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Barriers to Sugarcane Production Information Access via ICT: Perceptions of Extension Officers and Smallholder Sugarcane Growers in Swaziland

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Authors' contributions

This work was carried out in collaboration between both authors. Author MMD designed the study and wrote the first draft of the manuscript under the guidance of author SW who went on to manage the literature searches and edited the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

This paper aims at investigating barrier to sugarcane production information access via ICT among the Swaziland sugar industry stakeholders as perceived by extension officers and smallholder sugarcane farmers. The study was a census involving all active smallholder sugarcane farmers (N=172) in Swaziland and their extension officers (N=17). Quantitative data were collected through personal interviews using a valid and reliable structured questionnaire. Descriptive statistics and one way analysis of variance (ANOVA) were applied to analyse the data using SPSS version 20 statistical software. The results of the study revealed that sugarcane farmers do not perceive any of the barriers to be a hindrance to information access via ICT. However, extension officers differed regarding some of these barriers. The study also revealed that gender, educational level and

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respondents' job category had a significant influence on the perceptions of the respondents. Therefore, these demographic variables must be considered when planning the introduction of ICTs to enhance information access among the sugar industry stakeholders. The results of this study could provide guidance to the government or relevant organisation when considering barriers that may hinder the use of ICTs for information access.

Keywords: Extension; ICT; sugarcane; barriers; smallholder farmers; Swaziland.

1. INTRODUCTION

Agriculture is the mainstay of Swaziland's economy and it also underpins the landlocked country's development endeavour. It is a sector with great potential for stimulating growth and employment, consequently eradicating poverty. One of the main crops grown in the country is sugarcane which is also Swaziland's largest industry. The country is the fourth biggest manufacturer of sugar in Africa (following South Africa, Egypt and Sudan). About 60% of the country's agricultural output comes from sugar manufacturing, and it adds about 18% to Swaziland's Gross Domestic Product (GDP). About 35% of the of the country's wage employment comes from the sugar industry [1]. The industry is made of four components including, large millers and estates (77% of production); large-scale farmers (17% of production), medium-scale farmers (5% of production) and smallholder farmers (1% of production). Though accounting for a smaller volume of overall sugarcane production, the largest number of farmers come from this category of small- and medium-scale farmers [1].

The sugar industry sector in the country has evolved tremendously in the past ten years. However, when the productivity of smallholder sugarcane farmers versus large scale sugarcane farmers is analysed, there is a consistent average difference of ten tonnes cane per hector with smallholder growers on the lower side [2]. There is, therefore, huge room for improvement by smallholder sugarcane farmers in order to meet the performance of their large-scale counterparts. Among many factors that could have contributed to this gap, is insufficient knowledge through which smallholder farmers could access information. Poor access to information leads to farmers making poor farming decisions that have a negative effect on yield. Different studies have raised a number of issues that are a hindrance to the accessibility and adoption of sugarcane information. [3] cited high illiteracy rate among smallholder sugarcane farmers as a hindrance. Demographic and background characteristics have been found by numerous studies to have an influence towards the accessibility and adoption of sugarcane production information by smallholder farmers [4,5,6].

Information is regarded by many researchers [7, 8] as another important factor of production and a key factor that has an impact on the progress of a society and it also contributes to the improvement of a nation's economy. Information connects the world, dramatically changing our lifestyles and it provides a platform for underdeveloped nations to establish strategies for competing with their developed counterparts [9,10]. [11] regard information as a strategic resource, a foundation and a commodity for every operation in an organisation. Information helps producers to become more focused and to be able to analyse issues more clearly, thus making precise decisions [12]. The role played by information towards agricultural development is very crucial and it is regarded as a basis for extension service delivery [13]. An increase in the flow of accurate and relevant information in an organisation leads to improved agricultural development [7,8].

1.1 Objectives

The main reason for this article was to investigate the barriers towards the use of ICTs in accessing sugarcane production information as perceived by smallholder sugarcane farmers and their extension officers. The research was guided by the following objectives:

1. Describe respondents by demographic variables;
2. Determine the barriers that prevent the use of ICTs to access sugarcane production information as perceived by sugarcane farmers and their extension officers; and
3. Explain if demographic variables of respondents (age, gender, education, experience, marital status and respondent's category) do affect their perceptions.

1.2 Significance of the Study

The identification of barriers to sugarcane production information access via ICT will assist in designing a better information system that will enable smallholder farmers to meet their information needs in Swaziland. Furthermore, the results will encourage smallholder farmers to adopt appropriate means of seeking accurate and up-to-date sugarcane production information on time, thus improving their productivity.

2. METHODOLOGY

The research was carried in the year 2015, within the Lowveld region of Swaziland, where sugarcane is predominantly grown. The methodology used was a survey using the interview technique. This study employed quantitative research to investigate perceptions of sugarcane farmers and extension officers regarding barriers that hinder sugarcane farmers from accessing sugarcane production information via ICT. Four enumerators who had recently graduated from the University of Swaziland were hired and trained on how to collect the data. The study was a census. A structured questionnaire was used to interview all the smallholder sugarcane farmers (N=172), as well as all the sugarcane Extension Officers (N=17) actively growing sugarcane in Swaziland during the year of data collection.

Data were collected with a pre-tested schedule. Descriptive statistics and ANOVA were applied to analyse the data using SPSS 20. For testing significant differences, the alpha level was set at 95% ($P < .05$). Frame-error, selection-error and non-response error were managed in line with suggestions by [14]. An updated list of all current and active smallholder sugarcane farmers was obtained from the Swaziland Sugar Association (SSA) extension services, thereby managing frame-error. Farmers not currently growing sugarcane were removed to control selection error. A group of experts consisting of two extension managers from SSA, one extension manager from FAO (Swaziland) and four academic staff members from the University of Swaziland, Department of Agricultural Education and Extension were requested to check the instrument for content validity. The content validity of the instrument was approved by the experts. To determine the reliability of the instrument, a pilot test was conducted involving smallholder sugarcane growers from Vuvulane Sugar Estates who did not participate in the study. To compute the reliability coefficients of independent variables, the study employed Kuder Richardson (KR21) and Cronbach Alpha procedures.

2.1 Survey Instrument

The instrument was presented into two parts: Part I listed variables related to demographic characteristics and background information. Respondents were requested to make their choices as per each item. Part II consisted of items pertaining to barriers towards the use of ICT to access sugarcane production information. Respondents had to rate each item using a Likert type scale ranging from one (strongly disagree) to six (strongly agree). A cut-off point of 3.5 was established such that all those responses with a mean value of 3.5 and less were categorised as having disagreed and all those above 3.5 were recorded as agreed.

2.2 Literature Review

Extension exists to make agricultural information accessible to farmers and other stakeholders who need it to improve productivity. Unfortunately, extension currently does not meet this goal [15]. The public extension service, especially in the Sub-Saharan Africa region, has not been effective enough in conveying agricultural information to farmers. Farmers sometimes resist a much-needed improved technique not because they do not want it but because they are ignorant of the practice [15].

[16] argues that agricultural information plays an important role in the development of smallholder farmers towards increased production. He noted that most smallholder farmers are located in the rural areas, therefore an increase in their production automatically leads to a more desirable lifestyles for the rural people, food security and national economies of the countries where they operate. When reliable and accurate information is availed on time to smallholder farmers, they can reduce their production costs, improve their productivity, have collective bargaining with buyers and input suppliers, thus maximising their profit margins [10,16,17].

2.2.1 Barriers to information access

A number of barriers that limit information access by smallholder farmers, especially in developing countries have been identified. [18] revealed that these barriers are heterogeneous and grouped

them into seven including personal, learning style, instructional, situational, organisational, content suitability and technological barriers. [19] observed that barriers in poor nations are associated to infrastructure and Internet connectivity, availability of skilled personnel and existing government policies. [20] on the other hand, divided barriers limiting use of ICT into two factors; i.e., organisational factors and technical factors. [21] suggested that ICT projects come with a number of problems that include: technological dependence; unavailability of telecommunication infrastructure in most poor and isolated areas; initial investment costs of technologies; high expenditure for getting access and support; need for training; and poor engagement of all stakeholders in planning. These findings suggest four types of barriers limiting farmers' access to agricultural information in developing countries: organisation-related barriers; human resource-related barriers; technology-related barriers; and policy-related barriers.

2.2.2 Organisation-related barriers

The majority of sugarcane farmers have organised themselves into farmer groups and each farmer group has a management structure in place. Organisational barriers emanate from attitudes of organisations towards information sharing. These organisational attitudes are shaped mainly by the management structure of the organisation and the group of people involved in the information sharing process. [22] found that information sharing becomes inconsistent when there is no clear management structure in that organisation. If the structure is not clear then it becomes difficult for farmers to understand the flow of information within the organisation. Information exchange initiatives needs radical changes in the behaviour of people in an organisation. Managerial practices and structural conflicts in an organisation have been identified as the major cause of organisational barriers to information sharing. Any delays in addressing these barriers can result in a downward trend in production by the organisation [22].

[23] argued that the complication of information exchange increases as information sharing moves from an intra-organisational level into an inter-organisational level. The complexity is such that information sharing among related organisations is often compromised. Some organisations fear losing their competitiveness if they share technical information with other organisations. Sometimes smallholder farmer organisations feel that information sharing is only for large-scale farmers and that it is an unnecessary load for them that will contribute very little to the productivity of their organisation [24]. They further observed that smallholder farmer groups with centralisation in hierarchical structures have a negative impact on the exchange of information. The drive among farmers to share information is compromised if they do not enjoy freedom as a result of limited autonomy, or they are compelled to request for permission from their seniors to implement decisions.

Farmer groups that have a high level of bureaucracy and strict administrative control have a very low information sharing spirit [25, 26]. Furthermore, formal laws, ground rules, practices and regulations could become hindrances to information sharing, whereas non formal organisational structures with independent information exchange, preparatory measures can result to free interaction within farmers, thus creating a beneficial environment for information dissemination [26]. Backup from senior management has shown to be very effective in facilitating the acceptance and use of information exchange systems. Any innovation in information sharing system in an organisation cannot be adopted if there is no support from top management [27].

Inadequate numbers of agricultural extension service personnel is a further hindrance to information adoption. Low agricultural extension officers-to-farmer ratios impede farmers getting new information due to reduced frequency of visits [28,29]. [30] observed that the flow of information regarding latest agricultural technologies in the rural areas is very poor especially where there are no extension officers. Lack of information sources such as libraries within the farmer's vicinity was noted by [31] as another obstacle in accessing agricultural information. When smallholder farmers are required to travel long distances in order to have access to information sources, it implies that even if a farmer could be aware of an existing technology, he may find it difficult to obtain it, thus leaving the farmer uninformed.

2.2.3 Human resource-related barriers

Human resource barriers are hindrances emanating from behaviours of people within or between farmer groups. Information in a group

of farmers is often scattered among individuals, and the information that some members may need, may be held by others within the group. [32] noted that the efforts of organisations to invest in sophisticated information technology could be useless if the farmers in that farmer group are less prepared to exchange their information. Individuals are only comfortable to exchange information when they are excited. Unsatisfied or aggrieved individuals usually refuse to exchange information. Similarly, [33] found that many farmers are reluctant to share and contribute their knowledge with other fellow colleagues, indicating that one of the main hindrances towards exchanging information is lack of encouragement, particularly when individuals feel that they will lose the power that comes from ownership of crucial information when they share information. It is, therefore, very crucial for extension officers to explore farmer's attitudes in a farmer group and to develop means by which these attitudes could be improved.

Gender also impacts access to information. Women often have a high workload, which sometimes prevents them from attending meetings and workshops where vital information is being shared. [34] observed that the dual domestic and production roles played by woman in the rural set up often leaves them very tired to even listen to the radio; it also makes them to be reluctant towards partaking in extension activities. [6] reported that most rural African families would prefer sending a male child to school than sending a female child. This leaves the female child disadvantaged when she later becomes an adult in need of information. [35] noted that even though there is an increase in the awareness to reach woman farmers, agricultural extension services are still focused towards the male farmers. Similarly, [28] found that, in most cases, extension agents focus their extension services on male farmers and hardly reach out to female farmers, even though they make up a large portion of smallholder farmers in Africa.

The failure of farmers to obtain needed information from appropriate and credible sources is another barrier to information accessibility. When farmers are not confident about the information they possess, they feel reluctant to share such information. [36] and [37] associated this lack of confidence to lack of education. In particular, illiteracy is a major barrier to information access and most smallholder farmers in Africa are not educated, as a result they are unable to use written materials as a means for distributing agricultural information [28,38,39]. [37] observed that because of their illiteracy, they are often exposed to old and less accurate information which they receive through informal networks.

2.2.4 Technology-related barriers

Complexity is a one factor that negatively impacts the adoption of information exchange. Different organisations may use different technologies to share information. However, the challenge is integrating them [38]. [39] concluded that it is easy to adopt a less complex technology. They also noted that technology characteristics such as functionality, reliability and accessibility tend to positively influence farmers to use the technology for information exchange. Poor ICT infrastructure is viewed by [40] as a barrier to information sharing, and could be traced back to insufficient funds, unawareness and less commitment from senior management concerning the use of ICT tools to disseminate information. Poor conviction in ICT tools, phobia of information systems breakdown and poor capabilities towards operating technology tools also constitute barriers to information sharing. Connected to this is lack of ability to keep up with the ever-changing technology in terms of use and maintenance of the technology [40].

Physical barriers to information accessibility are comprised primarily of poor communication facilities [41,16] which infrastructure is an indispensable prerequisite for widespread socio-economic development of a society [42]. In most African countries, however, communication infrastructures are weak resulting in low internet usage, low telephone usage, limited information transmitting facilities, inadequate computing infrastructure and other ICT tools [42]. Some information systems have specific challenges. Television and radio, for example, are ideal sources of information, but they cost more and cannot be operated without electricity mains or batteries, both of which are very scarce and/or costly in rural areas [37,43].

2.2.5 Policy related barriers

Most African countries continue to remain behind other countries of the world regarding the introduction of ICT, especially in the rural areas. Achieving an all-inclusive and affordable access to a complete set of communication services is hindered by poor policies hindering market entry

[44]. [45] noted that suppliers of ICT and policy makers are not sure about the capacity and eagerness of the rural people to adopt and use ICT. Consequently there are small numbers of programs that are aimed at improving the implementation and use of ICT within the agricultural sector of isolated areas.

Policies for exchanging information in rural areas must put the rural people in a position where they will have exposure to information related to their lifestyles. These policies must assist the rural people to develop skills and knowledge on how to use and benefit from the information. Policies are implemented to set the rules and direction for the improvement of rural communication. An enabling communication policy environment allows for a free flow of information amongst different stakeholders in a society [44,45].

Rural communities where most smallholder farmers are located need this special focus because their ICT infrastructure is usually less developed than that of their urban counterparts. Due to lack of infrastructure, communication services in rural areas are commercially less attractive and this makes farmers less aware of economic possibilities and other opportunities. ICT must be available, accessible, demand driven and affordable to the majority of rural smallholder farmers. Policies and investment strategies need to be identified and recommended in developing countries to help smallholder farmers benefit from ICT based agricultural knowledge and information management [46].

The main challenge with national communication policies is that they are out-dated, over-regulated and/or uncoordinated. In most cases, these policies neglect the special needs for rural people. Further, poor implementation of existing policies makes policies to be ineffective. Corruption and dishonest activities regarding regulations can also be a problem in development of media strategies. Remote and poor areas are in most cases not commercially attractive for investment in services and infrastructure. Investors also need concrete incentives in order to invest in a given area [44].

3. RESULTS AND DISCUSSION

The reporting of results and discussions are organised into three sections. The first section responds to the first objective of describing the demographic variables of respondents. The reliability of the survey instrument is also discussed in this section. The second section reports results for the second research objective of determining the barriers that prevent the use of ICTs to access sugarcane production information as perceived by sugarcane farmers and their Extension Officers. The third section describe results for the third research objective explaining if demographic variables of respondents (age, gender, education, experience, marital status and respondent's category) do affect their perception of barriers towards sugarcane production information access via ICT.

3.1 Respondents Demographic Variables

To present a good understanding of the respondents, research objective one aimed at describing respondents according to their demographic variables, including age, gender, education level, sugarcane production experience and marital status. Results are presented in Table 1 and they reflect that most of the respondents were in the age group of 30 – 39 years (38.6%) followed by those in the range of 40 -49 years (19%) age group for both smallholder farmers and extension officers.

With regards to gender, both farmers and extension officers had higher proportions of male respondents (74.6%). This implies that the sugar industry of Swaziland is male-dominated. Worth noting again is that all (100%) of the sugarcane Extension Officers were also male. This observation provides an opportunity to encourage women to participate in this industry. The educational level of the farmers indicate that a majority (30%) had tertiary education with an almost similar number (29.6%) that had high school qualifications, while the rest never finished secondary school. Regarding the extension officers, all had gone through tertiary education and this is mainly due to the minimum requirement set by SSA for one to be employed as an extension officer.

Regarding the number of years of service, both farmers and extension officers indicated a high proportion (38.6%) having 1 – 5 years of service in the sugar industry. These were followed by those respondents who had 11 – 15 years of experience (22.8%). Very few respondents had above 21 years of experience. A majority (86.8%) of them were married while the rest were single. From the results of the demographic variables, it could be concluded that

most of them were educated middle-aged, married males, with 1 – 5 years sugarcane production experience.

3.2 Reliability Analysis of the Survey Instrument

Cronbach's Alpha was used to determine the reliability of the instrument. [47] stated that a Cronbach's Alpha score of .70 or higher indicates a proof of internal consistency. As shown in Table 2, an acceptable reliability is reflected for each of the domains: .89 for Information-related barriers, .72 for organisation-related barriers, .92 for personal-related barriers, .88 for technology-related barriers and .86 for policy-related barriers.

3.3 Barriers Preventing the Use of ICT to Access Sugarcane Production Information

Research objective two aimed at determining the barriers that prevent the use of ICTs to access sugarcane production information via ICT as perceived by sugarcane farmers and their extension officers. Respondents were asked to rate their perceptions regarding the industry's barriers on the use of cell phones as one of the technologies for accessing information among the smallholder sugarcane growers, extension officers and other stakeholders in the sugar industry of Swaziland. The items were arranged into five domains; Information-related barriers; Organisation-related barriers; Personnel-related barriers; Technology-related barriers and Policy-related barriers. The results are presented in Table 2. They indicate that both farmers and extension officers perceived information-related barriers (M=2.76, SD=.86) and organizational structure barriers (M=2.46, SD=.72) not to hinder information access within the sugar industry of Swaziland.

A difference in perception between farmers and extension officers was observed in personnel barriers, Technology barriers and Policy barriers. In all the above mentioned barriers, farmers disagreed that these barriers were a hindrance on the use of ICT to access information among the sugar industry stakeholders, whereas extension officers, on the other hand, agreed that these barriers were indeed a hindrance on the use of ICT for information access. These differences could be a result of the difference in the educational background of these two groups.

Table 1. Respondents' demographic profile

Characteristic	Category	Farmer (N=172)		EOs (N=17)		Total (N=189)	
		F	%	F	%	F	%
Age	19 - 29	24	13.9	3	17.6	27	14.3
	30 - 39	64	37.2	9	53.0	73	38.6
	40 - 49	32	18.6	4	23.5	36	19.0
	50- 59	25	14.5	1	5.9	26	13.8
	> 60	27	15.8	0	0	27	14.3
Gender	Males	124	72.1	17	100	141	74.6
	Females	48	27.9	0	0	48	25.4
Education	None	8	4.7	0	0	8	4.2
	Primary	30	17.4	0	0	30	15.9
	Secondary	38	22.1	0	0	38	20.1
	High school	56	32.6	0	0	56	29.6
	Tertiary	40	23.3	17	100	57	30.2
Experience	1 – 5	69	40.1	4	23.5	73	38.6
	6 – 10	28	16.3	7	41.2	35	18.5
	11 – 15	40	23.3	3	17.6	43	22.8
	16 – 20	14	8.1	2	11.8	16	8.5
	21 <	21	12.2	1	5.9	22	11.6
Marital Status	Married	151	87.8	13	76.5	164	86.8
	Single	21	12.2	4	23.5	25	13.2

Table 2. Perceptions of barriers towards accessing sugarcane information by a cell phone as technology for communication

Items	Farmers (N=172)		EOs (N=17)		Total (N=189)		CA
	Mean	SD	Mean	SD	Mean	SD	
Information related barriers							
Lack of information centres	3.97	1.488	5.06	.966	4.07	1.481	
Lack of training programs	2.93	1.473	3.18	1.741	2.95	1.496	
Unknown information sources	2.51	1.152	3.00	1.732	2.55	1.218	
Lack of simple reading material	2.57	1.219	4.06	1.819	2.70	1.348	
Lack of demonstration	2.58	1.237	3.59	1.805	2.67	1.324	
Unreliable information sources	2.28	1.040	2.65	1.656	2.32	1.108	
Unknown language presentation	2.21	.969	3.12	1.867	2.29	1.104	
Information delivered not understood	2.22	.976	2.94	1.676	2.28	1.072	
	2.66	**.865**	**3.45**	**1.452**	**2.73**	**.955**	**.89**
Organization-related barriers							
Limited organization support	2.72	1.361	2.59	1.873	2.71	1.409	
Lack of good leadership	2.98	1.483	4.12	1.691	3.08	1.533	
Restricted use of cell phones by women	2.17	.847	2.29	1.213	2.19	.883	
Gender restriction on extension officers	2.08	.696	2.24	1.300	2.10	.766	
Lack of sugarcane E0's	2.27	1.048	2.00	1.541	2.24	1.098	
	2.44	**.636**	**2.65**	**1.211**	**2.46**	**.704**	**.72**
Personnel-related barriers							
Farmer interpersonal barriers	2.77	1.382	3.65	1.412	2.85	1.404	
Inability to use gadget	2.91	1.405	3.71	1.312	2.98	1.412	
Costs of gadget too high	3.46	1.583	3.94	1.519	3.50	1.580	
E0's are biased	2.56	1.191	2.06	1.088	2.51	1.188	
Lack of awareness in ICT's	2.65	1.296	3.18	1.811	2.69	1.353	
Lack of confidence in ICT's	2.76	1.320	3.35	1.618	2.81	1.355	
Lack of motivation to use ICT's	3.02	1.469	3.35	1.656	3.05	1.485	
Language problem in using ICT's	2.85	1.347	4.00	1.871	2.95	1.434	
Less preference to use ICT's	2.70	1.297	4.18	1.551	2.84	1.384	
Lack of skill to use ICT's	3.21	1.440	4.35	1.412	3.31	1.471	
No time to listen to radio programs	3.00	1.422	3.82	1.286	3.07	1.427	
Poor time management	3.04	1.407	3.94	1.249	3.12	1.415	
High illiteracy rate	3.75	1.590	4.00	1.936	3.77	1.620	
Untimely information delivery	2.80	1.345	3.94	1.519	2.90	1.396	
Lack of training on ICT's	3.31	1.573	3.76	1.715	3.35	1.587	
	2.99	**.937**	**3.68**	**1.121**	**3.05**	**.973**	**.92**
Technology-related barrier							
Lack of ICT equipment	3.25	1.571	4.82	1.334	3.39	1.613	
Lack of ICT infrastructure	3.42	1.571	5.12	1.111	3.57	1.608	
Costs of broadband too high	3.47	1.527	4.88	1.495	3.60	1.573	
Low computer literacy	3.71	1.566	5.29	.686	3.85	1.574	
Restricted use of ICT's	2.98	1.493	4.76	1.200	3.14	1.553	
Poor interconnectivity	2.84	1.401	4.71	1.160	3.01	1.479	
Network coverage weak	2.98	1.426	3.59	1.417	3.03	1.433	
	3.24	**1.120**	**4.74**	**.902**	**3.37**	**1.181**	**.88**
Policy-related barriers							
No government policies on ICT's	3.23	1.391	4.12	1.219	3.31	1.396	
Existing policies need improvements	3.05	1.350	4.29	1.359	3.16	1.394	
ICT related laws not supported	3.09	1.339	4.00	1.541	3.17	1.378	
Special rate policies not there	3.27	1.466	4.24	1.251	3.35	1.472	
ICT budget is limited	3.30	1.522	4.59	1.417	3.42	1.554	
	3.19	**1.132**	**4.25**	**1.069**	**3.28**	**1.164**	**.86**

All the extension officers had gone up to tertiary level and were experts in the field which was not the case with the smallholder sugarcane farmers. Due to their education level, extension officers had a better understanding regarding the issues that hinder the use of ICT by farmers to access sugarcane production information. These issues as stated involved technology, policy and personnel. They require some degree of education or literacy level to understand them, which is not the case with some of the smallholder farmers. For the technology barrier, farmers indicated a mean value of 3.24 (SD=1.12), whereas extension officers reported a higher mean value of 4.74 (SD=.92). The same difference was observed with policy barriers where farmers recorded a lower mean value of 3.19 (SD=1.13) and extension officers recording a higher mean value of 4.25 (SD=1.07). Regarding the personnel barriers, farmers exhibited a lower mean value of 2.99 (SD=.94) and a higher mean value for the extension officers (M=3.68, SD=1.12) was reported.

3.4 Differences in Perceptions of Barriers Due to Demographic Variables

The third research objective of the study aimed at determining any significant deviation in the perceptions of respondents regarding the barriers based on the background and demographic variables. A series of one-way analysis of variance (ANOVA) were performed to observe if the responses of the participants differed according to age, gender, education level, experience, marital status and respondent's category. Five factors were investigated, including information-related barriers, organisational-related barriers, personnel-related barriers, technology-related barriers and policy-related barriers. The results are presented in Table 3.

The results indicate that age, marital status and sugarcane growing experience did not have any influence towards the perceptions of respondents for all the dependent variables. Only gender, education level and respondent's job category were found to have a significant difference on the perceptions of respondents. The ANOVA results indicated that the effect of gender was significant on all the dependent variables of *Information Barriers*, [F (1, 187) = 6.53, P<.01]; *Organisational barriers*, [F (1, 187) = 4.24, P < .04]; *Personnel barriers,* [F (1, 187) = 6.16, P < .01]; *Technology barriers*, [F (1,187) = 7.06, P < .01] and *Policy barriers*, [F (1, 187) = 5.83, P < .02]. The education level indicated a significant difference for one independent variable, organisational-related barriers, [F (4, 184) = 2.52, P < .04]. With regards to the respondent's job category, results indicated that it had an influence on *Information barriers*, [F (1, 184) = 1.1, P < .01], *Personnel barriers*, [F (1,184) = 8.24, P < .01], *Technology barriers*, [F (1, 184) = 28.8, P < .01] and *Policy barriers*, [F (1, 184) = 13.7, P < .01].

3.5 Discussion and Implications

ICT has a great opportunity to change the means through which information, knowledge and new technology is handled, developed and disseminated to farmers through extension services. Sugarcane farmers require support from other intermediaries to adopt new information and knowledge. In this regard, extension services are recommended to be the ideal intermediary for disseminating information and knowledge straight to farmers. Therefore, the assessment of barriers that hinder the flow of information to farmers using ICTs is very crucial.

The study has demonstrated through the results from the second objective that sugarcane farmers and their extension officers do not perceive information-related barriers and organisation-related barriers as hindrances for accessing information through the use of ICTs by the sugar industry stakeholders. This perception implies that ICTs, especially cell phones, can be used effectively in the sugar industry to enhance information access among smallholder farmers, thus improving their productivity.

Regarding the perceptions of respondents on personnel-related barriers, technology-related barriers and policy-related barriers, the study findings indicated a disagreement between farmers and extension officers. Farmers disagreed that these barriers could hinder information access, while the opposite was true for extension officers. Extension officers perceived these barriers to hinder information access by the industry stakeholders.

Table 3. One-way ANOVA of barriers

	Category	N	Information			Organisation			Personnel			Technology			Policy		
			Mean	F-value	Sig	Mean	F-value	Sig	Mean	F-value	Sig	Mean	F-value	Sig	Mean	F-value	Sig
Age	19 - 29	27	2.87	.839	.50	2.36	.562	.69	2.95	.461	.76	3.43	.661	.62	3.04	1.35	.25
	30 - 39	73	2.65			2.41			3.10			3.50			3.48		
	40 - 49	36	2.62			2.48			2.89			3.14			3.13		
	50- 59	26	2.69			2.57			3.14			3.42			3.04		
	60 <	27	2.73			2.58			3.13			3.23			3.44		
Gender	Males	141	2.43	6.53	.01*	2.28	4.23	.04*	2.75	6.16	.01*	2.99	7.06	.01*	2.94	5.83	.02*
	Females	48	2.83			2.52			3.15			3.50			3.40		
Education	None	8	3.05	1.35	.25	2.70	2.52	.04*	3.66	1.64	.17	3.64	2.21	.07	3.43	2.33	.06
	Primary	30	2.56			2.37			2.89			3.03			2.95		
	Secondary	38	2.87			2.74			3.02			3.27			3.29		
	High school	56	2.56			2.31			2.91			3.24			3.09		
	Tertiary	57	2.85			2.44			3.20			3.71			3.62		
Experience	1 – 5	73	2.67	1.25	.29	2.41	1.76	.14	3.05	.42	.79	3.33	.20	.94	3.17	.79	.54
	6 – 10	35	2.77			2.54			2.99			3.39			3.37		
	11 – 15	43	2.61			2.49			2.95			3.49			3.36		
	16 – 20	16	2.70			2.13			3.19			3.22			3.04		
	21 <	22	3.13			2.69			3.23			3.34			3.57		
Marital	Married	164	2.71	.58	.45	2.47	.13	.72	3.03	.45	.50	3.35	.25	.62	3.32	1.44	.23
	Single	25	2.87			2.42			3.17			3.48			3.02		
Category	Farmer	172	2.66	11.1	.01*	2.44	1.28	.26	2.99	8.24	.01*	3.24	28.8	.01*	3.19	13.7	.01*
	EO	17	3.45			2.65			3.68			4.74			4.25		

**P < .05*

The third research objective aimed at determining if demographic variables of respondents did have an influence on their perception regarding barriers to information access. The one-way ANOVA results indicate that age, marital status and sugarcane growing experience did not have any influence towards the perception of respondents in all the dependent variables. Only gender, education level and respondent's job category were found to have a significant difference on the perceptions of respondents. In line with prior studies [4,5], gender in this study indicated a significant difference to all the barrier variables. Females scored higher means than males in all the dependent variables. This implies that females perceived these barriers as a hindrance to information access than their male counterparts. [48] found that gender had an influence on only organisational-related barriers. This could be caused by the imbalance between the total number of male to female respondents (25% female and 75% male). Educational level exhibited a significant difference in organisation-related barriers with those who had less education scoring higher means than those with higher education. This finding is also in line with what [48] reported. The respondent's job category is another demographic variable that indicated a significant difference in all the barrier factors except for organisational related barriers. Extension Officers scored higher mean scores than sugarcane farmers and this is an indication that Extension Officers perceived these barriers as a hindrance to information access among the sugar industry stakeholders.

4. CONCLUSION

The major strength of the sugar industry extension in Swaziland is in its ability to effectively exchange sugarcane production information amongst its stakeholders thereby improving the productivity of sugarcane farmers. The strategic role played by ICT in the dissemination of such information is of great importance and this article has discussed the barriers that hinder information access via ICT. The research has indicated that sugarcane farmers do not perceive any of these barriers to be a hindrance on the use of ICTs for information access. Extension Officers, on the other hand, only agreed with farmers on information-related barriers and organisation-related barriers. Their perception with regards to the other barriers differed from that of farmers in that they perceived personnel-related barriers, technology-related barriers and policy-related barriers to be a hindrance when it comes to the use of ICTs for information access.

It has also been revealed that very few women are involved in the sugar industry of Swaziland and to cater for gender balance issues, this scenario has provided an opportunity for the industry to promote women in this sector. Furthermore, some demographic variables of respondents were found to have an influence on their perceptions of the barriers towards the use of ICTs for information access by the sugar industry. Gender, education level and respondent's job category were found to have a significant influence on the perceptions of respondents and this implies that demographic variables must be considered when planning the use of ICTs, especially cell phones, to access sugarcane production information.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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