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INFORMATION COMMUNICATION TECHNOLOGY:PERCEPTION AND ADOPTION OF DROUGHT RESILIENCESTRATEGY FOR PRODUCERS INDRIEKOPPIES, SOUTH AFRICA

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ABSTRACT

The study explored the exigencies, perception and adoption of the use of ICT as a resilience strategy for drought and weather related events.Data was collected from selected farmers using structured and semi-structured questionnaires, focus group discussion, key informant interview, field observations, and household questionnaire survey.The data was analysed by employing descriptive and inferential statistics using (SPSS) version 26. Finding reveal that ICT has positive impact on sugar cane yield ($\bar{\chi}$ = 2.91) and there are multiple advantages associated with use of ICT for accessing agricultural information ($\bar{\chi}$ = 3.59). Furthermore, illiteracy level was perceived by farmers as a factor influencing their use and application of ICT in farming ($\bar{\chi}$ = 2.72). Although farmers agreed that ICT facilitate timely access to information ($\bar{\chi}$ =2.75), but on the contrary, they were doubtful about the reliability of such information ($\bar{\chi}$ = 2.74). Furthermore, logistic regressionanalysis indicated that there were five variables (AGE, LOE, FRMS, FARME and AICT) found to have positive and significant influence on the adoption of ICT by sugar cane farmers. The study conclude that medium and long-term action must be put in place to ameliorate the vulnerability of sugar cane farmers. Additionally, a comprehensive needs-directed policy approach aimed at improving the resilience of the farmersshould be accentuated by government of South Africa.

Keywords: Perception, Adoption, Resilience, Information, Communication, Technology, Strategy, Drought, Sugar cane, South Africa

INTRODUCTION

In South Africa, agricultureplay an important role given the increase of concerns over food security, poverty alleviation, and livelihood sustenance. In most communities in South Africa,poor resource farmers are mostly susceptible to the effects of climate- related events. The severity of weather vagaries in the area, has impacted negatively on food security and increased poverty (Mpandeliand Maponya2013). Drought is one of the main constraints for crops and livestock production in South Africa. The socio-economic impacts of droughts in South Africa are severe mostly in regions with an annual rainfall of less than 500mm.The

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production systems used by farmers are directly affected by drought, rise in temperature and a reduction in water availability (Komba and Muchapondwa, 2015).
In the recent past, agricultural sector has witnessed the introduction of information communication technology (ICT) with primary aim of ensuring its acceptance by farmers. There are indications that ICT serve as a useful tool for the provision of valuable agricultural information to farmers (Sudath, 2008). Subsistence agriculture-centred economy can be transformed into viable commercial agriculture through the expansion and implementation of ICT-led policies and programmes geared towards perfecting the impact of extreme weather shocks (ICT4AD, 2003).

Generally, ICT has the prospect of providing information to farmers and the communities in a more speedy and cost-effective way, and could also complements other media sources (Munyua, 2000). ICT does not only provide access to information but also represents an avenue where famers could communicate amongst themselves to advance change and remove negative perceptions about agriculture reminiscence of the contemporary society. The use of ICT assists in making agricultural production a more feasible activity. Producers, especially commercial farmers consent that the use of ICT improves performance with focus on sustainability of production. However, the adoption of ICT and other farm technologies as a drought resilience strategy occurs very slowly, and this is so because the choice to adopt is not only dependent on net value of innovation but also on perceptions associated with social factors (Carli et al., 2017). According to Tey and Brindal (2012) the most important factors that determine the adoption of technology include farmers perception, socio-economic, agro-ecological, institutional, informational, behavioural, and technological factor. Even though the adoption of ICT is inhibited by differences in perceptions, geographical location, farming systems, technical developments, social issues, and farm sizes, the adoption of ICT creates new avenues in farming and enhance quality of life of farmers (Lombardo et al., 2017).
Despite manyinherent advantages associated with the use of ICT in agriculture, especially as it applies to drought mitigation and resilience adaptation, there are no sufficient research study that has determined how ICTs, have been perceived as drought mitigation strategy for sugar cane farmers in South Africa. Against this background, this study investigates the perception of farmers' and the use of ICT as drought management strategy in Sugar cane farming and examine the adoption behaviour of farmers in the use of ICT for sugar cane farming in Driekoppies, South Africa. The result of this study will assist government and policy makers in decision making and to understand the perception and adoption behaviour of farmers in the use of ICT.

REVIEW OF LITERATURE

Context: ICT Perception and Adoption of Drought ResilienceStrategy

In Sub-Saharan Africa, over 60% of farmers are susceptible to drought incidence with 30% regarded as mostly vulnerable (Benson and Clay 1998). South Africa is non-exclusive with the estimation of 65% of the country receiving less than 500mm of rainfall per annum. Despite this gloomy picture, South Africa remains a water scares country with erratic rainfall pattern and depleting water resources (Agholor and Nkosi, 2020). However, the basic rainfall variation and conditions under which most crops survive revolve around a mean rainfall of 1200 mm/annum. In the last decade, the incidence and impact of adverse weather events in the farming sector have increased tremendously, and the most common type of shock is drought, and the immediate consequence is decline in crop production (Tayengwa et.al 2020). Information and data obtained from the centre for research on the epidemiology of disaster indicated that drought is a major problem in South Africa, given that several people are affected resulting in low yield and economic loss in sugar production. Farmers and

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community dwellers are often vulnerable to the negative impact of drought (Austin, 2008; Akpalu, 2005). To ameliorate the impact of drought in South African, the government has over the years implemented several drought reliefs programmes as part of a national effort to assist affected farmers to either develop resilience or combat the incidence of weather vagaries by adopting different measures.

Perception and adoption of different types of technology including ICT depends not only on economic factors, such as costs-benefits-risk evaluation, but also on the farmer's demography, social capital, motivations, attitudes, constraints, and relationship with the operating environment (Zhaoand Frank2003). Positive perception and adoption of information regarding innovation amongst farmers is important for growth and sustainable agriculture. Foster *et al* (2010), asserted that affordability as well as the farmers' expectations with regards to the long-term advantage of innovationsremain the main determinants of technology adoption. Furthermore, Akudugo (2012), categorized the factors that influence technology adoption into social, economic, and institutional factors. The traits of innovations which include relative advantage, complexity, compatibility, trialability and observability, technology characteristics, information sources, knowledge, awareness, attitude, and group influence are amongst the factors influencing perception and adoption of innovation (Rogers 1983; Oladele 2005).

In sugar cane production, water stress not only leads to the shortening of the crop reproductive phase but also induce reduction in leaf area with the closure of stomata to minimize water loss (Barnabas et al., 2008). However, some cultivars of sugarcane are moderately resistant to drought, but severe water deficiencies affect growth and yield.For instance, several measures were presented to assist farmers affected by the 2007/2008 drought. Amongst these palliative measures was the purchase and supply of fodders to farmers at subsidised rates, contingent on the need of such farmer. Provision was made for the supply of feed to maintain large, medium, and small stocks owned by farmers in Provinces affected by drought. Farmers with up to a maximum of 50 large stock units (LSU) received 10 kg/LSU per day for a month, and smallholder farmers had their share of 90% subsidy rate, while medium-scale and commercial farmers were given up to 50 LSU at 80% and 70% subsidy rates, respectively. Besides, the supply of fodder, the scheme further made provision for the repair of water infrastructure (Department of Agriculture, Forestry and Fisheries [DAFF,2007). However, there are still some constraints in the implementation of drought relief programmes in South Africa, particularly regarding perception and adoption of drought resilience strategy for sugar cane producers in Driekoppies.

Despite the enormous government investment in drought recovery measures, there is still narrow understanding of the impact of drought relief programmes in South Africa. This raise doubts as to whether the government is providing a realistic level of welfare and awareness to drought-affected farmers, whilst ensuring sustainability of agriculture in farming community. Furthermore, on-going provision of drought assistance is turning out to be expensive, exacerbated by inflation. For example, in 2007/2008 the government of South Africa, spent R285 million on drought relief (DAFF, 2007). Notwithstanding, studies (Wilhite & Knutson n.d.; Austin 2008; Hobson 1994) show unanimity amongst researchers that drought support has been ineffective, inadequately organized. In South Africa, some studies have examined, *inter alia,* situations of sugar cane farmers in drought-affected areas, but ICT perception and adoption by farmers in these areas has not been adequately articulated. It is therefore, expected that this study will add to an increasing pool of studies on information communication technology, perception, and adoption of drought resilience strategy for sugar cane producers in South Africa.

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RESEARCH METHODOLOGY

Description of study area

Driekoppies is in Nkomazi Municipality and is bounded by Mozambique to the East, Swaziland to the South, Kruger National park to North, Umjindi Municipality to the South West, and Mbombela Local to the west. The notable urban centres are Louw's Creek;Kaapmuiden; Malelane; Marloth Park; Komatipoort; KaMhlushwa, Tonga and KaMaqhekeza. The Driekoppies area is located at latitude 25^0 30' 8.8'' South and longitude 31^0 43' 48.6" East. The Lowveld associated with the area experiences annual temperatures of 19^0C - 29˚C and rainfall of 767mm, and it is notable to produce subtropical crops like maize, wheat, groundnuts, sugarcane, vegetables, and citrus along with other subtropical fruits. Natural grazing covers 14% of the land area and the major livestock production are cattle, sheep, and poultry. Sugar cane production thrives best in the area primarily because of the economics of scale in the siting of Transvaal SuikerBeperk (TSB), a processing sugar cane factory.

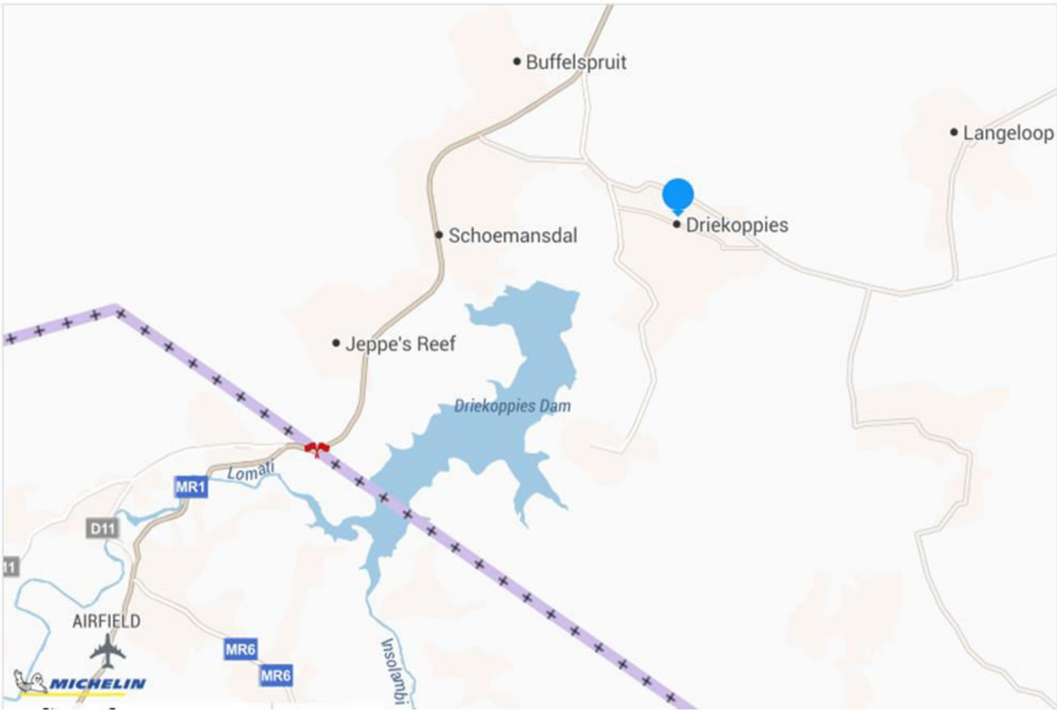

Figure .....: Map showing position of Driekoppies in Nkomazi Municipality

Research design and data collection

Research design encompassing both qualitative and quantitative techniques was employed for this study. The field work was done between January 2019 and February 2020, at both household and farm-site level. The study explored the exigencies, perception and adoption of the use of ICT as resilience strategies for drought and weather related events. The collection of data were done through focus group discussion (FGD), key informant interview (KII), field observations, and household questionnaire survey (HHQ). The FGD were useful in probing and validating responses gathered from KII, HHQ. However, random selection of respondent were adopted and were sufficiently informed prior to data collection, about the broad aim of the study, and their consent to take part in the study.The concept diagram adopted for data collection and analysis is illustrated below:

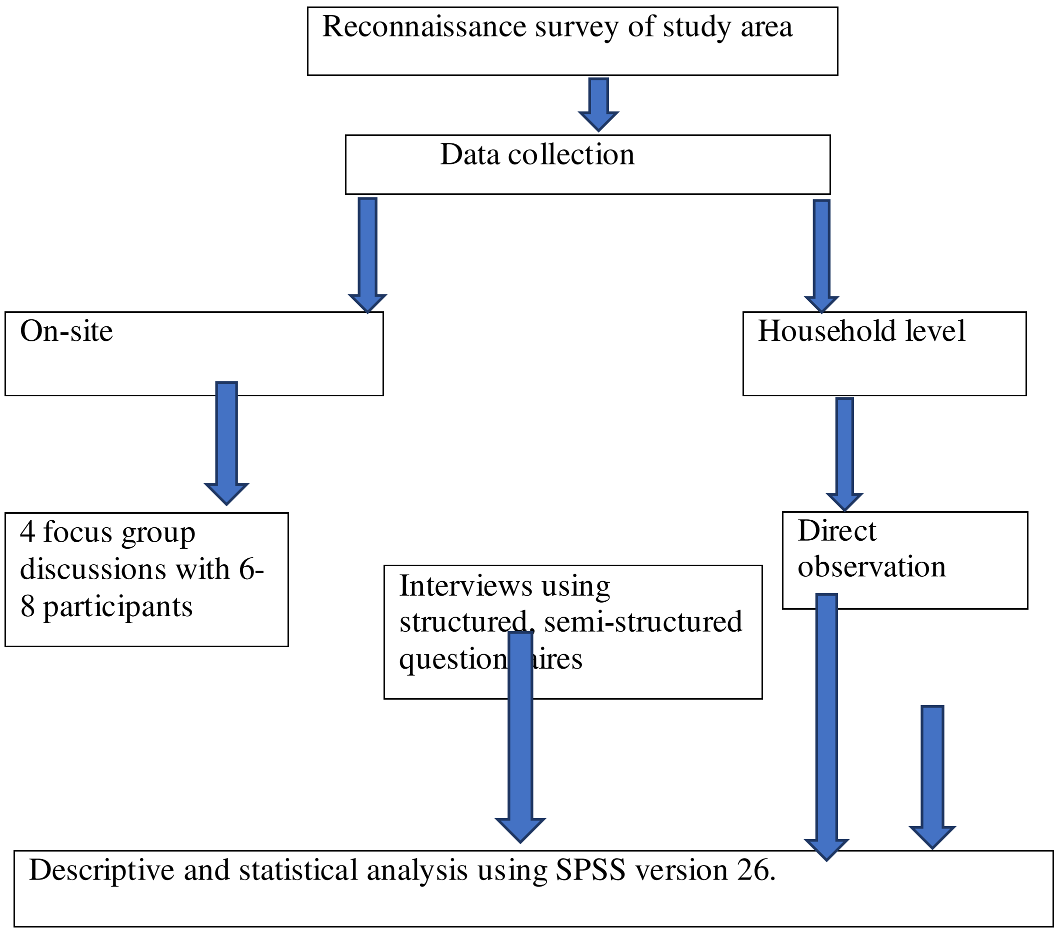

Fig 2. Concept sketch of the pathway adopted for data collection and analysis.

Reconnaissance survey

Prior to actual data collection, inspection of the study site was carried out using participatory appraisal tools such as the transect walk. The prepared questionnaire was pretested with 25 respondents to allow for adjustment, relevance,and clarity.

On-site and household survey

Sugar cane farmers were specifically chosen both on the field and at household level because they are mostly affected by weather related events. Owing to scattered farms, household settlement patterns and transport constrains, a manageable sample size of 460 were chosen as adequate for reliability and validity of results. The sample size of 460 used included a higher proportion of smallholder farmers on-site as compared to households' level.

Materials and Method

Data was collected from the selected farmers using structured and semi-structured questionnaires. The questionnaire used to elicit responses covered the socio-demographic characteristics of the farmers. Perception of farmers about the use of ICT as drought

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resilience strategy was ascertained with the use of 4-point Likert scale. The ranking of perception on the scale were 4=Strongly Agree, 3 = Agree, 2 = Disagree, and 1 = Strongly Disagree. Midpoint of 2.50 was realised, following the decision-rule that respondents (sugar cane farmers) accept the variable statements with mean score from 2.50 and above or disagree with a mean score of less than 2.50. The data was analysed by employing descriptive statistics involving frequency of responses, mean and standard deviation. The adoption behaviour of respondent was analysedemploying logistics regression using the statical package for social science (SPSS) version 26.

Adoption behaviour of sugar cane farmers in the use of ICT and the modelused.

Reflecting on the conceptual framework of this study, the adoption behaviour of sugar farmers in the use of ICT was investigated. The study espoused the logistic regression model to analyse the determinants of adoption of ICT by sugar cane farmers. Similar study (Abonazel and Ibrahim, 2018) and other researchers found that the logistic regression model is exhaustive (Nyanga, 2012) in analysing categorical and dichotomous variables. However, logistics regression model for binary variables allows the researcher to estimate probability of an event (e.g., Yes versus No), in agreement on the values of explanatory variables.
The model used the logit function: logit (p) = In (p/ (1-p), where p is theprobability of the event or outcome occurring to determine the corresponding log odds of the outcome which is modelled as a linear combination of explanatory variables. In this case, the model coefficients can thus be deduced to understand the strength of the relationship between the explanatory variables (categorical) and the dependent variables. By applying this method, the researcher carried out exponentiation of the coefficients and interpret them as odds ratios. Furthermore, logistic regression models remain an ideal tool for analysing variables that are binary and categorical because it assists the researcher to determine effects of an outcome or event, make predictions and strategize for future circumstances (Nargundkar 2015).In conformity with adoption behaviour,respondents were categorized into adopters and non-adopters. The respondents who adopt ICT takes the value of 1 and the non-adopters takes the value of 0. The probability of a farmer being an adopter of ICT is predicted by odds (Y=1), which implies that the ratio of the probability that Y = 1 is to the probability that Y≠ 1:

$$\text{Odd } Y = \frac{P(Y=1)}{(1-P(Y=1)} \qquad 1$$

Thus, the logistic model is specified as follows: logit Y is given log of Odds.

$$\text{In}\left\{\frac{P(Y_i = 1)}{(1-P(Y_i=1)}=\right\} \text{log Odds= logit } (Y) \qquad 2$$

The equation can be expanded thus:

$$\text{Logit (Y)} = \beta_o + \textstyle\sum\beta_1 X_1 + \sum\beta_2 X_2 + \ldots.. \sum\beta_n X_n + \mu \qquad 3$$

Where:

Y= dependent variable

β_o = intercept

$\beta_1 \ldots\ldots \beta_n$ = coefficient of the independent variables

μ= error term

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The categorical variables *(X_i)* included in the model were gender (GENDER), age (AGE), level of education (LOA), farm experience (FARME), Size of farmland (FARMS), ICT information (ICTI), Access to Extension services (AES), Access to ICT (AICT). In line with the above explanatory variables, the general form of equation [4] was rewritten below to represent the probability of adoption or non-adoption by households' in the study area as:

$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_{11} X_{11} + \mu$ …………………………………………… (4)

Where:

Y = Choice to use or apply ICT (Farmers use ICT = 1, O = otherwise)

X_1 - X_9= independent variables demarcated as:

X_1 = Gender (Male = 1, Female = 2)

X_2= Age (years)

X_3 = Level of education (No school =1, Primary school = 2, Secondary = 3, Tertiary = 4)

X_4 = Farm experience (years)

X_5 = Size of farmland (number)

X_6 = ICT information (Poor = 1, Fair = 2, Good = 3)

X_7= Access to Extension services (yes=1, No = 2)

X_8 = Access to ICT (yes = 1, No = 2)

β_0 = constant

B_1- β_8 = standardized partial regression coefficients

μ = error term

Table 1: Operational variables, measurement and expected sign

Variable and code	Operational description	Measurement unit	Expected sign
Gender (GENDER)	Male or female	1=male, 2=female	+
Age (AGE)	Number of years	1=20-30, 2=31-40, 41-50, 51…….,	-/+
Level of education (LOA)	Scholastic achievement	1 = Pry, 2=secondary, 3= ……….	+
Farm experience (FARME)	Number of years in farming	1=5-10yrs, 2=11-20….	+
Size of farmland (FARMS)	hectares of land	1=1-3ha, 4-6ha…….	-/+
ICT Information/Spending on (ICT)	Acquisition of information and spending on ICT	1= yes, 2= no	-/+
Access to Extension services (AES)	Household access and awareness of extension	1= yes, 2 = no	+
Access to ICT services (DUID)	Use of ICT	1 = yes, 2 = No	-+

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RESEARCH FINDINGS AND DISCUSSION

Table 2: Indicate the socio-economic characteristics of farmers in the study area. Majority of the respondents were in the age group of 20-30 years (28.3%) old while 17.4%, 16.3%, 17.4%, 12.0%, and 8.7% were in the age range of 31-40, 41-50, 51-60, 61-70, and 71-80 respectively. The male respondents were 44.6%, and female 55.4% while 14.1% had primary education, 48.9% secondary, 29.3% tertiary, 2.2% ABET (adult education), and 5.4% No school. The farm experience of respondents was in the range of 5-10 years (54.3%), 11-20 years (28.3%), 21-30 years (10.9%), and more than 31 years recorded a value of 6.5%. Farmers who had access to ICT information services, for the purpose of resilience adaptation were 53.3% while 46.7% have no access to ICT information. From the focus group discussion, it was explicit that majority of farmers were serviced by extension officers in the area. However, 67.4% of the respondents received services from extension officers.

Table 2: Demographic characteristics of sugar cane farmers

Variable (N=460)	Frequency	%
Age:		
20-30	130	28.3
31-40	80	17.4
41-50	75	16.3
51-60	80	17.4
61-70	55	12.0
71-80	40	8.7
Total	460	100.0
Gender:		
Male	205	44.6
Female	255	55.4
Total	460	100.0
Level of Education:		
Primary	65	14.1
Secondary	225	48.9
Tertiary	135	29.3
ABET	10	2.2
No School	25	5.4
Total	460	100.0
Farm Experience:		
5-10yrs	250	54.3
11-20yrs	130	28.3
21-30yrs	50	10.9
>31yrs	30	6.5
Total	460	100.0
Farm Size:		
1-3ha	210	45.7
4-6ha	35	7.6
7-9ha	105	22.8
>10ha	110	23.9
Total	460	100.0
Access to ICT information:		
Yes	245	53.3
No	215	46.7
Total	460	100.0

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ICT Information:		
Yes	300	65.2
No	160	34.8
Total	460	100.0
Extension Services:		
Yes	310	67.4
No	150	32.6
Total	460	100.0

Farmer's perception of information communication technology

The findings as presented in Table 3,indicate that 13 variables were used to illustrate perception of ICT in sugar cane farming, respondents positively perceived 6 variables as relevant in the use of ICT at farm level. Results indicate that majority of farmers asserted that ICT has positive impact in sugar cane yield ($\bar{\chi}$ = 2.91)and this findings, corroborated the use of internet to get information about production related issues ($\bar{\chi}$ =3.07). Respondents also asserted that there are multiple advantages associated with use of ICT for accessing agricultural information ($\bar{\chi}$ = 3.59). This finding is not surprising because from our focus group discussion, majority of the farmers were unanimous to the fact that ICT remains a fast and easy way of assessing agricultural information especially prices of farm produce and input. Furthermore, illiteracy level was perceived by farmers as a factor influencing their use and application of ICT in farming ($\bar{\chi}$ = 2.72). Although farmers agreed that ICT facilitate timely access to information ($\bar{\chi}$ =2.75), but on the contrary, there were doubtful about the reliability of such information ($\bar{\chi}$ = 2.74).

Table 3: Farmers' perception of information communication technology (ICT)

Variables	**Mean**	**Std Error**	**Std. Deviation**
Would you like to pay for ICT services, if provided by extension officers?	1.38	.023	.486
Do you think ICT Tool can assist smallholder farmers in combating drought?	1.32	.022	.465
What do you think about ICT in terms of increasing yield?	2.91	.059	1.267
Do you think ICT assist to develop resilience against drought	2.34	.060	1.289
Is it worth spending on ICT?	1.25	.020	.433
Do you often use internet to get information about production related issues?	3.07	.073	1.568
Do you Listen to radio programmes relating to agriculture?	1.26	.020	.440
Do think there are advantages derived from the use of ICT?	3.59	.117	2.510
Do you use ICT tools as climate risk aversion alternative?	.48	.023	.500
Do you use ICT as tool for cautionary savings for climate risk?	.55	.023	.498
I am not educated enough to use ICT	2.72	.059	1.265
The use of ICT will facilitate timely access to necessary	2.75	.059	1.260

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information			
Information accessed through ICT are not reliable	2.74	.059	1.261

The study used logistic regression model for analysis. The determinantsof adoption behaviour were grouped into: Age (AGE), gender (GEDR), level of education (LOE), farm size (FRMS), farm experience (FARME), access to ICT information (AICT), awareness of ICT in agriculture (AOU) and access to agricultural extension services (EXTNS).

Logistic regression outcome

Given that, in any model with a categorical dependent variable, it is not possible to compute a single R^2 statistic that has all the characteristics of R^2 in the regression model, so approximations were computed instead (Nagelkerke, 1991). The Nagelkerke *R* Square values provide an indication of the amount of variation in the dependent variable explained by the model (from a minimum value of 0 to a maximum of approximately 1).
In this study, Nagelkerke R^2 was calculated as a proxy estimate to R^2in ordinary logistics regression which measures the amount of the variations in the responses as explained by the model. Therefore, the Nagelkerke $R^2$of 0.610 was obtained which inferred that the model's estimate fit the data at appropriate level (Table 5). The overall percentage was 75 (Table 4). The logistic model reflected five variables (AGE, LOE, FRMS, FARME and AICT) to have significant influence on the adoption of ICT by sugar cane farmers while three variables.

Table 4: Determinants of adoption behaviour of smallholder farmers in the use of ICT

Independent variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
AGE	-7.081	3.443	4.229	1	.040*	.001	.000	.717
GEDR	2.057	1.144	3.231	1	.072	7.820	.831	73.640
LOE	8.811	3.371	6.833	1	.009*	6708.115	9.067	4962746.570
FRMS	5.658	2.038	7.709	1	.005*	286.699	5.280	15566.659
FARME	5.885	3.114	3.572	1	.059*	359.557	.804	160819.328
AICT	-5.431	1.822	8.880	1	.003*	.004	.000	.156
AOU	2.044	1.116	3.356	1	.067	7.725	.867	68.853
EXTNS	-.978	.912	1.151	1	.283	.376	.063	2.245

-2 Log likelihood:	54.613
Cox & Snell R^2	.412
Nagelkerke R^2	.610
% correctly predicted	75.0

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Significant variables influencing adoption behaviour of smallholder sugar cane farmers at 0.05 (*) level of significance.

The variable age was found to be significantwith *p-value* of .040 but negatively related to the adoption of ICT in the study area. The result suggests that with increase in age of household, the probability of adoption of ICT decreases. This result indicate that younger households are more likely to take risk related with new technologies and use of ICT than older farmers. Additionally, young farmers are new in the farming business and are motivated to adopt the use of ICT. This finding agrees withMorris and Venkatesh, (2000), who found that as age increases, the likelihood of adoption decreases. In contrast to this findings, Fikru (2009) reported that younger farmers are less likely to adopt the use of sustainable water conservation practice (SWC). This is because younger farmers are unwilling to accept SWC practices. Furthermore, this result is corroborated by the study of Agholor and Sithole 2020, who found that for every increase in age of households, there are chances of decreased interest to adopt modern weed control method. Older farmers are inclined to risk aversion with limited fear of investment.

The level of education was found to be a significant variable with a p-value of .009 and positively related to the adoption of ICT in sugar cane farming. This result suggests that as the level of education of the farmer increases, the probability of adopting ICT also increases. This indicates that the higher the level of education, the higher the chances that a farmer will adopt ICT tools. Furthermore, farmers that are educated tend to perceive innovative technologies in a very positive manner. This result agrees with (Mignoun*et a*l ,2011) who reported that the educational level of a farmer increases his ability to retrieve, make sense out of information and apply information appropriate for the adoption of a new technology.The farm size (*p-value* 0.005) was found to be positive and significantly influence the adoption of ICT. This result suggests that with every increase in farm size, the probability of adopting ICT also increases. This means that the bigger the farm size, the higher the chances that a farmer will adopt the use of (ICT). Additionally, farmers with larger farm sizes are more likely to take risks, run farm trials and obtain results which will ultimately induce adoption. This finding lead credence to the study of Lavison (2013) who found that a positive relation exists between farm size and the adoption of ICT. On the contrary, the study by Samiee et al., (2009) reported a negativerelationship between farm size and the adoption of ICT.

The farm experience of the farmer was found to be a positive and significant variable with a *p-value*of .059.The implication of this result is that the greater the number of years a farmer remains in farming, the odds of adoption increases correspondingly provided that all other variables remain constant. The study of Ighoro, *et al* (2019), found that farmers with years of experience were willing to adopt organic farming method. Furthermore, the result is substantiated by the study of Kariyasa*et al* (2013), found that older farmers are considered to have gained knowledge and experience over time, thus they are more capable of evaluating technology information than younger and inexperienced farmers.Access to ICT by the farmer was found to be significant variable with *p-valu*e of .003, but negatively related to adoption of ICT. This finding indicates that access to ICT is negatively related to the adoption of ICT by sugar cane farmers. This finding suggests that with increase in access to ICT there is a decrease in the probability to adopt provided that all other variables remain constant. The implication is that farmers with access to ICT facilities are less likely to adopt. The result of this study is in contrast with(Franklyn*et al.*, 2012) found that an individual with a higher level of access to ICT will have a higher level of ICT adoption.

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CONCLUSION

In South Africa, some studies have examined, *inter alia,* situations of sugar cane farmers in drought-affected areas, but ICT perception and adoption by farmers in these areas has not been adequately articulated. It is therefore, expected that this study will add to an increasing pool of studies on information communication technology, perception and adoption of drought resilience strategy for sugar cane producers in South Africa. Against this backdrop, this study investigates the perception of farmers' and the use of ICT as drought management strategy in Sugar cane farming and examine the adoption behaviour of farmers in the use of ICT for sugar cane farming in Driekoppies, South Africa.

The findings as presented in the study, indicate that 13 variables were used to illustrate perception of ICT in sugar cane farming, respondents positively perceived 6 variables as relevant in the use of ICT at farm level. Results shows that majority of farmers indicated that ICT has positive impact in sugar cane yield ($\bar{\chi} = 2.91$), and these agrees with farmers use of internet to get information about production related issues ($\bar{\chi} = 3.07$). Respondents also asserted that there are multiple advantages associated with use of ICT for accessing agricultural information ($\bar{\chi} = 3.59$). This finding is not surprising because from our focus group discussion, majority of the farmers unanimous agreed that ICT remains a fast and easy way of assessing agricultural information especially prices of farm produce and inputs. Furthermore, illiteracy level was perceived by farmers as a factor influencing their use and application of ICT in farming ($\bar{\chi} = 2.72$). Although farmers agreed that ICT facilitate timely access to information ($\bar{\chi} = 2.75$), but on the contrary, they were doubtful about the reliability of such information ($\bar{\chi} = 2.74$).

The logistic model indicated that there were five variables (AGE, LOE, FRMS, FARME and AICT) out of eight independent variables found to have significant influence on the adoption of ICT by sugar cane farmers while three variables (GEDR, AOU and EXTNS) were not significant.The age of the respondentswere found to be a significant variable with *p-value* of .040 but negatively related to the adoption of ICT in the study area. The level of education was found to be a significant variable with a p-value of .009 and positively related to the adoption of ICT in sugar cane farming. Furthermore, farmers that are educated tend to perceive innovative technologies in a very positive manner. Farm size was found to be a positive and significant variable in the adoption of ICT in the study area, with a *p-value*= .005. Additionally, farmers with larger farm sizes are more likely to take risks, run farm trials and obtain results which will ultimately induce adoption. The farm experience was found to be positive and significant variable (*p-value* = .059). Access to ICT by the farmer was found to be significant variable with *p-value*= .003, but negatively related to adoption of ICT.

The long-lasting impact of drought remains an on-going task that requires the cooperation of all relevant stakeholders, particularly in ensuring that medium- and long-term actions are put in place, to ameliorate the vulnerability of sugar cane farmers. A comprehensive and needs-directed policy approach aimed at improving the resilience of the farming community whilst at the same time encouraging sustainable management of natural resources must be accentuated by government. Because drought is a major limiting factor in South Africa where rainfed agriculture predominates, matters relating to drought policies and administration, must receive adequate attention by government. However, the result of this study will assist government and policy makers in decision making and to understand the perception and adoption behaviour of farmers in the use of ICTfor suitable agriculture in South Africa.

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