender

Language	Male	Female	Total
English	57 (33.9%)	29 (17.3%)	86 (51.2%)
Siswati	82 (48.8%)	53 (31.5%	135 (80.4%)

5.5.4.3 Format farmers normally receive information resources

Format in which information is packaged in central in effective dissemination of information. Therefore, farmers were asked to indicate the format information packages were mainly received. As presented in Table 5.20, a majority of farmers (116, 69%) receive information in both print and digital format, while 29.2% of farmers receive information in print. Though surprisingly, there were farmers who received information solely in digital format (3, 1.8%). The combo format as presented in Table 5.20 show some consistency with data in Table 5.15b, which confirms ownership of computer gadgets by almost half of the farmers that could be used to read information sent in digital format. Interestingly, almost one-third (49, 29.2%) of the farmers indicated that they receive information in print format only. Perhaps these are the farmers who hardly own ICT equipment.

Table 5.20: Format information is received

Format	Frequency	Percent
Print	49	29.2%
Digital	3	1.8%
Print and digital	116	69%
Total	168	100%

5.5.5 Relationship between demographics and the frequency of use of ICT tools

The relationship between frequency of use of ICT communication tools and demographic characteristics of farmers were analysed using Pearson's correlation procedures to determine the magnitude or strength of the relationship among variables. The demographic characteristics include gender, age, education, position, farm size, farming experience, mill group, and income. Table 5.22 presents the correlation matrix of the analysis. To provide a detailed analysis, the results were further tabulated to indicate the magnitude of the correlations amongst the variables. Those ICT tools variables with insubstantial correlations were removed, while those with small to very strong correlations were included.

In this study, magnitude was assessed based on Cohen's guidelines (1988:79). According to Cohen relationships below 0.1 are insubstantial, 0.1 to 0.29 are small, 0.3 to 0.49 are medium, 0.5 and above are large. As presented in Table 5.21, small, medium, and large correlations were found between the frequency of use of email, internet, and educational background of farmers. The frequency of use of email was found to have a large positive correlation (r = .562), whilst the internet had medium to positive correlation (r = .457). A medium magnitude of negative correlation was found between frequency of use of social networks and age (r = -.343). The rest of the correlations were found to be small.

Table 5.21: Correlations between frequency of ICT tools utilisation and demographic variables

Demographic Variable	**ICT Tools**	**Correlation coefficient (*r*)**	**Magnitude**
Gender	Email	-.156	Small
	Internet	-.117	Small
	Fax	-.120	Small
	Telephone	-.222	Small
Age	Email	-.151	Small
	Internet	-.109	Small
	Fax	-.262	Small
	Telephone	-.121	Small
	Social network	-.343	Medium
Education	Email	.562	Large
	Internet	.457	Medium
	Fax	.276	Small
	Telephone	.125	Small
	Mobile	.129	Small
	Social network	.236	Small
Position	Email	-.148	Small
	Internet	-.111	Small
	Telephone	-.145	Small
	Mobile	-.234	Small
Farm size	Email	.281	Small
	Internet	.138	Small
	Fax	.197	Small
	Social network	.182	Small
Experience	Fax	-.115	Small
	Social network	-.114	Small
Mill group	Email	.101	Small
	Internet	.176	Small
	Telephone	-.122	Small
	Mobile	-.104	Small
Employees	Email	.223	Small
	Fax	.221	Small
	Telephone	.109	Small
	Social network	.162	Small
Income	Email	.290	Small
	Internet	.121	Small
	Fax	.269	Small
	Telephone	.168	Small

	Social network	.202	Small

Table 5.22: Demographic variables and frequency of ICT utilisation: Correlations and descriptive statistics (N=168)

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Gender	1														
2	Age	.037	1													
3	Education	-.042	-.376**	1												
4	Position	.084	-.133	-.164*	1											
5	Farm size	-.172*	-.327**	.228**	.123	1										
6	Experience	-.004	.217**	-.002	-.168*	-.003	1									
7	Mill group	.044	-.265**	.082	.226**	.042	-.098	1								
8	Employees	-.192*	-.272**	.190*	.112	.676**	-.031	-.033	1							
9	Income	-.239**	-.388**	.283**	.060	.851**	-.103	-.067	.836**	1						
10	Email	-.156*	-.151	.562**	-.148	.281**	-.014	.101	.223**	.290**	1					
11	Internet	-.117	-.109	.457**	-.111	.138	.019	.176*	.071	.121	.803**	1				
12	Fax	-.120	-.262**	.276**	-.032	.197*	-.115	-.019	.221**	.269**	.322**	.214**	1			
13	Telephone	-.222**	-.121	.125	-.145	.098	-.084	-.122	.109	.168*	.198*	.156*	.448**	1		
14	Mobile phones	-.070	-.027	.129	-.234**	-.051	.067	-.104	-.056	-.025	.025	.076	.134	.301**	1	
15	Social Networks	.017	-.343**	.236**	-.019	.182*	-.114	.083	.162*	.202**	.266**	.259**	.346**	.153*	.257**	1
	M	**1.37**	**3.98**	**3.49**	**1.92**	**51.51**	**2.90**	**1.88**	**1.33**	**1.49**	**2.07**	**2.26**	**1.21**	**1.97**	**3.43**	**2.45**
	SD	**.484**	**1.029**	**1.061**	**.709**	**79.17**	**.314**	**.953**	**.471**	**.758**	**1.146**	**1.190**	**.608**	**1.011**	**.808**	**.977**

Note: *p < .05 **p < .01

5.5.6 Differences in the information services between the milling groups

A one-way ANOVA was conducted on the dataset to find out if there were statistically significant differences in the information services between the three mill groups. The table below (Table 5.23) shows that there was a statistically significant difference in the information services of farmers between the mill groups (F=7.062, p=.001), where the p value is below 0.05. Unfortunately, the ANOVA output did not indicate which of the mill groups differed. Therefore, the Tukey post-hoc test was conducted on the one-way ANOVA to find out the specific mill groups that differed. Table 5.24 presents the results of the post hoc test which reveals significant differences in the information services between Mhlume and Simunye Mill groups.

Table 5.23: ANOVA on the information services of farmers

Mill group	N	M	SD	F	P
Mhlume	87	2.536	.403	7.062	.001
Simunye	14	2.844	.456		
Big Bend	67	2.746	.358		

Table 5.24: Tukey post-hoc test output for information services of farmers

Mill group	N	Subset for alpha = 0.05	
		1	2
Mhlume Sugar Mill	87	2.536	
Big Bend Sugar Mill	67	2.746	2.746
Simunye Sugar Mill	14		2.844
Sig.		.125	.635

5.5.7 Explanatory and predictor variables for access to agricultural information services

Stepwise regression procedures were used to find out whether demographic characteristics of farmers could significantly predict information services of smallholder sugarcane farmers. R-squared values and adjusted R-squared values were computed in the regression analysis to measure the amount of cumulative variance accounted for by each respondent characteristic or variable. Table 5.25 presents the results of the regression analysis which shows that two characteristics (independent variables) were found to explain and predict information needs of farmers, namely: education, and mill group. The cumulative variance (R^2) explained by the two characteristics was 23.9 percent. Education explained the greatest variance of 19.5% while farm size accounted for 4.4 percent. The results further show that education (B=.173, p<0.05) and mill group (B=.092,

p<0.05) contributed significantly to the model, indicating the significance of the regression equation in predicting information access among smallholder sugarcane growers. A statistical model presented in form of an equation was produced that predict values of information access based on the predictor variable: $Y = \alpha + B_1X_1 + B_2X_2$

Where:

- Y represents the outcome variable
- α is the intercept
- X_1 represents the first predictor (education)
- X_2 represents the second predictor (mill group)

The following regression model was produced to measure demographic factors affecting information access:

Information access = 1.892 + (B_1 education) + (B_2 mill group)

Table 5.25: Explained variance in the information access by demographic characteristics of farmers

Variable	*R*	R^2	R^2 change	*B*	*Beta*	*t*	*P*
Education	.441	.195	.195	.173	.441	6.338	.000
Mill group	.489	.239	.044	.092	.211	3.100	.002

Note. Adjusted R^2 =.230; Standard error = .108; Constant = 1.892; $p \leq .05$

5.5.8 The state of e-readiness of farmers

To guarantee fruitful implementation of ICT-related information services, exploration of indicators of technology readiness and difficulties and barriers towards use of modern technology is important. In this study, the state of e-readiness and barriers to use of ICT by farmers was explored. First, reliability analysis was conducted to measure the internal consistency of the items in the questionnaire, using Cronbach's alpha, followed by a factor analysis of the constructs of e-readiness namely, management, personal and infrastructure readiness (Table 5.26). The reliability analysis helped the researcher understand reliability of the questions in terms of the measurement of the latent variable (feeling of being prepared to use ICT).

Table 5.26: Results of exploratory factor analysis of e-readiness of farmers

Indicators	Factor Loading	Means	SD	Variance (%)	Eigen-value
I. Management Readiness (CA=0.910)				47.5%	7.124
1. Senior management are familiar with ICT application	.891	2.62	1.242		
2. Senior management use ICT for daily administrative work	.856	2.32	1.122		
3. Senior management knows what ICT is	.842	2.73	1.369		
4. Senior management promotes the use of ICT	.748	2.53	1.238		
5. Senior management knows benefits of ICT	.740	3.07	1.270		
		2.654	**1.248**		
II. Personal Readiness (CA=0.913)				15.8%	2.371
6. I have no problem using the internet	.843	3.41	1.310		
7. I have adequate skills to utilise ICT	.832	3.08	1.184		
8. I can manage my time to be able to use ICT	.825	3.68	1.134		
9. I know how ICT can be used as a communication tool	.812	3.87	1.207		
		3.51	**1.209**		
III. Infrastructure Readiness (CA=0.911)				9.3%	1.399
10. My company can afford budget for ICT use	.883	2.26	1.299		
11. The infrastructure in my company can support ICT implementation	.811	2.47	1.443		
12. My company has suitable physical space for ICT equipment	.724	2.48	1.388		
		2.40	**1.377**		
Overall		**2.855**	**1.278**	**72.6%**	

The results of the test in Table 5.26 indicate that each variable has higher reliability, as demonstrated by the values of Cronbach's alpha of above 0.90, which is way above the recommended threshold of 0.70 (Pallant 2005:90). The Cronbach's alpha coefficients for each of the variables are as follows: management = 0.910; personal readiness = 0.913 and infrastructure readiness = 0.911. These alpha values are also within the range of 0.7 to 9.5, which is considered acceptable (Tavakol & Dennick 2011:54).

Factor analysis was performed using principal component analysis, and the varimax rotation method was used to rotate the factor matrix. Table 5.26 shows the factor loadings of individual items under three factor categories, namely management, personal, and infrastructure readiness. Factor I (management readiness) comprises five items with factor loading ranging from 0.740 to 0.891, Factor II (personal readiness) has four items with factor loading ranging from 0.812 to 0.843), and factor III (infrastructure readiness) has three factors, with factor loading ranging from 0.724 to 0.883. The results of the three factors of e-readiness show that each item under each factor had factor loadings above 0.7, demonstrating a good convergent validity readiness towards ICT.

The accumulative variance explained by these factors was 72.6 percent. The results show that management readiness explained much of the variance (47.5%), followed by personal readiness (15.8%), and the least by infrastructure readiness (9.3%). Table 5.23 shows that the mean scores for the determinants of farmers' readiness towards ICT were management readiness M=2.654 (SD=1.248), personal readiness M=3.51 (SD=1.209), and infrastructure readiness M=2.40 (SD=1.377). The mean scores show that management readiness and personal readiness towards ICT were positively perceived by farmers, whilst infrastructure readiness tended to be negatively perceived. The overall mean score for the determinants of farmers' readiness towards ICT is M=2.855 (SD=1.278). The overall mean score indicates that the determinants of farmer readiness towards ICT were perceived positively.

5.6 Challenges in accessing agricultural information by farmers

This section looked at the challenges faced by farmers in accessing agricultural information. Farmers were asked to indicate the challenges they encounter in obtaining required information as well as the barriers they encounter in utilising ICTs in accessing information.

5.6.1 Challenges encountered by farmers in accessing information

Factor analysis was employed to determine the challenges faced by farmers in accessing agricultural information. The results show that all the items have a factor loading above 0.8, which demonstrate that the items were highly important in defining the challenges encountered by farmers. The results show that 65.2% of the variance of the challenges could be classified under one group name, the "poor access to information". The main difficulties are that farmers do not know where to get information, procedures for acquiring information are complicated, they do not know whether information exist, and the information quality is poor.

Table 5.27: Challenges encountered by farmers

Challenge encountered	Factor loading	Eigen Value	% of Variance
Don't know where to get information	.892		
Complicated procedures	.883		
Don't know if information exists	.850	3.913	65.2
Information quality poor	.825		

The results presented in Table 5.27 are buttressed by responses to section 3.3 of the interview schedule, where officials from agricultural based institutions were asked to indicate the challenges they encounter whilst disseminating information to smallholder sugarcane farmers.

The interviewees were asked to state the challenges they face in disseminating information to SSFs in Swaziland. Table 5.28 below summarises the major themes that emerged from the analysis of interview transcripts.

Table 5.28: Emerging themes of challenges faced in disseminating information to SSFs as perceived by officials from agricultural support organisations

Participants	Obsolete contact details	Illiteracy	Language barrier	Limited use of ICTs	Obsolete information resources	Inadequate funds for information resources
SNLS	-	X	X	-	X	X
MOA	-	X	-	X	-	-
FINCORP	-	X	X	X	-	-
SCGA	X	X	-	X	-	-
SWADE	X	X	-	X	-	-
Swazi Bank	X	X	X	X	-	-
N=6	50%	100%	50%	83.3%	16.6%	16.6%

Illiteracy: All six participants in the interviews cited illiteracy of farmers as a major barrier to the dissemination of information to farmers. Farmers were perceived as individuals who do not have adequate formal education.

> "*Farmers are not that eloquent in reading and writing, so the mode of communicating with them has to be face-to-face*" (Male, Economist, in 40s).

> "*Some of them are basic farmers who are not highly educated to be able to understand some of the information they receive especially from government and other stakeholders who are not necessarily trained to communicate with farmers*" (Male, CEO, 50s).

By the same token, it is noted that while there are other available communication channels that come with the advent of technology, the literacy levels of the farmers would be a barrier to accessing information about them. This is reflected in the statement below:

> *"The mode of disseminating information is not along high technology areas for now due to the nature of customers we have. Even if we use newspapers, this approach won't reach some of our customers because of their literacy levels"* (Male, Manager Agribusiness, 40s).

Limited use of ICTs: An overwhelming majority of interviewees (5, 83.3%) cited limited use of ICTs (computers, cell phones) as a bottleneck to the dissemination of information to farmers. It

transpired that some farmers do not have access to computers and internet services which could be used for information access such as emails. Apart from non-use of computers, interviewees revealed that some farmers lacked proper office infrastructure, which demonstrate the level of unpreparedness by some farmers to adopt ICT-based information services. This is underscored by the statement below:

> *"Another challenge in the dissemination of information is that most farmers do not have emails whereas these days communicating through emails is quicker and makes more sense"* (Male, Branch Manager, in 40s).

While there is a general awareness that most farmers have mobile phones, however their use to access agricultural information remain unknown. There was a feeling that if farmers were to adopt the use of ICTs such as mobile phone run social media applications like WhatsApp, there would be increased access to information. It was revealed that the use of WhatsApp could have ripple effects in timely dissemination of information because all members enrolled in a group would get information instantly. This revelation suggests the need to encourage farmers to explore this popular ICT tool in agriculture. It appears there was great mistrust regarding the usage of the application by farmers, as reflected in the statement below:

> *"Normally we use WhatsApp to disseminate information when it's not all farmers who are on WhatsApp. Some farmers don't believe in WhatsApp, because they think it comes with corruption"* (Male, Extension Officer, in 30s).

> *"We do use emails but most of our small holder sugarcane growers have limited access to computers which makes it difficult to communicate with them"* (Male, CEO, in 50s).

> *"Another challenge in the dissemination of information is that most farmers do not have emails, whereas these days communicating through emails is quicker and makes more sense"* (Male, Branch Manager, 40s).

***Obsolete contact details*:** One of the challenges indicated is that information may not seamlessly get to the intended individuals due to obsolete contact details of the incumbent leaders of the farmer

companies. This is as a result of frequent change of the governance of the farmer companies. An official from SCGA stated that even though they may have sent letters to farmers, sometimes the information does not reach the newly elected executive committee, due to poor hand over. This is evidenced by the following statement:

> *"One of our main challenges is obsolete contact details. You find that the committees have changed, and the farms may be inherited by other people whose contacts we do not have"* (Male, CEO, in 50s)

Apparently, after the election of new executive committee members, no effort is made to update stakeholders about the contact details of the office bearers. It also emerged that sometimes information would be blocked at the executive committee level, without cascading down to the general membership. Hence, staff from agricultural support organisations have to make numerous visits to the farmer's office to repeat the same information that would have been passed on by the previous office bearers.

Language barrier: The other challenge is that information products may not be available or transcribed into local language. Farmers in rural areas were perceived to have a low level of education for them to comprehend content in the English language. One official stated that in their organisation, loan contracts/agreement forms are only available in the English language and it can even be difficult to find an equivalent word in Siswati as the local language. It was revealed that some farmers never went to school, where there are examples reported in which they use their thumbprint instead of a written signature to endorse a contract. This is reflected in the following comment:

> *"Due to low literacy levels, one cannot communicate to farmers using an advanced language. We need to downsize information to a level where it could be well understood and try to find the right SiSwati name for certain English names"* (Male, Branch Manager, in 40s).

Officials from Swazi Bank, the MOA and FINCORP similarly cited complicated procedures for acquiring information as an impediment in the distribution of agricultural information to farmers. An official from Swazi Bank stated that:

> *"The mode of disseminating information is not along high technology areas for now due to the nature of the customers we have. So, we understand that we have to use a mode of dissemination that will be easily understood by our customers. Even if we use newspapers, we know this approach won't reach some of our customers because of their literacy levels. Sometimes even after you disseminate the information by writing, you have to make follow ups to clarify it verbally to customers"* (Male, Agribusiness, in 40s)

In the same vein, an official from MOA indicated that:

> "*Most of the information we have in hard copies so it's not something that we can multiply and give to them, but they can only access it when they decide to come. Another challenge we cannot accommodate many people at the same time, and if there are 2-3 copies, they need to be shared and that limits us in terms of giving farmers information*" (Male, Economist, in 40s)

An official from FINCORP similarly cited that:

> "*Due to low literacy levels one cannot communicate to farmers using and advanced language. We need to downsize the information to a level where it could be well understood and try to find the right SiSwati name for certain English names*" (Male, Branch Manager, in 40s).
>
> Moreover, *"some farmers do not know how to read and write when they are in charge of signing loan agreements on behalf of the company. This requires them to have read and understood the documents"* (Male, Branch Manager, in 40s).

Moreover, the findings presented in Table 5.27 are supported by an official from SNLS's interview response which indicated that farmers have difficulties in accessing agricultural because they don't know where to get the information. The SNLS official stated:

"Most of the farmers are not that educated so they don't think that the library has a role to play in farming" (Female, Branch Librarian, in 40s).

Contrary to the findings presented in Table 5.27, interviewees from agricultural support organisations including SCGA, SNLS, and FINCORP cited different challenges in the dissemination of agricultural information than the ones cited by farmers. Their corresponding responses are summarised and presented in Table 5.29 below.

Table 5.29: Challenges in the dissemination of information as perceived by agricultural support organisations

Respondent (Official)	**Response**
SCGA (Male, CEO, in 50s)	• *One of our main challenges is obsolete contact details. You find that the committees have changed, and the farms may be inherited by other people whose contacts we do not have.* • *We do use emails, but most of our small holder sugarcane growers have limited access to computers which makes it difficult to communicate with them.* • *Another challenge is that as much as we know that about 60% of farmers have smartphones, so ideally, they should be able to access emails and WhatsApp, but we are not sure how much they use their cell phones to receive agricultural information.*
SNLS (Female, Branch Librarian, in 40s)	• *Farmers need information on what farmers have done in Swaziland. However, most of our books cover content from other countries, for example, when farmers are looking for information on local climate, you find that it is not covered by our content.* • *The collection is not adequate because most of the books are old, outdated and written in not simple/complex language, when most of the farmers are not that educated.* • *The budget for procuring agricultural information is not enough, so we can only buy resources once in a while.*
FINCORP (Male, Branch Manager, in 40s)	• *Another challenge in the dissemination of information is that most farmers do not have emails, whereas these days communicating through emails is quicker and makes more sense.*
SWADE (Male, Extension Officer, in 40s)	• *Normally we use WhatsApp to disseminate information when it's not all farmers who are on WhatsApp. Some farmers don't believe in WhatsApp because they think it comes with corruption.* • *Sometimes we fail to communicate crucial information to farmers because their phones are not available.*

5.6.2 Barriers encountered by farmers in utilising ICT communication channels

As information and communication technology become widely used in the dissemination of information in the agriculture sector, more scholars are focusing their research on how they can make farmers integrate and use ICT in their respective farming enterprises. In this study, problems to more effective use of ICT by smallholder sugarcane farmers was examined using factor analysis statistical method. Table 5. 30 shows that the barriers encountered by farmers in using ICT communication channels were grouped into four factors namely technological, organisational, policy and individual related barrier.

Table 5.30: Barriers encountered by farmers

	Factor			
	1	**2**	**3**	**4**
Technological barriers				
1. Computer literacy is low in the sugar industry	.868			
2. Restricted use of available ICT in the sugar industry	.864			
3. Lack of available ICTs in the sugar industry	.852			
Organizational barriers				
4. Lack of technical support from company		.862		
5. Lack of awareness in the availability of ICT		.850		
6. Lack of training in the use of ICT		.794		
7. Lack of staff access to the company's ICT computerized information		.767		
Policy barriers				
8. Lack of comprehensive plans for ICT implementation in the sugar industry			.837	
9. Lack of support for policies on subsidized rates for telephone and internet for the smallholder farmer			.807	
10. Lack of financial support from government for implementation of ICT in my company			.787	
Individual barriers				
11. Lack of confidence in the ability to use ICT				.886
12. Lack of motivation towards use of ICT				.823
Cronbach's Alpha	**.799**	**.806**	**.808**	**.807**
Eigenvalue	**5.186**	**4.651**	**2.429**	**1.399**
Cumulative variance explained (%)	**24.7**	**46.8**	**58.4**	**65.1**

The acceptable reliability of Cronbach's alpha for the factors were 0.799 for the technological barriers, 0.806 for the organisational barriers, 0.808 for the policy and 0.807 for the individual barriers. The barriers that loaded under technological related issues (Factor 1) includes: Computer literacy is low in the sugar industry (0.868), restricted use of available ICT in the sugar industry (0.864), and lack of available ICTs in the sugar industry (0.852). Factor 1 contributed 24.7% of the variance explained by the barriers. Variables that loaded under organisational related barriers

(Factor 2) includes: lack of technical support from company (0.862), lack of awareness in the availability of ICT (0.850), lack of training in the use of ICT (0.794) and lack of staff access to the company's ICT computerised information (0.767). Variables under policy related factor (Factor 3) includes: lack of comprehensive plans for ICT implementation in the sugar industry (0.837), lack of support for policies on subsidised rates for telephone and internet for the smallholder farmer (0.807), and lack of financial support from government for implementation of ICT in my company (0.787). Variables that loaded under individual related factor (Factor 4) comprises of: lack of confidence in the ability to use ICT (0.886) and lack of motivation towards use of ICT (0.823). The results further show that 65.1% of the variances of the barriers can be explained by these four factors. The first factor explains 24.7% of the variance, second factor explains 22.1%, the third factor explains 11.6%, and the fourth factor contributed the least of the variance explained (6.7%) of the problems faced by farmers.

5.7 Strategies for improving agricultural information delivery services

The growing of sugarcane for commercial purposes presents a dynamic environment, hence strategic information delivery methods that enhance the quick delivery of agricultural information to farmers should be in place. In the questionnaire, farmers were asked to suggest the most effective way of improving the agricultural information delivery service to smallholder sugarcane farmers in Swaziland. Upon collating the responses, seven themes emerged, namely: use of ICT (email, social media); face-to-face interaction (workshops, field days, meetings); mixed mode (ICT and face-to-face); ICT training; improved ICT infrastructure; centralised information hub (libraries, information centres); and translation of concepts into local language (Siswati). These themes were then captured on CsPro software and questionnaires were coded accordingly to generate the counts and percentages in SPSS software, as presented in Table 5.31.

The data show that an effective strategy will require the use of ICT communication tools (52, 29.4%) and face-to-face interactions (52, 29.4%). The data further reveal that ICT-related initiatives ought to be at the forefront of the strategy: ICT training (20, 11.3%), improved ICT infrastructure (18, 10.2%). The number of farmers that proposed ICT initiatives (use of ICT, ICT training and improved ICT infrastructure) account for more than half of the respondents (90, 50.9%), which suggests that an effective strategy for should be technologically driven, followed by face-to-face engagements, then mixed modes (22, 12.4%). The least considered suggestions

include the use of centralised information hub (7, 4%) like libraries and translation of concepts into local language, Siswati (6, 3.4%).

Table 5.31: Delivery strategies for improving agricultural information services

Delivery strategy	Number of responses	Percent responses
Use of ICT	52	29.4%
Face-to-face interaction	52	29.4%
Mixed Mode	22	12.4%
ICT Training	20	11.3%
Improved ICT infrastructure	18	10.2%
Centralized information hub	7	4.0%
Translation of concepts into local language	6	3.4%
Total	177	100.0%

Note: multiple responses were possible

The results presented in Table 5.31 are supported by agricultural support organisation officials' responses to section 4.3 and section 5 of the interview schedule, where they were requested to suggest strategies that could be adopted to improve the dissemination of agricultural information to farmers. The results similarly showed that the use of ICT was the most favoured strategy. This was followed by improved ICT and face-to-face interactions. Table 5.32 summarises the strategic thematic issues that transpired during the interview of officials from support agricultural organisations:

Table 5.32: Themes on strategies for improving delivery of information services to SSFs

Participants	Use of ICT	Improved ICT infrastructure	Face-to-face interaction
SNLS	X	-	-
MOA	X	-	-
FINCORP	X	X	X
SCGA	X	X	X
SWADE	X	X	X
Swazi Bank	X	-	X
N=6	100%	50%	66.7%

Use of ICT

All 6 participants (100%) cited use of ICT as the panacea to the delivery of information services to farmers. The ICT solutions that were mentioned include use of computers, mobile phones, digitization of hard copy information resources, social media (WhatsApp), short message service (SMS) and agricultural web-based applications. It was discovered during the interview that the

most-preferred ICT communication tool was the mobile phone. This was the case because a majority of farmers (4, 66.7%) believed that farmers could use social media platforms tenable on mobile phones such as WhatsApp to enable easy broadcast of information to a target group of farmers.

Face-to-face interaction

Four of six participants (66.7%) mentioned that is another important strategy that can be used improve information access. The face-to-face communication mode channels that were mentioned include meetings, workshops, and field days. Although there was a general satisfaction with face-to-face communication mode, it transpired that the method requires to be enhanced with ICT-based auxiliary services, because some farmers a very far away from service providers.

Improved ICT infrastructure

About three (50%) of agricultural support organisations officials indicated that there was need to improve the ICT infrastructure. This included building purpose-built offices that provide adequate space for computer hosting and internet connectivity. It also emerged that farmer companies need to buy smartphones for farm managers and supervisors.

Agricultural officials' corresponding responses are summarised and presented in Table 5.33 below.

Table 5.33: Strategies for improving the dissemination of information by agricultural officials

Respondent	Strategy	Responses
SNLS (Female, Branch Librarian, in 40s)	Use of ICT	• *Develop a portal that could be used by smallholder farmers to share agricultural information. They could share information such as weather, pests and diseases, and prices for agricultural products.*
MOA (Male, Economist, in 40s)	Use of ICT	• *This is through the use of social media mainly WhatsApp which is quite affordable for everyone.* • *There is also emails which are accessible at any time other than a call when one misses when not in the office, one misses.* • *It can also help us to have websites where farmers would go in every month.*
FINCORP (Male, Branch Manager, in 40s)	Use of ICT	• *They could use emails, which are currently used by a few farmers. WhatsApp groups could be opened for farmers in order to communicate and share information with them.*

	Improved ICT infrastructure	• *Use bulk SMS's through the local MTN network to update farmers on changes in interest rates.* • *We could use Facebook and twitter as we now have the young ones who are taking over the business space. Most of them are on Facebook which FINCORP is currently not using.* • *A website/ portal could be used to disseminate information to farmers.* • *FINCORP could develop an application which farmers can use to get the latest updates on our products and interact with FINCORPs facilities and services through a web-based application.* • *Use an application that is specifically designed for sugarcane farmers to search for information on pests and diseases, current practices in sugarcane farming, trending herbicides, as well as the prices of the herbicides.*
SCGA (Male, CEO, in 50s)	Use of ICT Improved ICT Face to face interaction	• *Ownership of computers by farmers could improve the delivery of information.* • *It is about time we ramp up the use of social media because it's actually gaining fast popularity in the farms.* • *Farmers can use their cell phone applications to share agricultural information.* • *The physical visits should continue.*
SWADE (Male, Extension Officer, in 30s)	Use ICT Improved ICT Face-to-face interaction	• *If they can have computers and internet in their offices, communication can be simple.* • *Share agricultural information via emails.* • *Each farmer should have a smartphone.* • *Meetings* • *Farmers need to build offices where they can meet and connect electricity.*
Swazi Bank (Male, Manager Agribusiness, in 40s)	Use of ICT Face to face interaction	• *Use of emails, and intranet.* • *Community meetings*

5.8 Summary

This chapter presents results of data that was collected using questionnaires and interviews to investigate the agricultural information needs and information services of smallholder sugarcane farmers. The key concerns established in the analysis are summarised as follows:

- Information needs of farmers revolve around production and farmer development information support.
- The information needs of farmers are homogeneous while the information services are heterogeneous across the mill groups.

- Demographic characteristics of farmers have an influence in the information needs of farmers.
- Farmers rely on the stakeholders in the sugar industry for information services.
- Face-to-face is the main delivery mechanism utilised by farmers to access and receive information from service providers.
- There is widespread ownership of basic ICT communication tools by smallholder sugarcane farmers.
- Demographic factors such as age and education meaningfully contributed to the frequency of use of ICT communication tools among farmers.
- Farmers are not technologically ready to use ICT to access information.
- Farmers view ICT as a catalyst in the effective delivery of agricultural information service.

The next chapter focuses on the extensive interpretation and discussion of the findings.

CHAPTER SIX

INTERPRETATION AND DISCUSSION OF RESEARCH FINDINGS

6.1 Introduction

This chapter provides interpretation and discussion of quantitative and qualitative data presented in the previous chapter, which is outlined based on the objectives and sub-questions posed for this study. The purpose of this study is to investigate the information needs and information services of smallholder sugarcane farmers in Swaziland, with a view to use the findings to inform the development of a strategy to enhance the delivery of information for these farmers. Quantitative data were collected from smallholder sugarcane farmers via questionnaires, while qualitative data were collected through interview with respective officials from agricultural support organisations directly involved with smallholder farmers in the sugar industry. This study used a conceptual framework derived from Wilson's 1996 model of information behaviour (Wilson 1999) and the Theory of Planned Behaviour Model (Ajzen 1971), which guide the interpretation of the data in addition to the research questions of the study. This chapter has been organised based on the order in which data was presented in Chapter Five, that is, according to the following subheadings, which represent research objectives:

- the agricultural information needs of smallholder sugarcane farmers;
- the current agricultural information services for smallholder sugarcane farmers;
- the challenges faced by smallholder sugarcane farmers in accessing agricultural information; and
- the strategy for enhancing access to agricultural information by smallholder sugarcane farmers.

These subheadings are discussed in detail below in the subsequent sections of the chapter.

6.2 Characteristics of respondents

This section discusses the findings regarding the characteristics of respondents as presented in section 5.3. The characteristics of the respondents included in this study are gender, age, education, position, farm size, farming experience, mill group, labour, and income. The findings of the current study revealed that the most (106, 63%) of the smallholder sugarcane farmers were males, with

fewer (62, 37%) females. The results demonstrate several disparities between male and female respondents. The results confirmed the male dominance (141,74.6%) of the sugar industry as reported by Dlamini and Worth (2017). Similarly, Ndlovu et al. (2014) revealed that there were more males (24, 66.7%) than females (12, 33.3%) involved in the Lower Usuthu Smallholder Irrigation Project (LUSIP). The findings demonstrate disparities in the percent shareholdings, with more male than females in the farmer companies despite that international organisations such as the FAO and World Bank (FAO 2012; World Bank 2008) encourage women involvement in rural development schemes. In a study conducted in rural Tanzania, Mtega et al. (2016) found that there were more male than female respondents. The present study also showed that most (5, 83%) of the people interviewed representing agricultural support organisations were males, with only one female. Even in terms of age distribution by gender, the results reveal that women were the least represented in all the age groups. These studies confirm that the agricultural sector is male dominated. This perhaps flags the importance of mobilising for women integration in development projects in the agriculture sector.

A majority of the farmers (66, 39%) surveyed were between the ages of 41- 50 years of age, followed by those between 31-40 years (41, 24%), 51-60 years (36, 21%) and the least represented were farmers between 20-30 years and those above 60 years (26, 15%). The findings show that the farmers were predominantly within the average active working age, with more farmers between ages 20-50 years old. In the Eastern Cape of South Africa, Muzangwa, Mnkeni and Chiduza (2017) reported that the average age of smallholder farmers was 60 years. In the same vein, Johr (2012) reported that in the United States of America (USA), the average age of farmers was 58 years, compared to 67 years in Japan. In terms of job creation, the findings suggest that the growing of sugarcane in the lowveld of Swaziland has managed to reduce the massive brain drain in rural communities. In the same vein, Ndlovu et al. (2014:3208) discovered that the age distribution in the LUSIP area clearly demonstrated that there was reduction in the migration of energetic working groups from the surrounding rural communities to industrial towns and cities.

The findings of the current study revealed that most of the farmers have gone through high school (61, 36.3%), followed by those with certificate (55, 32.7%), undergraduate diploma (21, 12.5%), bachelor's degree (4, 2.4%), and informal schooling (4, 2.4%). The results clearly show that farmers have by and large attained basic education, which is against the assertions by agricultural

support organisations who were interviewed that farmers are not educated. One of the informants said:

> *Most of the farmers are not that educated, so they don't think that libraries have a role to play in farming* (Female, Branch Librarian, in 40s).

Yet another had a similar concern that:

> *Not all of them are literate, so we need to downsize information to a level where it could be well understood and try to find the right SiSwati word to use* (Male, Branch Manager, 40s).

A third indicated that:

Some of them are basic farmers, who are not highly educated to be able to understand some of the information they receive, especially from government and other stakeholders who are not necessarily trained to communicate with farmers (Male, CEO, in 50s).

The study further shows that almost one-fifth of the farmers have higher educational qualifications. According to Gason (1998) there is a positive relationship between a farmer's formal qualifications and the propensity to respond to proper farm business management and policy advice. Perhaps the assumption is that an educated farmer is more likely to explore innovations that would make his enterprise more productive. This is because an educated individual would have the ability to acquire knowledge. However, there is limited literature on the influence of general education and experience regarding farm productivity. These findings underscore the importance of formal education in the agriculture sector.

The study further indicates that a majority (65.5%) of farmers were supervisors, followed by 23.8% of managers, and 5.4% executive committee members. The higher number of supervisor and managers could be explained by the fact that the study targeted these individuals given their hands-on approach in the running of the sugarcane enterprises. Similar studies conducted in the sugar industry that have targeted supervisors/managers, including that of Mhlanga-Ndlovu and Nhamo (2017), who systematically sampled 45 supervisors that have been with the industry for at least ten years. According to Mhlanga-Ndlovu and Nhamo (2017), supervisors also constitute membership of the executive committees that run the affairs of the farmer associations.

The study revealed that the mean average farm size for smallholder farmers was 47.7 hectares. The results further reveal that a third of the farms have above 50 hectares of farmland, which suggests that technically, they are medium scale farmers as per the SSA farmer classification scheme. Basically, the farm sizes in the raw data ranges between 2 hectares and 650 hectares, where there is no doubt that to a certain extent the disparities in farm sizes can influence the farmers' information behaviour.

The current study indicated that a large proportion of farmers (153, 91%) had more than 5 years farming experience, followed by those with 2-5 years (13, 8%) and below two years (2, 1%). This suggests that most of the respondents were able to provide meaningful insight into the study given that that they have been in the industry for some time. Job experience is considered one of the determinants of information behaviour in Wilson's model of information behaviour (Niedzwiedzka 2003; Babu et al. 2012). This suggests that farming experience can enhance or prohibit information behaviour.

The study further revealed that a majority of farmers (113, 67%) have more than ten full time employees. This could be explained by the fact that the growing of sugarcane is labour intensive and involves a variety of manual work (Sifundza & Ntuli 2001). The study also revealed that a large proportion of farmers (107, 63.7%) had an annual income of up-to E1 million. Income is one important socio-economic factor that influences information behaviour (Wilson 1999). The assumption is that affluent farmers are more likely to adopt computer use in their enterprises because they could afford it. Many studies have found a significant relationship between income and adoption of new technologies (Dhraief, Bedhiaf-Romdhania, Dhehibib, Oueslati-Zlaouia, Jebali & Ben Youssef 2018).

6.3 Agricultural information needs of smallholder sugarcane farmers

This section presents interpretation of data on the information needs of farmers based on data presented in Chapter Five (section 5.4). In order to better understand the information needs of farmers, a survey, which was the principal data collection method, was conducted and farmers were asked to indicate the type of information they require as well as the level of access to that topic mentioned. As a complementary method, key informant interviews were also conducted with individuals (agricultural support organisations) who were directly involved with farmers in the sugar industry and were asked to state the type of information requests they receive from farmers.

This understanding can therefore inform a framework for the development of an effective agricultural information service for smallholder sugarcane farmers, as stated in the principal research question in Chapter 1 (section 1.4). The interpretation of the data was based on the conceptual framework that underpins the study.

6.3.1 Information needs of smallholder sugarcane farmers

This section addressed the research question: *What kind of information do smallholder sugarcane farmers require?*

Factor analysis as a statistical method was used to determine the kind of information required by farmers for their sugarcane farming enterprise. An information need arise when individuals realise a gap in their knowledge (Omiunu 2014; Case 2012; Timmins 2006). According to the data (Table 5.4 and 5.5), the information needs of smallholder sugarcane farmers can be grouped into two, namely crop husbandry, and farmer development information. The cumulative variance explained by these two groups was 67.6 percent. The first factor, "crop husbandry", accounted for 38.8% of the variance, which indicates that highly required topics of information by farmers are related to sugarcane agronomy, weather forecast, disease and pest control, and sources of agricultural inputs. What emerged from the data is that agronomic information is the subject that is mostly required by farmers, as indicated by the high factor loadings in factor one. It is widely acknowledged in the farming industry that access and understanding of the agronomy (e.g. variety selection, fertilizer application) of that crop is crucial in producing the highest possible yield of high-quality produce that can attract good profits. The findings are supported by data from interviewees (Table 5.6) that indicates farmers were more concerned about information related to crop husbandry such the agronomy, weather, pest and disease and irrigation. One informant mentioned that:

> *"They also need to know how to plant their crops, what kind of planting material to use, where to source such material, how to manage crops in terms of diseases, how to prevent crop diseases and when to use specific chemicals"* (Male, Agriculture Economist, in 40s).

These findings are also in line with Mtega et al.'s (2016) findings, who found that rice farmers in rural Tanzania required agricultural knowledge on crop husbandry techniques, such as land preparation, seed selection and planting. Similar findings were revealed in a study by Phiri, Chipeta and Chawinga (2018), who investigated the information needs of rural smallholder farmers in Malawi. They also found that 149 (77.6%) out of 202 surveyed respondents (farmers) needed crop

husbandry information. Another study by Elly and Silayo (2013) assessed the agricultural information needs of rural farmers in Tanzania using factor analysis technique. Elly and Silayo (2013) discovered that 70% of farmers' information needs concerned crop husbandry. Yet another study was conducted by Naveed and Anwar (2013) to identify agricultural information needs of Pakistani farmers, where the authors found that the information needs of the farmers centred around crop husbandry. The results of these studies perhaps demonstrate the increasing need for dissemination of information that provide more efficient techniques of growing field crops such as sugarcane.

On the other hand, while the study suggest that access to agronomic information might be an issue, the overarching issues seem to relate to the education level of the farmer. Some key informants are of the view that farmers may not comprehend the information, especially that from third parties, who are not groomed in dealing with farmers. One key informant said:

> *"Some of them are basic farmers who are not highly educated to be able to understand some of the information they receive, especially from government and other stakeholders who are not necessarily trained to communicate with farmers"* (Male, CEO, in 50s).

This assertion is shared by Dlamini and Worth (2018), who were quite concerned about the education level of some farmers, in the sense that it was at a level that would render them incompetent to understand technical sugarcane management practices. These assertions are supported by the data in section 5.3 (Figure 5.3), which indicates that less than one fifth of the farmers have formal tertiary training, in spite of the fact that the agriculture sector is knowledge intensive and complex (Babu et al. 2012). The complexity perhaps comes from the fact that the farmers were initially growing subsistence crops on a small scale, yet now, under a new regime, are obliged to grow sugarcane on commercial basis, and to follow business principles that might be a challenge if they are not well capacitated on the proper management of the crop. In the farming industry, farmers must make several decisions that include adoption of more productive technologies, management of these technologies, human resource management, as well as skilful manipulation of the limited resources to improve output (Van den Ban 1998).

The second factor is labelled "farmer development", and constitutes about 29% out of the 68% variance (Table 5.5). This factor indicates that farmers further required information related to

government policies on smallholder farmer development and training on sugarcane production. It also emerged from the data that government-related information is the least accessible, which corroborates the need for policy information from government agencies. In a thorough review of literature, Mbagwu, Benson, and Onuoha (2018) found that in developing countries, there was a lack of a designated information providing agency, whether from government or the private sector, which widens the knowledge gap on government-related information farmer development initiatives. Unbundled, the survey showed that the needs of the smallholder sugarcane farmers are: agronomic, weather forecast, disease and pest control, sources of agricultural input, government policies on farmer development, and training information. The findings of the study showed that the information needs of farmers are not unique to that of other smallholder farmers in developing countries, apart from the way they are categorised, and the type of enterprise undertaken (Tena et al. 2016; Elly & Silayo 2013; Lwoga et al. 2010; Msoffe & Ngulube 2016; Ozowa 1992). However, these studies rank financial and market information to be one the overarching needs of farmers in developing countries, whereas on the contrary, this study's findings exclude financial and market information.

Not surprisingly, firstly, market information does not fall amongst the information required by farmers, notwithstanding that Terry and Ogg (2017) identified market volatility to be a major threat to the profitability of the sugar industry in Swaziland. This could be attributed to the fact that the SSA is responsible for marketing of sugar to the international markets on behalf of the farmers, which relieves the burden from them of worrying about markets directly (Masuku 2003). Secondly, financial information has not been ranked high, despite the fact that many studies suggest access to finance to be the major obstacle among smallholder farmers (Elly & Silayo 2013; Samuel 2008; Galadima 2014). This is a result of the EU's huge financial support, combined with the Swaziland government's support towards irrigation infrastructure, which makes it attractive for a financial institution to finance smallholder sugarcane farmers given their potential to repay loans (Samuel 2008; Terry & Ogg 2016; Malaza & Myeni 2009; Shongwe 2009). According to Shongwe (2009), smallholder sugarcane farmer received grants from the European Union (EU) accounting for 70% of the costs involved in the production of sugarcane by the respective farmer companies. As a result, financial risk become minimal to private financial institutions interested in the financing of farmers because the larger burden is borne by EU.

6.3.2 Information needs differences between the mill groups

This section addresses the second research question: *What are the information needs differences between mill groups?*

Scholars have asserted that the need for information is heavily influenced by an individual's association to a social or professional group (Choo & Auster 1993:284; Du Preez 2015:242; Leckie et al. 1996:188). In the same vein, Lwoga et al. (2010:97) aver that the information needs of rural farmers are location-specific. These scholars implied that individuals may experience different information gaps, defined along their social, professional or geographic affiliation. On that basis, one-way ANOVA was performed on the dataset to ascertain whether there were differences in information needs between Mhlume, Simunye and Big Bend Mill groups (Table 5.9). The findings of the study indicated that there was no statistically significant difference between the information needs of farmers between the mill groups, suggesting that the geographic context had no effect on the information needs of farmers. This means that the information needs of smallholder sugarcane farmers aren't location specific, regardless of the mill group to which they belong. This could be explained by the fact that most of the farmers under the auspices of these mill groups are located mainly in the semi-arid lowveld of Swaziland, where production challenges for sugarcane farmers are relatively similar.

Contrary to these findings, Lwoga et al. (2010), in a study conducted from twelve districts in Tanzania, assessed the information needs of small-scale farmers and discovered that the information needs of farmers were location specific to a certain extent. Similarly, Elly and Silayo (2013) found that there was a significant difference between two wards in farmers' information needs in Tanzania. The disparities between the results of the present study and Lwoga et al. (2010), and Elly and Silayo (2013) could be attributed to the fact that these studies were conducted in diverse agricultural context (crops and livestock enterprises), and their population of studies were based largely in diverse agro-ecological zones.

6.3.3 Explanatory and predictor factors that influence the information needs of smallholder sugarcane farmers

This section considers the study's third research question: *What are the explanatory and predictor factors that influence the information needs of smallholder sugarcane farmers?*

The research question sought to determine if the information needs of SSFs were associated with certain individual farmer factors outlined in Wilson's model of information behaviour, which is one of the models where the study's conceptual framework is based. According to Wilson (1997:552) information need is triggered by factors related to the person, role, and environment. The factors included in this study are: demographic factors (personal: gender, age, farming experience, education); environmental (socio-economic: income, farm size, labour, mill group); and role-related (position). The findings of the regression analysis (Table 5.9) revealed that the information needs of farmers were significantly influenced by labour and farm size. This finding suggest that the information needs of SSFs were influenced by environmental factors, which are socio-economical in nature. The findings support the assertion by Wilson (1997) that a wide range of environmental factors influence the information behaviour of individuals.

Labour: The results further revealed that an increase in the number of people employed, the information needs of farmers increased. This makes sense intuitively, where an increase in human capital/resources would require farmers to deal with labour issues such as wages, insurance, pension and staff health relative to the number of employees added. Human resource management is an important aspect that is increasingly recognised in the farming industry because it determines productivity, however it remains a challenge to smallholder farmers (Fawole & Olajide 2012; Babu et al. 2012; Van den Ban 1998).

Farm size: The results suggest that farmers with smaller farms have higher information needs. This is expected, since farmers with smaller farms must individually make various complex decision related to the production of their crops, as opposed to a bigger farm that may have various dedicated sections. Moreover, farmers on small farms may have less time and opportunity to seek information from authoritative sources such as libraries. This is consistent with Kuivanen, Alvarez, Michalscheck, Adjei-Nsiah, Descheemaeker, Mellon-Abedi & Groot (2016), who asserted that small sized farms were the most constrained lot, characterised by relatively low levels of resource endowment. A recent study by FAO (2017: viii) revealed that smallholder farmers are faced with

constraints related to markets, finance, labour, education and weak information flow. Farm size is commonly taken as a proxy for wealth, hence it would be expected that farmers with larger farms may have bigger income that puts them in a position to benefit from information sent in various communication channels. On the other hand, farmers with small farms typically have lower production capacity, and cannot afford to invest in new technologies to meet their information needs. The finding mirrors a study conducted by Dlamini et al. (2010) involving smallholder sugarcane farmers in Vuvulane (Mhlume mill group) and Big Bend. Dlamini et al. (2010) found that along with an increase in farm size, production inefficiencies decreased. By the same token, Mabuza et al. (2012) found that the size of arable land used by farmers in the customary Swazi Nation Land (SNL) influenced the use of modern cultivation technologies. Similarly, a study on land tenure and land productivity in Swaziland by Dlamini and Masuku (2011) found that smallholder farmers in SNL have an immediate requirement for land (Dlamini & Masuku 2011:306). These studies embolden the influence of farm size in agricultural productivity, hence an increase in farm size would reciprocally increase the need for more crop husbandry information to enable the farmer to cope with the size of the business.

The study revealed that 33.4% (56) of the farmers have farm holdings with a land area above 50 hectares, which shows that this crop of farmers can be classified as medium-scale farmers not smallholder farmers as they are currently known. As expected, the information requirements of these farmers will increase to counter the constraints they face in the farms. Farmers need to widen their knowledge regarding how to source funding, improve overhead cost efficiencies, and subsequently increase income from sugarcane farming. Increased sugarcane production can be achieved by understanding the type of production information required by the farmer within the context of that enterprise. This is because a good sugarcane yield is determined by timely and optimal application of fertilisers, herbicides, and irrigation (Malaza & Myeni 2009). On the other hand, expansion of farm size in rural areas is complex, because the land cannot be sold in the same manner as title deed land. Hence, if rural land reform policy can be developed and implemented, it could translate into tangible benefits in as far as smallholder agriculture is concerned. This is because farmers would be able to manipulate this important factor that determines their information need. The finding broadly underscores the need for awareness of the implications of the size of land under cultivation and the influence of the number of employees in the planning and provision of information services to farmers.

6.4 Agricultural information services for smallholder sugarcane farmers

This part covers the interpretations of results from section 5.5, which address the following research questions: What agricultural support organisations are available to meet the agricultural information needs of SSFs? What are the preferred communication channels for agricultural information to SSFs? What is the frequency with which information communication channels are utilised by SSFs? What is the relationship between demographic factors and the frequency with which SSFs utilise ICT resources? What are the differences in information services between the milling groups of SSFs? What are the explanatory and predictor variables for access to agricultural information services by SSFs? What is the state of e-readiness of SSFs?

6.4.1 Agricultural support organisations available to meet the agricultural information needs of smallholder sugarcane farmers

This section addressed the research question: *What agricultural support organisations are available to meet the agricultural information needs of smallholder sugarcane farmers?*

Several organisations in Swaziland interact with smallholder farmers in the sugar industry as they exchange information on sugarcane production. Farmers were asked to select specific primary information provider (agricultural support organisation) from a list of organisations that included government agencies, industry-based and academic research institutions. The results (Table 5.11) from the study show that farmers utilise mostly their respective mill groups (163, 25.8%) to access agricultural information. The findings are also consistent with Von Maltitz et al. (2018), who found that there was a tight link between millers and smallholder farmers in Southern Africa, where such a link guarantees a predictable supply of sugarcane to the mills. Perhaps the link is important to ensure that after harvesting, the cane is quickly processed at the mill before the it deteriorates and loses its value. Masuku and Kirsten (2004:147) argue that the sustenance of the link between millers and smallholder farmers in Swaziland ought however to be founded on trust and psychological commitment over and above any legal contingencies. The SGCA is followed by the other industry-based organisations, namely the Swaziland Cane Growers Association (154, 24.4%), and the Swaziland Sugar Association (149, 23.6%). The finding corroborates Dlamini and Worth's (2018) findings that smallholder sugarcane farmers perceive sugar industry-based organisations to be reliable source for sugarcane related production information. The findings of the study is confirmed by other studies conducted in the sugar industry by Samuel (2008); Malaza

and Myeni (2009); Dlamini and Dlamini (2012) and; Terry and Ogg (2017) that in Swaziland independent sugar industry-based associations play a pivotal role in supporting SSFs to be productive, competitive, and sustainable in the sugar industry. The findings imply that both industry-based organisations and farmers need to continually reshape and strengthen the links through sharing of information to ensure the sustainability of the sugar industry. This underscores the need for service providers to collaborate with the millers, SSA and SCGA to deliver effective information dissemination programmes, because they are well placed to meet the information needs of smallholder sugarcane farmers.

6.4.2 Preferred communication channels for agricultural information by smallholder sugarcane farmers

This section considers the study's fifth research question: *What are the preferred communication channels for agricultural information by smallholder sugarcane farmers?*

The research analysed sources of information used by smallholder sugarcane farmers to access agricultural information. Farmers were diverse in their preference of use of 13 sources of information listed in the questionnaire used in accessing information for their sugarcane business enterprise. The study revealed that farmers used several sources of information including television, radio, newspaper, internet, farmer groups, other farmers, extension officers, home phone, mobile phone, library, input suppliers and personal knowledge (Table 5.12). A substantial number of farmers expressed preference for extension officers (161, 95.8%). This is consistent with Dlamini and Worth (2016) and Jibowo and Dube (2008), who reported that extension work still emerge as the main pathway for communicating agricultural information to rural farmers in Swaziland. The literature reveals that the sugar industry in Swaziland heavily relies on the use of extension officers to communicate information to smallholder farmers (Terry & Ogg 2017; Malaza & Myeni 2009; Dlamini & Dlamini 2012). The SSA, SWADE, Millers, and GOS provide extension services to farmers to capacitate them with skills necessary to be successful in the industry. The finding of the study are in line with findings from a study by Galadima (2014), who investigated the constraints on farmer's access to agricultural information in Nigeria. Galadima (2014) found that 62% of the farmers consulted extension officers for agricultural related information.

The results also show that the second most preferred source of agricultural information are farmer groups (145, 86.3%). The third source of agricultural information were mobile phones (102, 60.7%). It was further established from key informants that farmers groups such as the SCGA conducted periodic outreaches (meetings) to farmers, and directly communicate to them.

The study also established that extension officers and farmer groups in Swaziland heavily rely on the use of face-to-face communication, which is a theme that also emerged in the qualitative aspect of the study. It is curious, though, that farmers show preference for conventional communication channels despite the rising spread of modern ICT communication tools. On the other hand, this is not surprising, because few farmers have minimal advanced level of education, that is, university training (26, 15.5%), which may explain the ubiquitous use of conventional communication channels such as face-to-face discussion. Some scholars have reported that, in general, farmers are individuals that make very minimal use of ICTs despite its potential in disseminating a huge amount of information in a timely and cost-effective way (Okoedo-Okojie & Omoregbee 2012; Msoffe & Ngulube 2016). Most of the key informants indicated that it is very useful to physically meet the farmer so that one can explain the concepts and in turn give them a chance to ask questions. Extension officers, primarily from the large-scale producers, including those from government aid farmers by ensuring that they adhere to basic good management practices (Dlamini & Worth 2016). The results of the present study are corroborated in a study by Mtega et al. (2016), which investigated the accessibility of agricultural knowledge among smallholder farmers in Tanzania. Mtega et al. (2016) found that smallholder farmers primarily used agricultural extension officers to access agriculture related information.

One key informant indicated that farmers are continually forming groups to collectively bargain when making purchases for farm inputs like fertilizer. For instance, farmers within mill groups would form a farmer group to facilitate the acquisition of farm inputs, and the group would have power to negotiate down prices, where as a result they would receive better deals from service providers. These farmer group would then serve as a conduit for disseminating information because the group leaders would have the authority to call meetings whenever the need arose, perhaps to make farmers aware of a given innovation. The inability of extension officers to cover all the farmers at the same time compromises the free flow of information, yet information is produced now and again by research institutions and industry-based organisations. It can be

deduced from the findings that farmers prefer to access information from familiar communication channels, with which they are able to establish relationships. Therefore, in the success equation of disseminating information to this group, such tendencies ought to be incorporated into policy formulations. The other important aspect that has transformed the dissemination of information in the sugar industry is the increasing influence of ICTs.

The study also found that the third mostly used information source is through mobile phones and lastly, input suppliers. The choice of the mobile phone as one of the preferred communication channels is consistent with the findings of the study (section 5.5.3.1) that most participant farmers owned mobile phones. The results support the assertion by FAO (2012) and Dlamini and Worth (2018) that mobile phones have by now penetrated even rural communities. FAO (2012: v) asserted that mobile technology are ubiquitous today, and hold great promise in rural development. According to Dlamini and Worth (2018:25), more than 60% of farmers in the sugar industry have mobile phones. Moreover, mobile phones can deliver undiluted information packages easily, and in a cost-effective manner (Anunobi & Anunobi 2018). The study further confirmed that while mobile phones may be widely use, however, face-to-face communication is still a predominant mode with smallholder sugarcane farmers. This suggests that a multi-method approach is required in the dissemination of agricultural information to farmers.

6.4.3 Frequency with which information communication channels are utilised by smallholder farmers

This segment addressed the sixth research question of the study, namely: *What is the frequency with which information communication channels are utilised by smallholder farmers?*

This section sought to identify the frequency with which information communication channels are utilised in by smallholder sugarcane farmers in accessing agricultural information. It has been found from the data that farmers often used the sources below in the following order: extension officer, farmer groups, personal knowledge, mobile phones, input suppliers, and other farmers. The findings reveal that farmers tend to largely rely on sources that would provide a face-to-face platform. The results tally with the findings on section 6.3.2, Table 5.16; hence it can be deduced that farmers frequently use sources that are known to them. The results also reveal that the library is the least used information communication channel in the sugar industry. This perhaps was caused by the lack of dedicated agricultural information sections in the Swaziland National Library

Service (SNLS), which is compounded by the fact that the libraries are under resourced. This was confirmed by the interviewed official from SNLS in the following statement:

> *"The budget for procuring agricultural information is not enough, so we can only buy resources once in a while"* (Female, Branch Librarian, in 40s).

6.3.4 Relationship between demographic factors and the frequency with which smallholder farmers utilize ICT resources

This section considers the seventh research question of the study: *What is the relationship between demographic factors and the frequency with which smallholder farmers utilise ICT resources?*

The objective sought to determine the relationship between farmers' frequency of use of specific ICT communication tools and their demographic characteristics. Section 5.5.4, Table 5.21 provides the findings that serve as a basis for the discussion of this aspect. It was necessary to establish the relationship between the two factors, because some researchers have asserted that the personal dimension and technology are the building blocks of information needs (Meyer 2016; Du Preez 2015). Among the demographic variables, correlations were found between frequency of use of email, and internet versus educational background. The frequency of use of email and internet were found to have positive relationships with the educational background of the farmer. Correlations indicate that 31.6% of the variance of frequency of use of email and 20.9% of the variance of frequency of use of the internet were associated with the background education of the farmer. This is expected, because farmers who have reached tertiary education are more likely to experiment with the use of computers for administrative work since the use of computers at tertiary institutions is commonplace. In his study of factors influencing the adoption of a farm management information system by farmers in Brazil, Carrer, De Souza, Filho and Batalha (2017) reported that the likelihood of adoption of computer to assist in decision-making increased by 20% for those farmers with a higher education degree. Yet another study by Das (2014) on ICTs adoption for accessing agricultural information in India found that the probability of using ICTs to access agricultural information increased relative to the educational attainment of the farmer.

Furthermore, frequency of use of social networks was inversely related to the age of the farmer, suggesting that age may be a bottleneck in the use of social media as means of communicating agricultural information. Variation in the age of farmers was associated with a variance percentage

of 11.8 percent. Li and Sicular (2013) reported that older farmers in developing countries tended to lack motivation and competence in using new technologies, as has been reported in previous research. The unwillingness to use ICTs by elders means that they will be excluded from important information transmitted on modern ICT platforms. The unwillingness could be explained by the fact that some of them attended school at a time when computers use was not common. Many researchers have reported the existence of a relationship between the ready adoption of the internet and education (Gloy & Akridge 2000; Mishra & Park 2005). The influence of education and age in the utilisation of ICT communication tools among smallholder sugarcane farmers in Swaziland is in consonance with Wilson and Walsh's (1996) observation that intervening variables such as demographics can manifest at the realisation of the information need, acquisition and use. Hence, education and age are some of the demographic intervening variables that influence information use found in Wilson's model of information behaviour (1996) and adapted for the conceptual framework of the study. These intervening variables influence the frequency of use of ICT communication tools by smallholder farmers. The finding implies that service providers ought to be extremely careful about incorporating social media platforms in information services, targeting smallholder farmers before they have ascertained its potential acceptance within that group.

6.4.5 Differences in information services between the mill groups

This section concerned the study's eighth research question: *What are the differences in information services between the mill groups?*

The one-way ANOVA and the Tukey post-hoc test revealed significant differences in the information services between Mhlume and Simunye Mill groups (section 5.5.6, Table 5.23 & Table 5.24). This finding might be explained by the fact that the Mhlume Mill group is made out mostly of smallholder farmers, who are farming individually in smallholdings with an average of 4.5 hectares per farm in the Vuvulane area, and a small number of farmers associations from the KDDP area (Terry & Ogg 2017). The farmers in the Vuvulane area are marred in their farming efforts by huge production inefficiencies, which stem largely from unresolved land settlement issues (Dlamini et al. 2010; Tuckett 1977; Terry & Ogg 2017). The farmers in the Simunye group were fewer in number (less than 30) than the other mill groups, and located both in the Lowveld and the Middleveld of Swaziland. It is possible that geographic location played a role in the definitions of contextual issues as outlined in the questionnaire. The findings emphasise the need

to consider the geographic locations when planning information services programmes for these groups. For instance, most of the service providers are based in the major cities Mbabane and Manzini, which provide advantage to some farmers under the Simunye Mill group in terms of access to a variety of information resources.

6.4.6 Explanatory and predictor variables for access to agricultural information services

This segment tackled the research question: What are *the explanatory and predictor variables for access to agricultural information services by smallholder sugarcane farmers?*

By means of multiple regression analysis, the explanatory and predictor variables for access to agricultural information services by smallholder sugarcane farmers were determined (section 5.5.7, Table 5.25). The constructs that were considered to be direct determinants of information access were demographics (personal), environmental (external) and role-related (position) as outlined in the Wilson's model of information behaviour. The finding showed that the most important determinants for access to information services were education (personal) and the mill group (environmental), where the farmer belongs. This implies that better education level and belonging to a mill group increased the likelihood of smallholder farmers' access to agricultural information services through modern information sources.

Education: As expected, better-educated individuals would have a greater edge and need to take advantage of available information services products. In a study by Dhraief et al. (2018), applying regression analysis in Tunisia, it was found that education was statistically significant and positively influenced information technology adoption. This emphasises the need to empower farmers through education in order to enhance information use. It has been reported that education is a determinant of access and farmers' use of ICT-based information services. In his study, Okoedo-Okojie & Omoregbee (2012) found that education was one of the important factors that determined farmers' likelihood of high access to ICT related information services. Chalukya (2015) reported that user education and development in information technology have facilitated a paradigm shift from manual access mechanism to information resources to direct access to networked information services. These findings are in line with other previous related studies that highlight the importance of education in the ability of farmers to access agricultural information services (Anunobi & Anunobi 2018; Ogungbeni, Ogungbo & Adeleke 2013). The study established that smallholder sugarcane farmers had different educational backgrounds (section 5.3)

and that as such, education can represent success or failure in meeting the information needs (intervening variable). In this context, educational backgrounds can also be perceived as a barrier (Wilson 1981). For this reason, the involvement of educated farmers in the sugar industry would ensure that information flow from service providers is not hindered, because educated farmers would independently make more efficient and effective use of modern information services. This is because education enhances the ability of individuals to understand and explore ICT related services.

Mill group: Apart from education, the mill group matters as revealed in the study. The mill group represents the "environmental context" as outlined in the conceptual framework of the study. According to Taylor (1991), as quoted by Sonnenwald (1999), a context can be described as a place. It is obvious that a place has boundaries, and hence the smallholder sugarcane farmers in Swaziland were categorised based on the respective mill groups to which they belong. The study further revealed that there was a disparity in the constitution of the groups, with some mill groups having more members than others (section 5.3). The empirical findings imply that information providers need to consider education and context of the farmer when planning information services programmes to enhance information flow.

6.4.7 State of e-readiness by smallholder sugarcane farmers

Smallholder sugarcane farmers were further asked to assess their level of technology readiness towards use of ICT communication tools. This was in order to resolve the research question: *What is the state of e-readiness by smallholder sugarcane farmers?*

With the rapid penetration of the internet across the agriculture sector worldwide, there is a need to assess the technological readiness (e-readiness) of farmers within their context. Given that e-readiness may have various meanings to individuals, this study operationalised e-readiness to denote awareness, availability, accessibility, competencies and the importance of ICT tools (Mabe & Oladele 2015:315). The data was analysed using factor analysis, means and standard deviation.

The study examined the e-readiness of smallholder farmers on the use of ICTs to access agricultural information in the sugar industry. To assess the e-readiness of the farmers, the study looked at the awareness of information sources (Psychological variable: Wilson (1999), ownership (Source characteristics: Wilson (1999) and utilisation of ICTs by farmers in their agribusiness

(TPB constructs: Azjen 1991). Furthermore, factors that determine e-readiness were examined and isolated.

The finding reveal that farmers (142, 84.5%) were aware of information sources (Table 5.10). Similar findings were obtained by Phiri, Chipeta and Chawinga (2018), who reported that 94.8% of smallholder farmers were aware of information sources. The study also found that farmers own at least between one and five smartphones, desktop computers, laptop computers, tablet computers, networked offices, Wi-Fi, telephones, post office boxes and fax machines (Table 5.15). Most of the farmers (139, 83%) indicated that they owned smartphones, viz. a cellular phone with integrated computer functions, which enables internet and application usage that extends beyond phone calls and text messages. The finding supports the declaration by the GOS that mobile penetration in Swaziland had reached 95% (GOS 2012). The finding further corroborates Dlamini and Worth (2018) who, regarding information management by farmers and extension officers, found that more than 60% of smallholder farmers in the sugar industry had cell phones. In rural Mali and Burkina Faso, mobile phone use is widespread to such an extent that farmers use video-based information due to their access to third generation (3G) network (Sousa, Nicolay & Home 2016). The availability of the fourth generation (4G) mobile network in Swaziland puts the farmer in a more advantageous position in this regard (GOS 2012). The findings moreover show that 46% (77) and 42% (71) of the farmers respectively, have computer gadgets such as desktop computers and tablet computers. The determination of the available ICT communication tools is supported by the Azjen (1991) TPB and Wilson's 1996 model of information behaviour as motivators and barriers to performing certain behaviour. According to Azjen (1991), the availability of resources is linked to an individual's motivation to perform a certain behaviour. Wilson (1999) adds that the availability and accessibility of the resource (source characteristics) are intervening attributes that influence the information behaviour of individuals. Only after smallholder farmers have access to or own computer gadgets will they be able to use computer-based information services.

The most widely used means of communication with services providers by farmers were mobile phones (102, 60.7%). The findings show that the use of mobile phones has surpassed other means of communication like telephone and fax. An indication that farmers are taking advantage of mobile technologies enables easier communication, as long as there is a network signal. This finding is in line with Aker and Mbiti (2010), who found that in Niger, farmers in the rural areas

mostly relied on mobile phones to obtain agricultural price information, with search costs reduced by 50 percent. Furthermore, the findings show that computer-based communication platforms were the least used, despite that internet coverage and access infrastructure through mobile service providers is improving in rural areas of Swaziland (GOS 2012). The non-use of computer-based communication services by farmers in rural areas has been reported by other researchers (Briggeman & Whitacre 2010). This is the case notwithstanding reports that with the application and use of ICTs in agriculture, an increase in agricultural production has been realised (Das, Munshi & Kabir 2016).

Despite the potential that new ICTs have in disseminating agriculture related information, service providers hugely depend on workshops, field days and newsletters as information delivery means (Table 5.13). It is necessary, therefore, that service providers and other stakeholders encourage farmers to adopt modern ICT tools to enhance the delivery of critical agricultural information to farmers. Once farmers have developed a positive attitude towards the importance of being "connected", perhaps they will realise how much they need to use new technology to improve farm operations. According to the TPB model (Ajzen 1991), an individual can adopt a new technology if they possess a favourable or positive attitude toward that technology. This suggest farmers need to be technological conscious and realise that that they can use the internet for timely information like weather forecasts, market updates, and purchasing inputs online.

Factor analysis was used to investigate the e-readiness of farmers, as the predisposition to benefit from the implementation of ICT-based information services. The factor analysis extracted three factors described as management, personal and infrastructure readiness (Table 5.26). The three factors contributed a total of 72.6% to the overall level of ICT readiness. The findings revealed that management readiness is most important factor for determining the e-readiness of farmers and accounts for 47.5% to the total variance in farmers' perceived ICT readiness. This implies that subjective norms or social influences are the most important determinant of SSFs' e-readiness. According to Azjen (1991), social pressure influences the ability of individuals to perform or not to perform a behaviour. Thus, the success of adoption and use of ICT-based information services hinges on the support from senior management. If senior management knows and understands the value of using ICT in their businesses, then they are most likely to include a budget for ICT equipment and further encourage staff to seek ICT-based information services. These findings are

supported by the TPB, which states that intentions and resultant behaviours are influenced by subjective norms, namely the perceived expectations from valued others on how to behave when faced with uncertainty (Azjen 1991).

While the overall mean score [M=2.855 (SD=1.278)] indicates that the determinants of readiness towards ICT were perceived positively by farmers, based on the assessment model for e-learning Readiness Survey (e-LRS) (Aydin & Tasci 2005), the farmers' level of electronic readiness was low; that is, they were not ready yet, but needed some work on the management, both in personal and infrastructural aspects. The finding suggest that farmers are not technologically ready for the implementation of ICT-based information services, and additional work needs to be done on several factors prior to their deployment. The results confirm the findings of the technology readiness assessment by the World Economic Forum that the state of technological readiness of Swaziland was low (Baller, Dutta & Lanvin 2016). The World Economic Forum report stated that countries like Swaziland, with a low Networked Readiness Index score (2.9 out of 7), needed to identify the areas of priority in order to fully exploit the benefit associated with ICTs for socio-economic development (ibid.). Similarly, a study conducted by Purnomo and Lee (2010) on the assessment of readiness Indonesian farmers toward ICT programme implementation revealed that farmers' perceived readiness was low, considering this a barrier to ICT programmes implementations. Another study conducted by Koyu, Singh, Kalai, Laitonjam and Meena (2018) on the e-readiness of farmers in India and found that the level of e-readiness among farmers was poor. Yet, another similar study by Lwesya and Kibambila (2018) on maize farmers in rural Tanzania revealed that the level of ICT readiness among farmers was low due to lack of technical know-how, basic ICT skills, and ICT infrastructure in the rural areas. These findings are perhaps similar because typically, rural areas are faced with poor infrastructure development that could facilitate adoption of technology.

The findings reveal that smallholder sugarcane farmers in the rural areas are unprepared to receive information services using ICT, despite the widespread use of mobile phones and the internet in Swaziland. This might be blamed on the huge digital divide and information gap between urban and the rural areas (Dlamini & Worth 2018; Phiri 2008). Therefore, meaningful intervention from stakeholders is necessary at this point to ensure the adoption and use of ICT-based information

services. This implies that the government and the SSA need to consolidate their efforts to improve the availability of information resources to smallholder farmers and further impact ICT literacy skills on a continuous basis to encourage ICT integration in their farming business.

6.5 Challenges and barriers in accessing agricultural information

This section covers challenges faced by SSFs in accessing information as well as barriers encountered in using ICT communication channels in accessing information.

6.5.1 Challenges in accessing agricultural information from support organisations

Moreover, farmers were asked to indicate the difficulties they perceived to hinder access to information from stakeholders. This was to address the research question: *What challenges are encountered by smallholder sugarcane farmers in accessing agricultural information from support organizations?*

The study examined the challenges faced by smallholder sugarcane farmers in accessing agricultural information. Section 5.6.1 (Table 5.27, Table 5.28 and Table 5.29) provides the basis for this part. The study identified one major challenge in accessing information, namely poor access to information. The individual components that made up the major challenge are that: farmers do not know where to get information; procedures for acquiring information are complicated; they do not know whether the information exists; and the information quality is poor. One key informant mentioned that some farmers do not know where they can get information, especially information that relates to government policies. The key informant mention that farmers would only rely on information from coordinated efforts of the SSA, SCGA and millers, owing to the vested interest of these organisations in the success of smallholder farmers. The complication in the procedures for getting information might be explained by the fact that government, for instance, have minimised publishing of policy information in print, where it uses its own website. This has been necessitated by the fiscal challenges the government faces and perhaps by the potential to reach a larger audience. Those farmers who do not have computers or the know-how to navigate the websites are inclined to view access as a constraint. This crop of individuals would not even know whether or not the information exists and they are most likely to get scanty information from alternative sources which may not be genuine. Ifeanyi-Obi et al. (2017) noted in his study of challenges faced by cocoyam farmers in Nigeria in the face of climate change adaptation that poor access to information was proved a major challenge.

6.5.2 Barriers encountered by smallholder sugarcane farmers while using information and communication technology (ICT) channels

Furthermore, farmers were asked to indicate the problems they perceived to be bottlenecks in using ICT-based communication tools. The aim was to address the study's research question: *What barriers are encountered by smallholder sugarcane farmers while using information and communication technology (ICT) channels?*

Numerous researchers perceive ICT to be a platform where farmers can be informed at a faster rate than before (Csótó 2010; FAO 2017; Mase & Prokopy 2014; Fawole & Olajide 2012; Babu et al. 2012; Mugwisi, Mostert & Ocholla 2015). However, to realise this, barriers to ICT integration, which are a major problem, must be addressed. This study identified four barriers (section 5.6.2, Table 5.30) encountered by smallholder sugarcane farmers in using ICT communication channels to access agricultural information, namely technological, organisational, policy, and individual-related barriers. These barriers pose a problem in ICT implementation and use among farmers. Among the four barriers, technological-related barriers were the most important problems responsible for non-access to agricultural information by smallholder farmers. Similarly, in a study by Siyao (2012) on barriers in accessing agricultural information by small-scale sugar growers in Tanzania, the barriers were associated with a lack of means and facilities by which information can easily be accessed. The technological barriers that were considered important include issues like low computer literacy, restricted ICT use, and perceived lack of ICTs in the sugar industry. The issue of low levels of ICT literacy in the smallholder farming sector hinder the successful implementation of internet-based agricultural information services, where the results appear to indicate that farmers have minimal ICT equipment, such as computers (section 5.5.3.2). While most of the farmers indicated that they have access to smartphones, the frequency of use of internet and email was low, indicating that very few farmers have internet access. The low ICT literacy levels could also be explained by the fact that most of the farms tend to be located in rural communities with inadequate ICT infrastructure and under-resourced local libraries. The finding suggests that though farmers are open to new ICT, they still have challenges to fully exploit the inherent benefits. This finding underscores the need for the capacity building of farmers, who lack formal education on the use of computers, and other ICT-based information services. The sugar industry can also encourage farmer companies to consider hiring farm managers or

supervisors with advanced degrees because such individuals are predisposed to effectively use ICTs, thus reducing information deficit in the industry.

Secondly, farmers encounter problems that are organisational in nature when it comes to implementing ICT in their farming enterprise. The finding reveals that farmer companies have inadequate ICT technical support, lack of ICT awareness, lack of access to company's computerised information, and ICT-related training, which hampers the successful integration of ICTs. This suggests that farmers do not have the requisite knowledge, expertise or the organisational capacity required to implement ICTs in their companies. Once farmers are capacitated, one can expect a sustained use of computers for managing various farming activities.

Thirdly, policy-related barriers were drawn from the analysis of data. The findings revealed that there was lack of agricultural policies that supports the comprehensive integration of ICTs by smallholder sugarcane farmers. This finding corroborates Kalusopa (2005), who found that a lack of clear national information policy in Zambia stifled access to information by farmers. This is the case despite the fact that the FAO is encouraging governments across the world to formulate policies that promote the integration of ICT in agriculture to ensure food security for all. According to FAO (2017: iii) "policies and measures to promote ICTs are crucial for agriculture". The study reveals that farmers lack of comprehensive plans for ICT implementation, reduction of internet and telephone rates, and financial support from government to integrate ICTs in their operations. While farmers have reported a willingness to pay for information services (Babu et al. 2012), a lack of policies that subsidise the agriculture sector, especially smallholder farmers, contributes to the low levels of ICT uptake and use. In Zambia, Kalusopa (2005) reported that high prices of telecommunication negatively affected information access and utilisation among small-scale farmers. The results also revealed that there was lack of policy that mandates government to financially support the implementation of ICT. Government support has been reported as a motivational factor that influences the development of a behavioural intention (Öhlmér, Olson & Brehmer 1998).

The fourth barrier farmers encounter in integrating ICTs is individual-related. This problem stems from lack confidence in the ability to use ICT, and lack of motivation towards the use of ICT. This finding conforms to a study by Msoffe and Ngulube (2016), which notes that individual-related factors also prevent farmers from accessing information.

The findings from this study and other related studies suggest that barriers to the implementation or integration of ICT in agriculture in developing countries are, to a certain extent, similar. Notably, the lag in rural uptake of ICTs is linked to inadequate telecommunication infrastructure, weak public transport infrastructure, weak human capital, and lack of information policy (Kalusopa 2005; Msoffe & Ngulube 2016; World Bank 2008).

6.6 Strategies for improving agricultural information delivery services

Lastly, farmers were asked to comment on how they think access to information services might be increased. This was to address the last research question: *What are the strategies for enhancing access to information services by smallholder sugarcane farmers?*

The study found that access to agricultural information can be improved by use of ICT tools (52, 29.4%) and face-to-face interaction (52, 29.4%) (section 5.7, Table 5.31). Equally, all officials from support agricultural organisations (6, 100%) confirmed that the use of ICT can enhance the delivery of information services, followed by face-to-face interaction (4, 66.7%) which is presently popular with farmers (Table 5.32 and Table 5.33). The findings suggest that both farmers and agricultural support organisations view ICT as an enabler in the dissemination of information in the sugar industry. The results corroborated assertions by Dlamini & Worth (2016) that that in addition to face-to-face (extension work), ICT can play a huge role in enhancing the dissemination of information to rural smallholder farmers in Swaziland. The findings that ICT use can enhance access to information lends credence to the belief that the wide penetration of mobile technology to include rural areas can support access to agriculture-related information (World Bank 2008; Aker & Mbiti 2010). While there is widespread use of a face-to-face model in terms of dissemination of information, a model popularised by agricultural extension officers, scholars agree that ICT can be an effective means of disseminating information to farmers (Ajayi, Alabi & Okanlawon 2018; Lwoga et al. 2010; Dlamini & Worth 2016).

6.7 Summary

This chapter discussed and presented the interpretation of the research findings as presented in the previous chapter. The discussion and interpretations were based on the study's research objectives and corresponding research questions as presented in Chapter One (section 1.5), where related literature and theories constitute the conceptual framework of the study. The study sought to investigate the information need and information services of smallholder sugarcane farmers in

Swaziland. The findings revealed that SSFs have unmet information needs, primarily in crop husbandry, and farmer development information. It was further revealed that the information needs of the farmers were homogenous across the mill groups. The findings also indicated that labour and farm size were predictors of information needs for farmers. The findings likewise revealed that stakeholders from the sugar industry were the main agricultural support organisations that farmers use to access information. It was also revealed that farmers had preferences for face-to-face mode of communication, the extension officers being the most commonly used. The findings uncovered that there was a relationship between the use of ICT resources and farmers' demographic characteristics, such as education and age. It was further uncovered that there were differences in information services between the mill groups. The findings revealed that two demographic variables, education and mill group must be taken into consideration when implementing information services for SSFs. It was also revealed that there was poor access to information, and that the state of e-readiness of farmers was low, where several barriers to the use of information and communication technology (ICT) were uncovered including technological, organisational, policy and individual-related barriers. The results revealed that current information services to SSFs are not adequate. Respondents suggested information delivery strategies that include the use of ICT resources and face-to-face communication strategies.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

This section provides the overall summary, conclusions and recommendations based on the survey, interviews and analysis of data as part of the research study. It concisely highlights the main research findings of the study, and further proposes a strategy that could help address the research problem going forward. In this chapter, the main research findings and general conclusions are presented in the order of the research themes/questions of the study, under the following key headings that include: overall summary of research findings, conclusions, recommendations, significance and contribution of study, and limitations and suggestion for future research.

7.2 Overall summary of research findings

This section summarises the research findings based on the study objectives in the following order: agricultural information needs of smallholder sugarcane farmers, agricultural information services for smallholder farmers, challenges faced by farmers in accessing agricultural information, and strategies for improving agricultural information delivery to smallholder sugarcane farmers.

7.2.1 Agricultural information needs of smallholder sugarcane farmers

The study's first objective examined the information needs of smallholder sugarcane farmers in Swaziland. The findings revealed that the information needs of farmers were, by and large, to do with sugarcane husbandry and farmer development information. The results further revealed that there was no statistically significant difference between the information needs of farmers between the mill groups, indicating that that geographic context had no effect on the information needs of farmers. Moreover, the findings revealed that labour and farm size were the predictors of information needs of SSFs. The findings suggest that SSFs have unmet information needs, which are homogenous across the mill groups, and which are further influenced by labour and cultivated land holdings.

7.2.2 Agricultural information services for smallholder farmers

The second research objective assessed the current agricultural information services for smallholder sugarcane farmers. The findings revealed that farmers mostly utilise their respective mill groups to access agricultural information. The findings further revealed that the Agricultural

Extension Officer was the most preferred communication channel for agricultural information. To gain more clarity on individual farmers' use of information communication channels, farmers were asked to indicate the frequency with which information communication channels were utilised. The findings revealed that the Agricultural Extension Officer was the most frequently used source of agricultural information, suggesting that farmers were comfortable with information services that provided face-to-face platforms. By the same token, the findings revealed that there was a positive relationship between education, and the frequency of use of email and the internet. However, an inverse relationship was found between age and the frequency of use of social networks. These findings indicate that demographics have an influence in the use of ICT related information services and the influence could be either way as portray by Wilson's model of information behaviour (Wilson 1999). Wilson's model postulates that intervening variables, such as demographic characteristics of individuals, are significant determinants of information behaviour.

Furthermore, the results revealed that that were significant differences in the information services of farmers between mill groups and the differences existed between Mhlume and Simunye mill groups. These findings suggested that, while the information needs of farmers might be homogenous, their information services are heterogenous, and as such, ought to be considered in the planning of targeted information services.

To gain a deeper knowledge on the farmers' level of electronic readiness (e-readiness), farmers were asked to indicate their awareness of information sources; ownership of ICT communication tools, and management, personal, and infrastructure readiness. The findings revealed that a majority of the farmers were aware of information sources and more than 80% of respondents owned smartphones. Unfortunately, their level of e-readiness was found to be low when assessed on an e-LRS assessment scale (Aydin & Tasci 2005).

7.2.3 Challenges faced by farmers in accessing agricultural information

This section deals with the study's third objective, which examined the challenges faced by farmers in accessing agricultural information. The results revealed that poor access to information was the main difficulty encountered by farmers in accessing information. Moreover, farmers faced problems in the use of ICT to access information. The findings indicate that farmers face technological, organisational, policy and individual related barriers in the order it is presented.

Technological barriers were identified as the main barrier for farmers in accessing agricultural information using ICTs. These findings indicate that information providers need to minimise these challenges to ease access to information by smallholder farmers in the sugar industry.

7.2.4 Strategies for improving agricultural information delivery services

This section addresses the forth objective, which purported to develop strategies for enhancing access to agricultural information by smallholder sugarcane farmers. Farmers and representatives of agricultural support organisation were asked to suggest ways in which information delivery services might be improved. The results revealed that the use of ICT, in conjunction with extension work, can effectively improve the delivery of information to farmers. Other suggestions included mixed mode, ICT training, improved ICT infrastructure, centralised information hub, and the translation of concepts into local language. They also indicate that ICT integration into agriculture can play a vital role in enhancing delivery of information.

7.3 Conclusions

This section provides conclusions based on the study's main research findings and outlined based on the objectives/themes of the study: agricultural information needs of smallholder sugarcane farmers, agricultural information services for smallholder farmers, challenges faced by farmers in accessing agricultural information, and strategies for improving agricultural information delivery to smallholder sugarcane farmers.

7.3.1 Agricultural information needs of smallholder sugarcane farmers

From the overall findings, it can be concluded that SSFs have unmet information needs that revolve around sugarcane crop husbandry and farmer development information. This conclusion confirms findings by Elly and Silayo (2013), Mtega et al. (2016), and Phiri et al. (2018), who reported that farmers had an information gap regarding crop husbandry and other farmer development-related information such as training on new farming techniques. The results uncovered that the information needs of farmers were homogeneous among mill groups, implying that similar information needs of farmers were currently not met by existing agricultural information services. Further to this, the results revealed that labour and farm size were the two major demographic characteristics that influenced the information needs of smallholder sugarcane farmers. Based on these findings, one can conclude that demographic variables such as labour and farm size were predictors of the information needs of farmers.

7.3.2 Agricultural information services for smallholder farmers

The results also indicated that farmers utilised mostly mill group gatherings, and frequently relied on Agricultural Extension Officers for access to agricultural information. The findings further suggest that farmers tended to use face-to-face communication channels to access information, and that face-to-face communication remains a key communication tool for delivering information to smallholder farmers in the sugar industry in Swaziland.

The results further uncovered a positive relationship between education, and the frequency of use of email and the internet, whereas there was an inverse relationship between age and the frequency of use of social networks, suggesting that demographic variable have an influence on ICT tools use. Therefore, demographic variables including education and age are found to influence the use of ICTs among smallholder sugarcane farmers in Swaziland. Moreover, information providers should consider minimising dissemination of information on social networks to older farmers (above 60 years) and use other communication channels. The results also uncovered that there were statistically significant differences in the information services between two mill groups. It was concluded, therefore, that farmers have uneven access to information services among mill groups. The results also revealed that education and mill group were determinants of information access by farmers. This lead me to conclude that demographic variables, such as education and mill group, were predictors of information access among smallholder sugarcane farmers. The findings also indicated that the level of e-readiness of farmers was low, despite the high level of ownership of mobile phones, and increasing computing in the sugar industry. The findings suggest that farmers need to consolidate their efforts towards increase in several readiness factors such management, personal and infrastructure. Although this study measured the e-readiness of farmers based on the above three factors, the available literature (Hadining & Sukanta 2019) suggests that there are other electronic readiness factors that need to be considered.

7.3.3. Challenges faced by farmers in accessing agricultural information

The findings revealed that farmers faced several difficulties in accessing information emanating from poor access to information services. The results further indicated that the challenges to information access were exacerbated by barriers related to limited ICT use among farmers. Although the results revealed several barriers to use of ICTs to access agricultural information, technological-related barriers were identified as the most important to farmers. Based on these

findings, poor access to information can be taken as the major culprit that inhibit access to agricultural information, which invariably compromises the growth of the smallholder sugarcane farmer sector. It can also be concluded that the barriers to use of ICT to access agricultural information in the sugar industry are technological in nature.

7.3.4 Strategies for improving agricultural information delivery services

The findings revealed that many respondents suggested improving the delivery of information services using ICTs and face-to-face communication. To embolden ICT use, some respondents suggested improvement in the ICT infrastructure and training in ICTs. This implies that ICTs are perceived as tools that can effectively deliver agricultural information services to farmers quickly and easily. Based on these findings, one can conclude that there is need to integrate ICTs in the communication of agricultural information to farmers to complement the face-to-face mode of communication predominantly used in the sugar industry.

7.4 Recommendations and suggestions

Recommendation are given in response to the conclusions reached, which are based on the study findings. These recommendations are essential for government agencies, sugar industry, input suppliers and other private information providers directly involved with smallholder sugarcane farmers. This section is arranged according to the objectives/themes of the study.

7.4.1 Recommendation 1: Information needs of farmers

The findings of the study revealed that farmers had information needs related to sugarcane crop husbandry and farmer development information, and that their information needs were homogeneous across mill groups, suggesting that this was not location specific. The sheer homogeneity of the information needs of farmers suggest that information providers need to develop a single information package, which would invariably meet the needs of all farmers, a strategy that would ensure effective allocation of scarce resources. The findings also showed that labour and farm size were predictors of information needs. The study recommends the need for information providers to conduct periodic information needs assessment to assist in providing quality information services.

7.4.2 Recommendation: Information services

The findings revealed that smallholder sugarcane farmers tended to prefer face-to-face communication channel as means of accessing information; that education and age influenced the use of ICT by farmers; that there was uneven access to agricultural information among two mill groups; that education and mill group were determinants of information access; and that the level of e-readiness towards use of ICT for information access was low.

7.4.2.1 Recommendation 2: Preference of information sources

The findings revealed that farmers mostly used their respective mill groups to access agricultural information followed by the sugar industry focused information sources such as the SSA and the SCGA, suggesting that these sugar industry stakeholders were perceived as credible sources of agricultural information for smallholder sugarcane farmers. Based on these revelations, the study recommends that government need to strengthen engagement and collaboration between farmers and the sugar industry stakeholders. This could perhaps be achieved through provision of a set of innovative incentive schemes by the government directed towards motivating the sugar industry stakeholders to assist in the development of capacity building programmes required to make the smallholder farmer competitive in the industry. To a certain extent, the strengthening of these collaborations will facilitate the provision of quality and relevant information to the smallholder farmer.

7.4.2.2 Recommendation 3: Preference of communication channel

As expected, the findings revealed that farmers largely depend on face-to-face interaction for acquiring agricultural information. The study recommends the continued use of face-to-face method among other methods as means of communicating agricultural information to smallholder sugarcane farmers. Msoffe and Ngulube (2016) assert that face-to-face communication remains the most appropriate method for delivery of agricultural information to rural-based farmers in developing countries. The findings also revealed that mobile phones were the second most used method for accessing agricultural information. Based on these findings, it is recommended that information providers should use multiple modes of communication, especially face-to-face and mobile phones to disseminate information to farmers. The use of multiple modes of communication ensures that information filters down to as many people as possible by eliminating the risk of investing in one method that may not be wholly inclusive.

7.4.2.3 Recommendation 4: Demographic factors and ICT use in accessing information

The results uncovered that factors affecting use of ICTs in accessing agricultural information include education and age. The study recommends the need for training of farmers on the use of ICTs. The training/capacity building of farmers is necessary, especially the upskilling of farm supervisors/managers on how they can integrate ICTs in their enterprises. This could be achieved through training of the Supervisors/Managers on ICT use by government and the sugar industry, especially those that have gone through high school. Placing education restrictions on ICT training will not only ensure that programme content is mastered, but may motivate farm owners to hire well educated supervisors/managers for their enterprises, so that they do not risk missing out on such empowerments. The findings showed an inverse relationship between age, and use of social networks. Hence, it is further recommended that service providers refrain from using social networks to disseminate information to older farmers, especially those above 60 years old.

7.4.2.4 Recommendation 5: Information services between mill groups

The findings revealed that there were differences in information services between two mill groups. Therefore, it is recommended that there is need to raise awareness about existing sugarcane-based information services through advocacy campaigns during periodic mill group meetings, and other communication platforms. Such public advocacy campaigns would help ensure that there is equitable access to information across all mill groups. Equally as important, it is necessary for awareness raising and advocacy campaigns initiatives to take into consideration information behaviour models, such as Wilson's model of information behaviour (Wilson 1999) and the Theory of Planned Behaviour (Ajzen 1991), so as to determine where interventions can be concentrated in order to augment the farmers' information behaviour.

7.4.2.5 Recommendation 6: Factors explaining and predicting access to information

The findings revealed that personal factors such as education and mill group predicted access to agricultural information by farmers, suggesting that farmers' use of information services is dependent on the level of education attained and the co-geographic location of the farmer to the milling company. The study recommends that farmer companies put in place staff development policy to help improve and update skills of their workers across the mill groups. In other words, farmers need to be well-rounded in terms of their education so as to facilitate access to agricultural information within their respective mill groups. Moreover, information providers should always

strive to bring information closer to each mill group formation and strengthen their information resources awareness efforts. This is necessary because without the availability information resources at mill groups, even an educated farmer may suffer from information deficiency, as for others who are limited by a lack of education.

7.4.2.6 Recommendation 7: State of e-readiness by smallholder sugarcane farmers

The findings revealed that farmers were aware of information source, and that there was widespread ownership of smartphones. However, their level of e-readiness was found to be low, requiring more work to be done. The study recommends the need for government and the sugar industry to assist farmers with the acquisition of ICT tools (such as computers), internet connectivity, and training on basic ICT application software. Farmer companies can also consider hiring qualified information technology (IT) expert per mill group, so as to assist in the set up and troubleshooting of computer/network problems as the need arise. The presence of mill group dedicated IT personnel would ensure sustainability and effective use of ICTs within each mill group.

7.4.3 Recommendation 8: Challenges face by farmers in accessing information

As a way out of the challenges face by farmers in accessing agricultural information, it is recommended that government and key sugar industry stakeholders ought to promote the ownership and use of ICT as an enabler to information access. This could be achieved by putting in place policies that address issues of cost of ICT, harnessing of ICT for agriculture, the empowerment of smallholder sugarcane farmers, and the development of comprehensive ICT infrastructure in the rural areas. A great deal of emphasis had been put on agricultural extension services that by and large depended only on face-to-face interaction with farmers, however the model has failed to cover much needed ground in the sugar-belt, mainly because it is costly. As a result, farmers are unable to access vital agricultural information. Findings from the study reveal that ICT has the potential to address a number of challenges faced by farmers, hence ICT channels such as mobile phones can be integrated with face-to-face methods as a vehicle for dissemination of sugarcane husbandry information.

7.5 Proposed strategy for dissemination of agricultural information to smallholder sugarcane farmers

As part of developing a comprehensive strategic framework for dissemination of agricultural information to SSFs, a SWOT analysis was conducted, using the findings of the study as building blocks.

7.5.1 SWOT analysis of the smallholder sugarcane farmers

The study also examined the SWOT of the implementation sector, that is, the smallholder sugarcane farmers (SSFs) sector, based on the findings of the study and literature. A SWOT analysis was used as tool to evaluate the strength, weaknesses, opportunities and threats in the SSFs sector for the purposes of developing an implementation framework integrating ICT and face-to-face information delivery strategy that matches the farmer's resources and capabilities (Dergisi 2017; Bohara & Tiwari 2014). Most of the internal factors (strengths and weaknesses) were obtained from the findings of the study, while external factors (opportunities and threats) were obtained mostly from the literature.

Strengths

The strengths of the farmers regarding the implementation of the ICT-Face-to-face strategy were identified as follows:

- A large proportion of farmers (164, 97.6%) have some form of formal education (section 5.3) that indicates their ability to grasp agricultural information.
- There is growing awareness of information sources by farmers (142, 84.5%) (section 5.5.1)
- Statistical findings indicate that more than 70 percent of the farmers frequently use mobile phones to access agricultural information (section 5.5.3) which demonstrate their ability to quickly adapt to mobile-based information services.
- More than 80 percent of the farmers have smartphones (section 5.5.3.2), which predisposes them to use the internet, audio, video and other agriculture related applications.
- More than 70 percent of the farmers belong to the age group (20-50) years old (section 5.3), characterised by energetic and innovative individuals mostly likely to utilise new ICT platforms (Ndlovu et al. 2014). There is a strong relationship between age and use of ICTs (Aldosari, Shunaifi, Ullah, Muddassir & Noor 2017)

- That more than 90 percent of the farmers have farming experience of more than five years, which indicates the potential of farmers to explore and disseminate information.
- The findings reveal that close to 40 percent of farmers have annual income above E1 million (section 5.3). The results of previous research indicate that income levels are determinants of affordability and ICT adoption (Nzonzo & Mogambi 2016).
- Experienced agricultural extension officers from the sugar industry (Dlamini & Worth 2016).
- Around 95 percent of the population is covered by mobile telephone in Swaziland (GOS 2012).
- The long-term (from 1957) existence of the sugar industry in Swaziland (Sifundza & Ntuli 2001; Terry 1997).

Weaknesses

- Land holdings in the rural areas are small, despite the pooling of land resources by shareholders of farmer companies/associations. A larger proportion of farmers (109, 65%) have farm sizes below or equal to 50 hectares, with little hope for expansion because of the restrictive land tenure system on SNL. Yet, the size of the farm plays a key role is the adoption and use of ICT for dissemination of information (Aldosari et al. 2017).
- Inadequate agricultural extension officers to cover all farmers (Dlamini &Worth 2016). Obviously, inadequate skilled extension officers would impact negatively on the dissemination of agricultural information.
- Imbalance in gender distribution in the sugar industry. The study found that around 37 percent of the respondents were women, which compromises the propagation and dissemination of knowledge in the smallholder farmer sector (section 5.3).
- About 50% of the farmers do not have computer equipment, which demonstrates their limitations in terms of their capacity to utilize ICT-based information services (section 5.5.3.2).
- There is a low level of e-readiness amongst farmers (section 5.5.8).

Opportunities

- Access to duty free sugar markets assured for Swaziland (Dhladhla 2018).

- Capacity building and empowerment from agricultural input suppliers, SSA and SASRI (SSA 2019).
- Political support from the Swazi state (Terry & Ogg 2017).
- Strong linkage between farmers and key stakeholders (SSA, financial institutions, millers, government) (Samuel 2008; Masuku 2003).
- Improving food security and socio-economic status of farmers (Terry & Ryder 2007).
- Growth in telecommunication and power infrastructure (GOS 2012).

Threats

- Unstable information needs (Bothma 2013).
- Attitude of farmers towards dissemination of information using ICT.
- Extreme variable weather conditions and drought exist due to climate change (Mhlanga-Ndlovu & Nhamo 2017; Anderson 2018).
- There are internal disputes among farmers especially where geographic boundaries of chiefdoms overlaps due to improper demarcation (Dlamini & Worth 2016; Terry & Ogg 2017). This could delay strategic implementation of information services.
- There is improper corporatisation of farmer companies/associations (Ndlovu et al. 2014). Proper consolidation of resources and human resource capital could ensure long term sustainability of the sector.
- There is a lack of sustainable land administration and management (land tenure) policies in rural areas (Mabuza et al. 2013). Uncertainty of the most important factor, that is, land thwarts long term future developments in alternative channels of information dissemination such as ICT use.
- The impact of HIV/AIDS epidemic on the labour force (Mabuza et al. 2013). High staff turnover of skilled labour could destabilise proper running of information centre.

Figure 7.1 below shows a graphical synopsis of the SWOT analysis used to design the framework for information delivery services for smallholder farmers in Swaziland.

Figure 7.3: SWOT analysis for smallholder sugarcane farmers

7.5.2 Strategic implementation framework for agricultural information dissemination for smallholder sugarcane farmers in Swaziland

Several authors have agreed that the design of an information delivery service should be human-centred and further reflect the context of those targeted individuals (Wilson 1994; De Rouw & Johnson 2017; Schumann & Stock 2014). Hence, the successful implementation of agricultural information services largely depends on the determination of information needs and the availability of ICTs at farm level. The design of the proposed framework for the delivery of information services to farmers was based on the information needs assessment (survey) as

outlined in the methodological section of the study in Chapter Three. Figure 7.2 below depicts the recommended framework, being an integrated approach for the implementation of an effective information delivery services to meet the agricultural information needs of smallholder sugarcane farmers in Swaziland. The proposed framework integrates the use of ICT and face-to-face communication resources, services, tools and facilities as per the findings of the current study. The framework proposes a centrally coordinated sugarcane information and communication centre (SICC) that utilises a combination of a digital information repositories, call centres, and a learning/ICT centre.

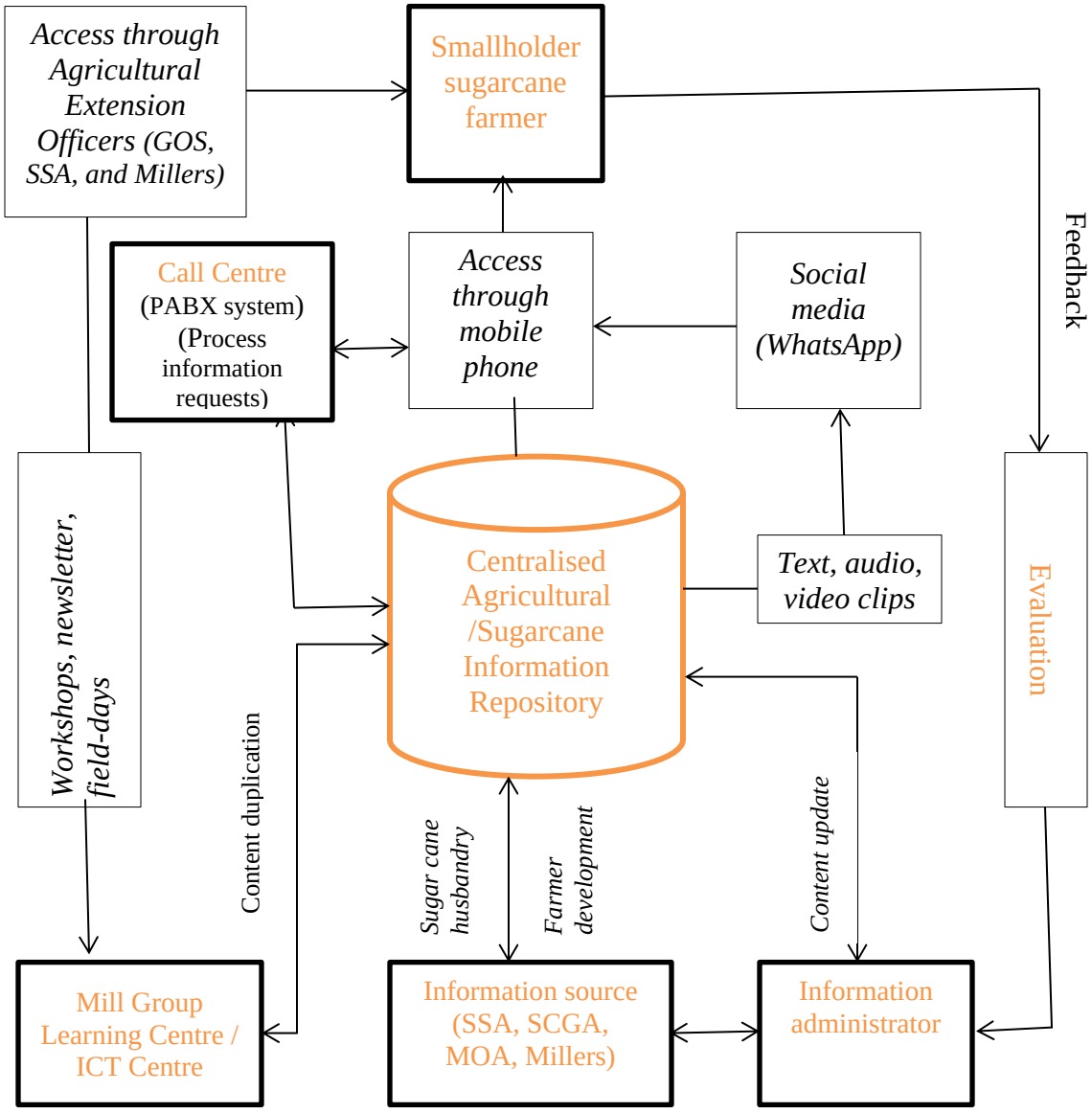

Figure 7.4: Proposed Sugarcane Information and Communication Centre (SICC) strategy framework for agricultural information access by smallholder sugarcane farmers in Swaziland

Central agricultural/sugarcane repository

The findings of the study revealed that farmers required information on sugar husbandry and farmer development which are challenges that require consolidated information from various stakeholders. Moreover, the study revealed that ICTs have the potential for processing and exchanging information at a faster rate, especially using mobile phones which are widely used by

farmers. Keeping in mind the findings of the study and the SWOT analysis, the proposed strategic framework will be composed of a centralised digital agricultural/sugarcane repository that will be used to hoard information on sugarcane production and farmer development. The central repository organizational model enables information providers to deposit information in a single silo where the target group would always go to for information.

Information source

The current study revealed the main credible source of sugarcane husbandry information are SSA, SCGA and Millers. Therefore, the study envisaged that while information may come from private organisations, the key content providers to the repository would be industry-based stakeholders. Other stakeholders may include the MOA, SWADE, University of Swaziland, Swaziland National Library Services and other stakeholders. Content may include sugarcane production manuals, government policies that impact the work of farmers, and other industry-related information.

Information administrator

The role of the information administrator would include collection development and metadata curation of the e-content. This incumbent needs to possess cross-functional and highly specialised competencies, which include skills pertaining to repository management, knowledge of software, and administrative skills such as the ability to add records, check metadata and copyright (Cassella 2012). The study found that one of the challenges farmers encounter in implementing ICTs in their organisations is related to lack technical expertise. The sugar industry stakeholders and government can play a major role in assisting farmers in recruiting qualified individuals.

Call centre

Once the technical implementation of the repository has been completed, the framework proposes the creation of value-added services that includes the creation of a call centre that utilises a private automatic branch exchange (PABX) system for better call management. The role of the call centre unit would be to process information enquiries from farmers, perform database searches, and dispatch the information through their mobile phones. The study found that more than 70 percent of farmers frequently use mobile phones to access agricultural information. Moreover, more than 80 percent of the farmers own smartphones, which could enable them to access social media applications like WhatsApp. Hence, the repository staff can also send text, audio and video clips through social media. The call centre would be responsible for formal and informal

communications with farmers and repository managers, as well as performing advocacy activities on its behalf.

Learning centre/ICT centre

The survey findings show that, while farmers are increasingly embracing ICTs, however, face-to-face communication channels are still considered important in meeting their information needs of smallholder sugarcane farmers in Swaziland. This finding has been corroborated by a majority of the key informants, who have indicated that they occasionally pay visits farmers to promote their services through a word of mouth. Hence, the framework includes a modern learning centre that incorporates an ICT learning centre to empower farmers on the use of ICT. The deployment of the learning centre would be facilitated by Agricultural Extension Officers from the sugar industry (SSA and Milling companies) and government, using information sourced from the repository. Farmers can conduct workshops, field days (demonstrations) and distribute print or electronic agricultural newsletters within this unit. Blending of the traditional learning centre with the ICT centre model would enable farmers to upskill themselves on computer use, such as searching the internet and using email for communication under a familiar environment. The formulation of the blended learning centre was motivated by the finding in section 5.8, which shows that more than half of the respondents suggested the deployment of an ICT-based information delivery service strategy.

Content format and Language

The findings indicate that 69% (116) of the farmers are comfortable with the use of both print and digital formats in accessing information (section 5.5.4.3). Digital formats include text, audio and video. Moreover, the findings indicate that farmers preferred the local language, Siswati over English, irrespective of gender.

Evaluation

After several months of operation, implementation of the SICC the framework includes evaluation aspect of the information service strategy to determine its quality and effectiveness. Feedback would be elicited from the farmers by the Information Administrator/Repository Manager in collaboration with the key stakeholders, who are generators and providers of information. Data would be collected on the usage of the service through daily call logs and periodic surveys, with the aim to improve, showcase best practices and determine the way the service is perceived by the

farmers (Schumman & Stock 2014). The evaluation would investigate the quality of the content and auxiliary services within SICC. The SICC strategy framework could be implemented and maintained by the Swaziland Sugar Association, Swaziland Cane Growers Association, SWADE, and the Ministry of Agriculture or by the University of Swaziland, which are sources of reliable information currently available to farmers to access agricultural information.

7.6 Significance and contribution of the study

The study has contributed to the field of information science, by providing new perspective about the information needs information services of smallholder sugarcane farmers in the context of a developing country. This is the first study to cover the information behaviour of SSF in the sugar industry in Swaziland, an area that has not received much attention in the literature. Many studies conducted in the sugar industry looked at the economic viability of SSFs (Terry & Ogg 2017; Ndlovu et al. 2014; Samuel 2008; Masuku 2003; Dlamini et al. 2010), and extension services (Dlamini & Worth 2016; Dlamini & Dlamini 2012). Although there are other studies in developing countries that have been conducted on information needs (Msoffe & Ngulube 2016; Mtega et al. 2016; Kalusopa 2005), and information services (Chiware & Dick 2008; Raman 2006; Zhang et al. 2016), none have specifically examined smallholder sugarcane farmers in the context of the Swaziland sugar industry.

The study has implications for practice, policy and theory. From the practical perspective, the study enhances awareness about the importance of conducting information needs assessments prior to providing information services products to consumers. Moreover, it provides empirical evidence upon which relevant information delivery strategies can be based to enhance access and use of information. From a policy perspective, the study provides a framework for the formulation of relevant information delivery policies to guide the provision of agricultural information to SSFs in the sugar industry. Theoretically, the study validates the compatibility of Wilson's 1996 model of information behaviour and the TPB model to formulate a conceptual framework applicable in an agricultural setting. This demonstrates the adaptability of information behaviour models in providing frameworks for studying farmers' information behaviour from a developing country context. Again, this study proposed a strategic framework (SICC) for dissemination of information services to smallholder farmers in the rural areas setting, providing an enhanced approach to traditional or conventional means of disseminating to farmers. The framework is envisaged to

assist bring new insight to information providers and policymakers on how existing information services programmes can be improved, based on empirical foundations.

Evaluation of the conceptual framework of the study

The findings of the study were in line with its conceptual framework of the study as adapted from Wilson's Model of information behaviour and the TPB (Azjen 1991). In the conceptual framework, the person in context and the information need context were the SSFs, which represented an agricultural context. A survey of 168 SSFs was successfully done in the sugar industry of Swaziland. The findings indicated that the needs of the farmers were centred around their agricultural enterprises. This was expected because farmers are mainly concerned about the productivity of their farming businesses. While Wilson's model used stress/coping theory to explain information needs decisions, the conceptual framework of the study used the TPB (Azjen 1991). In general, the TPB model postulates that decision-making by individuals is based on their assessment of the available information against the obtaining situation. E-readiness is another important concept that was employed in the study in line with Meyer (2016) and Du Preez (2015), who asserted that the personal dimension and technology were the building blocks of information needs. In this study, the tenets of the TPB were used to evaluate the e-readiness of SSFs against the criteria of personal (Attitude), infrastructure (Perceived behavioural control) and management readiness (Subjective norm). Regarding subjective norm (management readiness) the results revealed that the "significant others" were significant determinant of their intention to utilise ICT. The findings of this study revealed that SSFs have a positive attitude towards the use ICT, which demonstrates a favourable attitude towards technology adoption in agriculture. Moreover, with regard to perceived behavioural control (infrastructure readiness), SSFs felt they have significant infrastructural support in the form of expertise, budget, and physical space. The findings of the study relating to the TPB tenets were all significant in the model, suggesting that the theory may help in explaining the psychological factors that influence their intention to use ICT. While Wilson's model included "psychological factors" as building block of information behaviour, in this study, this factor was eliminated in favour of the TPB tenets, where the literature revealed that the psychological factor fabric is made from attitudes, beliefs, and behaviours (Azjen 1971; Öhlmér et al. 1998). By the same token, Niedzwiedzka (2003) questioned the placement of psychological factors under intervening variables category in the Wilson's model, arguing that

psychological factors cannot be separated from the person-in-context. Therefore, the TPB model came in handy in explaining the psychological nuances with regard to the assessment of technological readiness of farmers.

The findings were also in line with Wilson's model regarding intervening variables. Wilson's model presents five types of intervening variables, which may influence the farmer at the time of making decisions. However, the adapted conceptual framework of this study adopted three types of intervening variables from Wilson's model, which include: demographic, environmental, and personal/role-related. The results of this study revealed that demographic and environmental factors were the only two categories of intervening variables that influenced information needs and information services of farmers. Overall, the conceptual framework of the study, being a derivative of Wilson's information behaviour model and TPB model, was successful for assessing the information needs and information services of farmers. The adapted conceptual framework assisted in the understanding of demographic characteristics, information needs, sources, communication channels used, and factors related to the agricultural context of SSFs. One can conclude that the Wilson's 1996 model of information behaviour can be adapted and customised for the study information behaviour of various groups and only serve to provide theoretical insights. This conclusion supports Niedzwiedzka (2003), and Mahindarathne and Min (2018:797), who asserted that the Wilson's 1996 model of information behaviour was not designed to be used as is to explore information behavior of individuals, but rather to serve as a theoretical base. Moreover, in adjunct and important disciplines like the agriculture sector, there is wide recognition of the need to understand the information needs and information services of farmers to enable information providers to generate and disseminate information packages that are relevant and timely.

7.7 Limitations and suggestion for further research

One limitation of the study is related to quantitative data analysis, namely the coefficient of determination, R-squared (percent of variance explained by model) values obtained when performing a regression analysis to determine the explanatory and predictor variables (independent variables) for information needs and information services of farmers. The analysis produced R-squared values ranging from 8.2% to 24%, which was rather low, indicating that the explanatory power of the factors was weak, thus making the findings not generalisable beyond the population.

The examination of agricultural information needs and review of information services for smallholder sugarcane farmers is the first such study in Swaziland. Further studies on smallholder sugarcane farmers' information behaviour might focus specifically on each of the categories of information needs such as market, weather information among others to determine how they are accessed and used. This would provide a more profound understanding of the farmers' information needs regarding that specific kind of information. The study revealed that there was a low level of ICT readiness among farmers. However, the present study focused on three factors of e-readiness, but it would be interesting to explore other factors in order to enlarge the level of understanding in this regard of the agriculture sector.

7.8 Overall conclusion

The study achieved its purpose of investigating the information needs and information services of smallholder sugarcane farmers in Swaziland using a conceptual framework derived from tenets of Wilson's model of information behaviour and the TPB. The success of the study lends credence to the notion that general models like Wilson's model can be integrated with other existing models to comprehensively study a phenomenon. The study revealed that there we information gaps regarding the information needs of SSFs in the sugar industry. The study uncovered that the information needs of farmers were crop (sugarcane) husbandry and farmer development information. Farmers received most of their information through word-of-mouth, and their level of technology readiness was very low, suggesting that there was low usage of ICT to access information, which translates to low usage of information. This implies that the existing information service environment was inadequate to meet the information needs of farmers. Moreover, farmers encountered several challenges in accessing information. The study made several recommendations as to how to improve the existing state of agricultural information delivery, and made suggestions for further research.

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APPENDICES

Appendix 1: Objectives, research questions and possible sources of data

Research objectives	Research questions	Questions addressing the objectives	
		Questionnaire	**Interview**
1. Examine the agricultural information needs of smallholder sugarcane farmers in Swaziland	a. What kind of information do smallholder farmers require?	Question: 10	Question: 2
	b. What are the information needs differences between the milling groups and smallholder farmers?	Question: 7[a]	
	c. What are the explanatory and predictor factors that influence the information needs of smallholder sugarcane farmers?	Question: [1, 2, 3, 4, 5, 6, 8, 9][b], 10	
2. Assess the current agricultural information services for smallholder sugarcane farmers.	d. What agricultural support organizations are available to meet the agricultural information needs of smallholder sugarcane farmers?	Question: 16	Question: 3
	e. What are the preferred communication channels for agricultural information to smallholder sugarcane farmers?	Question: 13, 14, 15, 18, 19, 21, 22, 23	Question: 4
	f. What is the frequency with which information communication channels are utilised by smallholder farmers?	Question: 20	
	g. What is the relationship between demographic factors and the frequency with which smallholder farmers utilize ICT resources?	Question: [1, 2, 3, 4, 5, 6, 7, 8, 9][c], 20	
	h. What are the differences in information services between the milling	Question: 7[a], 13	

	groups and smallholder farmers?		
	i. What are the explanatory and predictor variables for access to agricultural information services by smallholder sugarcane farmers?	Question: [1, 2, 3, 4, 5, 6, 8, 9][b], 14	
	j. What is the state of e-readiness for the smallholder sugarcane farmers?	Question: 12,19,24, 25, 26	
3. Examine the challenges faced by farmers in accessing agricultural information.	k. What difficulties are encountered by smallholder farmers in accessing agricultural information from support organisations?	Question: 17	Question: 3.3
	l. What problems are encountered by smallholder farmers while using ICTs?	Question: 27, 28, 29, 30	
4. Develop strategies for enhancing access to agricultural information by smallholder sugarcane farmers.	m. What are the strategies for enhancing access to information services by smallholder sugarcane farmers?	Question: 31	Question: 5

Note: a - analysed using ANOVA

b - analysed using Multiple Regression

c - analysed using Correlation

Appendix 2: Questionnaire for farmers

Agricultural information needs and information services for smallholder sugarcane farmers in Swaziland.

Introduction

To continuously improve information service delivery to smallholder sugarcane farmers in Swaziland, this questionnaire has been developed to gather feedback on your agricultural information needs and how well current information delivery services meet them.

We value your honest and detailed responses and the questionnaire should take approximately 20 minutes to complete. Your responses are completely confidential.

Instructions for answering the questionnaire

Please mark (X) against the option you have chosen.

Please use the spaces provided to write your answers to the questions.

PART I: Characteristics of respondent

Q1. Gender

☐ Male ☐ Female

Q2. To which age group do you belong?

☐ Below 20 years ☐ 20 – 30 years ☐ 31 – 40years
☐ 41 – 50 years ☐ 51 – 60 years ☐ Above 60 years

Q3. Highest education level attained?

☐ Informal schooling ☐ Primary school
☐ High School ☐ Certificate
☐ Undergraduate diploma ☐ Bachelor's degree
☐ Post graduate degree

Q4. What is your position in the company?

☐ Manager ☐ Chairman
☐ Supervisor ☐ Executive committee member

Q5. What is the size of your farm?

…….

Q6. How long have you been involved in sugarcane production?

☐ Below 2 years ☐ 2 – 5years ☐ Above 5 years

Q7. To which mill group do you belong?

☐ Mhlume ☐ Simunye ☐ Big Bend

Q8. How many people do you employ?

☐ Below 10 ☐ Above 10

Q9. What was the company's approximate annual income?

☐ Below 1 million emalangeni
☐ Between 1 million and 5 million emalangeni
☐ Between 5 million and 10 million emalangeni
☐ Above 10 million emalangeni

PART II: Agricultural information needs of smallholder sugarcane farmers

Q10. Please indicate the type of information needs in your sugarcane growing enterprise?

Type of agricultural information	**Highly required**	**Moderately required**	**Lowly required**	**Not at all required**
a) Financial advice				
b) Market information				
c) Weather information				
d) Agronomic information (production, fertilizers)				
e) Sources of agricultural inputs				
f) Disease and pest control				
g) Transport (sugarcane haulage)				
h) Training information (schedules of available workshops, field days)				
i) Policy / farmer development information (government support, best practices)				
j) Regulations/ standards (quality, environmental)				
k) Other information				

Q11. How easy is it to get the following information for your sugarcane growing enterprise?

Type of agricultural information	**Highly accessible**	**Moderately accessible**	**Lowly accessible**	**Not accessible**
a) Financial advice				

b) Market information				
c) Weather information				
d) Agronomical information				
e) Sources of agricultural equipment and inputs				
f) Disease and pest control				
g) Transport information				
h) Training information				
i) Policy /smallholder farmer development				
j) Regulations/ standards				
k) Other information				

PART III: Information sources used by smallholder sugarcane farmers

Q12. Are you aware of where to obtain information for your agricultural enterprise?

☐ Yes
☐ No

Q13. What sources do you currently use to access agricultural information? (You may choose more than one)

☐ TV ☐ Radio ☐ Newspaper
☐ Internet/ website ☐ Farmer group ☐ Other farmers
☐ Extension officers ☐ Home phone ☐ Mobile phone
☐ Local Library ☐ Input supplier ☐ Personal knowledge
☐ Other (please specify):…….

Q14. How often do you use the following sources to access agriculture related information for your sugarcane farming enterprise?

Information source	**Very often**	**Often**	**Not very often**	**Never**
a) Private company				
b) Media (Newspaper, Radio, TV)				
c) Internet /related website/ electronic databases				

d) Farmer group (Swaziland Cane Growers Association)				
e) Other farmers				
f) Extension officers				
g) Personal friends and family				
h) Mobile phone				
i) Local Library				
j) Input suppliers				
k) Personal knowledge				
l) Others				

Q15. Which of the following sources give you satisfactory agricultural information?

Information source	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) Private company					
b) Media (Newspaper, Radio, TV)					
c) Internet /related website/ electronic databases					
d) Farmer group (Swaziland Cane Growers Association)					
e) Other farmers					
f) Extension officers					
g) Personal friends and family					
h) Mobile phone					
i) Local Library					
j) Input suppliers					
k) Personal knowledge					
l) Other, please specify					

Q16. Which of the following organisations do you utilise to access agricultural information for your sugarcane farming enterprise? (You may choose more than one)

☐ Swaziland Sugar Association (SSA)
☐ Swaziland Cane Growers Association (SCGA)
☐ Mill group (Mhlume, Simunye, Ubombo)
☐ Swaziland Water and Agricultural Development Enterprise (SWADE)
☐ Swaziland National Agricultural Union (SNAU)
☐ University of Swaziland Research Centre
☐ Ministry of Agriculture (Malkerns Research Station)
☐ Swaziland National Library Services (SNLS)
☐ Other, please specify……

Q17. What are the challenges that you encounter in obtaining required information for your sugarcane farming enterprise?

Challenge encountered	Major challenge	Medium challenge	Low challenge	Not a challenge
a) Information is too expensive				
b) Do not know where to get required information				
c) The quality of the information is poor				
d) Do not know whether the required information exists				
e) Complicated procedures for obtaining information				
f) External information takes too long to acquire				
g) Other, please specify				

PART IV. Information delivery mechanism

Q18. How do you receive agricultural information from information providers?

Delivery mode	Most frequently	Frequently	Moderately	Never
a) TV/Radio				
b) Email				
c) Newsletter/brochures				
d) CD/DVD				
e) Workshops				
f) Field days				
g) Other, please specify				

Q19. Please indicate the number of the following information and communication technology (ICT) tools available in your sugarcane growing enterprise.

ICT tool	None	1-5	More than 5
Smart phones			
Telephones			
Fax			
Computers (desktop)			
Laptops			
Tablet computer			
Networked office			
Wifi hotspot			

Post boxes			

Q20. How frequent are the following communication tools currently used in conducting your sugarcane farming enterprise?

Communication tool	**Most frequently**	**Frequently**	**Moderately**	**Never**
Email				
Internet				
Fax				
Telephone				
Mobile phones				
Social networks (WhatsApp, facebook, twitter)				
Other, please specify				

Q21. In what language do you normally receive agricultural information from business providers?

☐ English
☐ Siswati
☐ Other(s), specify……..

Q22. In what language would you prefer to receive agricultural information?

☐ English
☐ Siswati
☐ Other(s), specify:……..

Q23. In what format(s) are information resources documents mainly received by your company?

☐ Print format only
☐ Digital format only
☐ Both print and digital formats

Q24. What is your overall personal readiness regarding the use of information and communication technologies (ICTs)?

Personal readiness	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) I know how ICT can be used as a communication tool					
b) I can manage my time to be able to use ICT					
c) I have adequate skills to utilise ICT					

d) I have no problem using the internet					
e) I know the internet can be a source of agriculture information					

Q25. What is your company's infrastructure readiness to enhance use of information and communication technology (ICT)?

Infrastructure readiness	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) The infrastructure in my company can support ICT implementation					
b) There is adequate ICT technical expertise in my company					
c) My company can afford a budget for ICT use					
d) My company has suitable physical space for ICT equipment					

Q26. What is your company's management readiness regarding information and communication technology (ICT) use?

Management readiness	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) Senior management know what ICT is					
b) Senior management promote the use of ICT					
c) Senior management are familiar with ICT application					
d) Senior management know the benefits of ICT					
e) Senior management use ICT for daily administrative work					
f) My company has an information management post					

Q27. What are the organizational barriers affecting use of ICT?

Organizational barriers	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) Lack of training in the use of ICT					
b) Lack of technical support from company					
c) Lack of awareness in the availability of ICT					
d) Lack of staff access to the company's ICT computerized information					

28. What are the individual barriers affecting the use of information and communication technology (ICT)?

Individual barriers	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) Lack of motivation towards use of ICT					
b) Lack of confidence in the ability to use ICT					
c) Difficulty in understanding ICT language					
d) Less preference in using ICT					
e) In adequate skills to use ICT					
f) Inadequate time to learn to use ICT					
g) Poor English proficiency to use ICT					

29. What are the technological barriers affecting the use of information and communication technology (ICT)?

Technological barrier	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**

a) Poor infrastructure development in the sugar industry					
b) Broadband connectivity too costly					
c) Lack of available ICTs in the sugar industry					
d) Computer literacy is low in the sugar industry					
e) Restricted use of available ICT in the sugar industry					

30. What are the policy barriers affecting the use of information and communication technology (ICT)?

Policy barrier	**Strongly agree**	**Agree**	**Neither agree or disagree**	**Disagree**	**Strongly disagree**
a) Weak policies and regulations about ICT					
b) Lack of support for ICT related policies					
c) Lack of support for policies on subsidized rates for telephone and internet for the smallholder farmer					
d) Lack of comprehensive plans for ICT implementation in the sugar industry					
e) Lack of government financial support for implementation of ICT in my company					

Q31. In your opinion, what would be the most effective way of improving the agricultural information delivery service to smallholder sugarcane farmers in Swaziland?

……....……
……
……
……
……..……

End of questionnaire

Thank you for your time

Appendix 3: Interview guide for key informants

Agricultural information needs and information services for smallholder sugarcane farmers in Swaziland.

Introduction

To continuously improve information service delivery to smallholder sugarcane farmers in Swaziland, this interview has been developed to gather feedback on farmers' agricultural information needs and how well current information delivery services meet them. The interview should take approximately 10-15 minutes to complete. Your responses are completely confidential, and you have a right to withdraw from the interview at any time without penalty.

1. **BACKGROUND INFORMATION**.

   Please tell me about:

   - The main function of your organisation.
   - The work that you perform in the organisation.
   - Number of years you have been employed in the organisation.
   - Your work with smallholder sugarcane farmers.

2. **INFORMATION NEEDS**

   2.1 Do you receive information requests from smallholder sugarcane farmers?

   2.2 What kind of information requests do you receive?

   2.3 In your view, what are major constraints that these smallholder farmers need information for.

3. **INFORMATION DISSEMINATION**

   3.1 Do you disseminate information to smallholder sugarcane farmers?

   3.2 How do you disseminate the information to smallholder sugarcane farmers?

   3.3 What are the challenges that you encounter when disseminating information to smallholder sugarcane farmers?

   3.4 What do you think can be done to solve these challenges?

4. INFORMATION DELIVERY MECHANISM

4.1 Which modes do you use to deliver information to smallholder sugarcane farmers? Please explain why you prefer using these modes.

4.2 Which mode do these smallholder farmers use to communicate with you?

4.3 Are there any information and communication technologies that you think can be used to effectively deliver information, which are not available to smallholder farmers?

5. INFORMATION SERVICE

In your opinion, what can be done to improve the communication of agricultural information to smallholder sugarcane farmers in Swaziland?

END OF INTERVIEW!

THANK YOU FOR YOUR TIME.

Appendix 4: Letter of introduction from Swaziland Cane Growers Association

SCGA
SWAZILAND CANE GROWERS ASSOCIATION

To whom it may concern

Survey: Agricultural information needs and information services for smallholder farmers in Swaziland by Mr Nkosinathi M Dlamini

The Swaziland Cane Growers Association (SCGA) seeks your cooperation in assisting one of its development associates in the agriculture sector, Mr Nkosinathi Mswelani Dlamini (a PhD student with the University of South Africa) with his research process. Mr Dlamini will be approaching your offices seeking information related to the study and you are kindly requested to provide him with the assistance he may require.

The SCGA acknowledges the few on-going and related surveys in the sugar industry, but these studies are meant to benefit your business and the sugar industry as a whole. Should you have any questions about the survey, please do not hesitate to contact the SCGA office at 2404-3561.

Thanking you for your cooperation

S V Nkambule (Dr)
CHIEF EXECUTIVE OFFICER

14 August, 2018

Office 2nd Floor Nkhotfotjeni Building Cnr Msakato & Dzeliwe street Mbabane Tel: (+268) 2404 3561 Fax: (+268) 2404 4061
Email: info@scga.co.sz P.O. Box 273 Mbabane H100 Swaziland,Southern Africa

"Cane For Growth"

Appendix 5: letter to agricultural support organizations requesting permission to interview their officials

Nkosinathi Mswelani Dlamini
P. O. Box 9263
Mbabane
19 October 2018

The Manager
Swaziland Water and Agricultural Development Enterprise
P. O. Box 5836
Mbabane

Dear Sir

Re: Request to conduct interview with a member of your organisation

This is to request your office to grant me permission to conduct an interview with one member of your organisation who frequently works with smallholder sugarcane farmers in improving their business. I am a PhD student enrolled at the University of South Africa and working as a Senior Assistant Librarian at the University of Eswatini.

Your organization has been identified as a key stakeholder in my research project entitled, "Agricultural information needs and information services for smallholder sugarcane farmers in Swaziland". I have attached an introduction letter from UNISA, consent letter and the interview schedule for your information.

Your consent and assistance given will be greatly appreciated.

Sincerely,

Nkosinathi Dlamini

Mobile: +268 76511383; Email: ndlamini@uniswa.sz

Appendix 6: Letter of introduction from the University of South Africa

University of South Africa
College of Graduate Studies
School of Interdisciplinary Research and
Post graduate Studies
P. O. Box 392
0003
UNISA
South Africa
10 October 2018

TO WHOM IT MAY CONCERN

Letter of introduction: PhD candidate Nkosinathi M. Dlamini, Student Number 58536337 (Information Science)

This letter serves to introduce Mr Nkosinathi Dlamini who is a PhD student at the University of South Africa. Mr Dlamini is undertaking research leading to the production of a thesis or other publications on the subject: **Information needs and information services for smallholder sugarcane farmers in Swaziland**. The results of the study will assist in the recommendation of optimal ways of disseminating information to farmers in the sugar industry.

To achieve the objectives of this study Mr Dlamini will carry out interviews with selected key informants to cover certain aspects of the study. Therefore, the UNISA College of Graduate Studies is kindly requesting your organization to provide him with the assistance he may require. All the data that will be gathered will be treated confidentially and will only be used for the purpose of this study.

Any enquiries you may have about the study, please contact Professor Patrick Ngulube, who is his supervisor at the address given above or by telephone on +2712 429 2832 or email: ngulup@unisa.ac.za.

Thank you in advance for your attention and assistance.

Yours Faithfully

Professor Patrick Ngulube (Supervisor)

Appendix 7: Informed consent documentation for farmers

Dear Research Participant

As a candidate for a Doctor of Philosophy in Information Science degree at the University of South Africa, I request you to participate in a study to investigate improvements to agricultural information dissemination in the sugar industry in Swaziland. Participation in the study involves answering the accompanying questionnaire. The estimated approximate time to complete the questionnaire will be 20 minutes.

Any information that you provide will remain confidential and your personal information will not be identified in the final report or in any presentation. You may choose not to participate or withdraw from participating in the study at any time without prejudice in anyway.

AUTHORISATION: I confirm that I have read and understood the nature and purpose of this research study; and have had the opportunity to consider the information. I understand that should I have any questions, concerns or complaints regarding the conduct of this research project, I may contact the student's promoter, Prof. Patrick Ngulube (ngulup@unisa.ac.za) , or the student, Nkosinathi Mswelani Dlamini (58536337@mylife.unisa.ac.za) at any time.

I agree to taking part in the study.

Name: ……

Signature: ……

Date: …….....

Appendix 8: Informed consent documentation for key informants

Dear Research Participant

As a candidate for a Doctor of Philosophy in Information Science degree at the University of South Africa, I would like to invite you to participate in a study that seek to investigate improvements to agricultural information dissemination in the sugar industry in Swaziland. Participation in the study involves answering brief interview questions. The estimated approximate time for the interview is about 10- 15 minutes and will be scheduled at a time more convenient for you.

The interview will briefly explore topic on the information needs, information dissemination, information delivery mechanism and information services to smallholder farmers in Swaziland. I will also request for you consent to make audio recording of the interview or a transcription in preparation for the thesis.

Be assured that any information that you provide will remain confidential and your personal information or the identity of the organization will not be individually identifiable in the final report or in any presentation. You may choose not to participate or withdraw from participating in the study at any time without prejudice in anyway.

AUTHORISATION: I confirm that I have read and understood the nature and purpose of this research study; and have had the opportunity to consider the information. I understand that should I have any questions, concerns or complaints regarding the conduct of this research project, I may contact the student's promoter, Prof. Patrick Ngulube (ngulup@unisa.ac.za) , or the student, Nkosinathi Mswelani Dlamini (58536337@mylife.unisa.ac.za) at any time.

I agree to taking part in the study.

Name: ……

Signature: ……

Date: …….....

Appendix 9: Ethical clearance letter

UNISA university of south africa

DEPARTMENT OF INFORMATION SCIENCE RESEARCH ETHICS REVIEW COMMITTEE

Date: 12 December 2016

Ref: 2016_IS58536337_057
Name of applicant: Mr NM Dlamini
Student #:x

Dear Mr NM Dlamini,

Decision: Ethics Approval

Name: Mr NM Dlamini, 58536337@mylife.unisa.ac.za, 0026876511383

Supervisor: Prof P Ngulube, Department of Information Science, Unisa, ngulup@unisa.ac.za, 012 4292832

Proposal: Agricultural Information needs and information services for smallholder sugarcane farmers in Swaziland

Qualification: Postgraduate degree, Master of Library Science

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Thank you for the application for research ethics clearance by the Department of Information Science Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the project.

For full approval: *The application was reviewed in compliance with the Unisa Policy on Research Ethics by the Department of Information Science RERC on 12 December 2016.*

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Department of Information Science Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*

Open Rubric

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:
The reference number [2016_IS58536337_057] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the Department of Information Science RERC.

Kind regards,

Prof GV Jiyane
Department of Information Science
012 429 6057

Appendix 10: Certification of editing

GENEVIEVE WOOD
P.O. BOX 511 WITS 2050 | 0616387159

EDITING CERTIFICATE
LANGUAGE EDITING SERVICES

Date: 2019/7/10

This serves to confirm that the document entitled:

Information needs and information services for smallholder sugarcane farmers

by

Nkosinathi Dlamini

has been language edited on behalf of its author.

Genevieve Wood
PhD candidate
Wits University

Appendix 11: Turnitin digital receipt

Skip to Main Content

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	N M Dlamini
Assignment title:	Complete dissertation/thesis submis…
Submission title:	Agricultural information needs and i…
File name:	File size: 4.05M
Page count:	294
Word count:	86,816
Character count:	515,276
Submission date:	25-Jul-2019 01:08PM (UTC+0200)
Submission ID:	1154876399