

Roles of Universities in Rural Farmers' use of Extension Suite Online System as Solution for Subsistence

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Agriculture plays a pivot role in the economic development of any area: urban and rural inclusive because it is a source of employment and sustainable livelihood. Conversely, Information Communication Technology has brought to the fore efficient ways of information dissemination for agricultural development. This study investigates the impact of using Extension Suite Online System (ESOS) for farming. Qunu Area in the Eastern Cape Province was selected for the study. Qualitative method was adopted for data collection through the use of semi-structured interviews conducted for eight conveniently selected subsistence farmers servicing the area. The collected data was coded and thematically analysed. A finding of the study amongst others showed that information is paramount for farmers. Also, the introduction of the ESO system to the Qunu rural farmers helped to close the information gap that was initially a challenge and it fascinated young people who perceived agriculture as a sector for older people. However, findings further revealed that most farmers in the rural area are computer illiterate and this affects their appreciation and use of the ESO system. The study recommends amongst others that universities should organise short term programmes on computer literacy and other useful skills for rural farmers.

Key words: *Extension Suite Online (ESO) System, Information Communications Technologies (ICT), Rural Farmers.*



Introduction

African National Congress (ANC) Agricultural Policy (1994) views the agricultural sector as being of crucial importance to South Africa for various reasons, amongst which are: it is the primary source of food and fibre for the nations; it makes a greater contribution to the economy suggested by its share of GDP; it provides employment to over 1.2 million farm workers which in turn provides livelihood to their families; and it is an important source of income and contributor to household food security for millions of the poorest South Africans. The ANC policy continues to indicate the way the agricultural policies of the apartheid government have been biased in favour of large scale farmers. Black rural people have systematically been deprived of land and agricultural support services. Meanwhile, The Reconstruction and Development Programme of 1994 acknowledges the importance of agricultural and rural development in terms of reducing poverty, unemployment and inequality in South Africa. The ANC's agricultural policy has been directed at: improving support for the neglected small-scale farming sector; promoting household food security; boosting rural employment; and improving more sustainable farming practices. StatsSA (2015) indicates that prior to 1994 agricultural census has largely concentrated on commercial agriculture, leaving out small-scale farmers and subsistence agriculture. This clearly showed that there was not enough data even for planning and implementing the agricultural policy in South Africa. In 1994, 55,000 commercial farmers were the main users of agricultural services and thirty percent of these farmers were responsible for 80 percent of the country's agricultural output. The DAFF Agric Policy Plan (2014) states that Cabinet (July 2013) resolved that the Department of Agriculture develop a plan that addresses the National Development Plan and New Growth Path.

Information Communication Technologies (ICTs) in Agricultural Policy Implementation

InfoBridge (2012) states that ICTs have brought to the fore new ways of doing things and there is a general realisation that information technology should be integrated to be effectively used in agricultural development as facilitating tools to boost its impact on the lives of farmers. Ganzel (2009) had earlier stated that technological gadgets such as computers should be identified and regarded as a tool for farmers in implementing agricultural practices. Reviews of the works of Mzirai (2017) as well as Saiz-Rubio & Rovira-Más (2020) show that in the 21st century, the use of ICTs is vital. Mzirai (2017) further calls for digital farming in the 21st century. Various scholars such as Mzirai (2017) as well as Saiz-Rubio & Rovira-Más (2020) continue to hold the view that the role of ICT to stimulate agriculture, enhance food security and support rural livelihood is increasingly realised and acknowledged. This was previously officially endorsed at the World Summit on the Information Society (WSIS) 2003-2005. Tongeren (2008) states the same on monitoring and evaluation of government policies using ICTs. A process to monitor the achievements of

policies and evaluating them in terms of their efficiency needs to be put in place. He further states that relevant information systems should produce information that is used by policy decision makers.

Expert and Decision Support Systems in Agriculture

Rani, Rajesh & Saravan (2011) stipulate that an expert system is a computer program designed to model the problem solving ability of a human expert. There are several major areas of expert systems such as agriculture, education, environment and medicine (Rani, Rajesh & Saravan, 2011). In this study, the researchers reviewed the impact of the use of the ESO expert system in agriculture focussing in the rural subsistence and emerging farming. Recently, expert systems are widely used in agriculture exclusively for diagnosing and managing agricultural related problems, be it an animal disease, nutritional problem, weed control cultivation, animal pathology, soil fertility etc. These problems are mainly dependent upon human experts for their diagnosis and getting solutions. Moreover, the human experts are very scarce or are not always available when and where they are needed. One of the advantages of an expert system is that once developed it can raise the performance of an average worker to the level of an expert. These systems increase the probability and consistency of making good decisions.

Assessing the Impact of Technology is Crucial

The screening of technology is important since not all innovations are relevant or attractive to all areas. According to Androuse, Cao & Javad (2013) following a study conducted in India, the implementation of agricultural practices and use of the latest technology is not enough. Thus, it is vital to screen the technologies according to the geographical areas and the local contexts of agriculture and recommend appropriate technologies. The same touched on the usefulness and need of an expert system. It indicated it was proven the expert system in agriculture helps in increasing the crop production, however, it could not provide evidence of statuses before and after these systems were introduced. Hence, the question: why the implementation of expert systems? According to Rani, Rajesh & Saravan (2011), a range of expert systems were interrogated and the study was done based on horticulture specialists who are generally not accessible where and when needed in the rural areas of India. In this case, expert systems are a viable option, the same reason for the implementation of ESO in the Department of Agriculture as an intervention programme by the South African government. However, in spite of the intervention by the government, the question remains whether farmers, especially those in rural areas have truly been helped following various constraints. Hence, the reason for this study which explores the challenges experienced by extension advisors as well as emerging farmers in using and accessing information, and how the ESO system has impacted the lives of emerging farmers using Qunu area of Eastern Cape Province, South Africa. The reason for this exploration following the findings of the study

was to deduce the role that could be played by universities in corroborating the efforts of the South African Government in enhancing rural farmers' use of the ESO system as a solution for subsistence. In achieving the objectives of the study, attempts are made to proffer solutions to the two identified research questions of the study. These questions are:

- What are the challenges experienced by extension advisors as well as emerging farmers in using and accessing information?
- How has the Extension Suite Online impacted the lives of emerging farmers in Qunu?

Methodology

The study was premised on the ideology of interpretivism. Hence, the qualitative method was adopted for the study. Data was collected with the use of semi-structured interviews. Kumar (2019) and Creswell (2014) opine that the qualitative method can be adopted for data collection in a study through the use of interviews which can be structured or semi-structured. They further posit that the reason for the adoption of interviews for data collection is to enable the researcher to elicit in-depth information on the subject matter under focus. Purposive sampling was adopted for selecting the research site: Qunu Area in the province of the Eastern Cape. This was to ensure that a rural area was selected for the study. Meanwhile, convenient sampling was adopted for selecting the respondents of the study. Convenient sampling was adopted for selecting the participants of the study. This was based on their availability, time schedule and interest to partake in the study. Hence, semi-structured interviews were conducted for eight (8) participants.

Data Analysis

The collected data were coded and thematically analysed.

Findings and Discussion

Farmers and advisors were interviewed to collect their perceptions in using ESO. The following themes emerged from the responses of farmers and advisors.

Research Question 1

What are the challenges experienced by extension advisors as well as emerging farmers in using and accessing information?

Theme 1: Computer skills are still a challenge amongst the rural farming community.

While knowledge about computers has become crucial for the digital world, findings reveal that not everyone is equipped with computer usage skills. Most of the interviewed farmers in

the Qunu region indicated that they struggle with performing highly technical tasks using computers. In the quest to advance the agriculture field through technology, lack of computer skill could work against the pursuit. Evidence gathered from the findings also reveals that the most accessed form of computer is the mobile phone. Based on that evidence perspective developers of decision support systems must ensure that mobile versions of ESO are user-friendly.

Literature analysis reveals that Decision Support Systems (DSS) are a class of laptop-based statistics structures that contain expertise systems that aid decision making (Naidu , 2014). DSS requires individuals to have computer skills. According to Naidu, the system helps human beings operate alone using computer intelligence to generate options and make decisions. In practice, references to DSS are generally references to laptop packages that carry out one of these helping positions (Wareham, Zheng & Straub).

The following responses in verbatim proves this.

Table 1: Computer skills are still a challenge amongst the rural farming community.

Participants	Response
F1	<i>I am able to perform some basic functions and use applications such as word.</i>
F2	<i>Computers are difficult for me because I was only able to learn them when I was old.</i>
F3	<i>Word is the only thing that is easy for me on computers.</i>
F4	<i>I went to a group A school, we grew up using computers and for me it is not a challenge. I can use it to perform any task, except technical tasks such as connecting printers.</i>
F5	<i>Computers are something that I am afraid of using because I am scared of damaging them if I press incorrect buttons.</i>
F6	<i>For me the computer is for only three things. I use it for typing word documents, sending emails and listening to music.</i>
F7	<i>I do not use my computer when looking for things on the internet because I have a mobile phone, which goes on the internet and allows me to look for</i>

	<i>anything. I however use my computer for typing word documents and not complicated stuff.</i>
F8	<i>Software and other complicated applications are not for me on the internet. I am only able to perform simple tasks, which require not much skill.</i>

Sequel to the responses of participants on Theme 1 it is obvious that computer skills are still a challenge amongst farmers in the selected rural area. This finding corroborates the finding of the work of Mbagwu, Benson & Onuoha (2018) who opine that in developing countries one of which is South Africa, one of the challenges of meeting the information needs of rural farmers through internet-based service is their lack of computer skills.

Theme 2: Phobia for computers and limited training on the system hindered full potential use of the ESO system.

In terms of usability, at least three of the eight respondents indicated that they were comfortable with the ESO system. The respondents especially commended the ease of navigability of the mobile ESO version. Cross sectional analysis of the farmers shows that phobia for computer technology generates negative attitude among users. A number of farmers seem not to have knowledge of the benefits associated with use of the ESO. Ignorance is therefore a cause for negative attitude towards the extension online system.

Analysis of literature reviews that geographic isolation of farmers makes it difficult for them to access markets and share common prices (Lindblom & Ljung, 2013). This indicates that the advent of online extension suites came as a mean to help farmers regain their bargaining power which initially was restrained. The attitude of users has much to do with the manner in which individuals perceive technology as a whole, regardless of its specific use.

The following responses in verbatim demonstrate this:

Table 2: Phobia for computers and limited training

Participants	Response
F1	<i>The training that I did was facilitated by a colleague of mine and I can use ESO.</i>
F2	<i>I am not very comfortable and you know with my age it is a bit late for me to fully grasp and learn to use these Online</i>

	<i>Systems.</i>
<i>F3</i>	<i>I was introduced to it at school we did not go much into detail but I would like to do much training and learn more about it.</i>
<i>F4</i>	<i>I am very comfortable with computers. I do not have much knowledge about ESO but I did some basics, which I came across on the internet. I therefore recommend others to use it because it seems to be helpful in developing agriculture and lives in this area.</i>
<i>F5</i>	<i>I am not comfortable in using computers at all because I did not have the chance to study them when I was still at school.</i>
<i>F6</i>	<i>Fairly comfortable I was not taught much and I did not have much interest in using ESO.</i>
<i>F7</i>	<i>I am comfortable with using computers especially on complicated or complex tasks. I learnt about ESO on the internet when I came across it. I would also recommend others to try to use it.</i>
<i>F8</i>	<i>I am not comfortable with using computers. I do not have opportunities that enable or motivate me to use ESO.</i>

Theme 2 shows that phobia for computers and limited training affect rural farmers. This finding agrees with the finding of the works of Mzirai (2017) as well as Saiz-Rubio & Rovira-Más (2020) which suggest the need for computer literacy training and the like for farmers in order to enable them overcome their fears and boost their confidence. Meanwhile, Ganzel (2009) holds the view that the computer is a tool needed by farmers, hence, by extension, there is need for them to be duly trained in order to maximise its usefulness to their benefits.

Theme 3: System benefits are dependent on the availability of basic infrastructure (electricity, broadband coverage).

The issue of high cost has been one of the barriers limiting the implementation of electronic agricultural systems. Researchers have noted absence of supporting policy for ICT implementation as a challenge limiting the usability of ESO. Literature notes lack of context of rural-ICT-based total innovations and lack of understanding of the value of ICT as major obstacles. For many users the time and resources involved in getting to know and apply new innovation may be perceived as a loss in itself (Viljoen, Bennett, Berndt & van Zyl, 2005). Farmers interviewed in the Qunu area raised trust concerns associated with the use of the internet mediated services. Additionally, it was also noted that the network in the rural Qunu area is sometimes low due to lack of power and malfunctioning of the system itself. The need for trust when dealing with technology implies that trust is a risk factor. Vast research evaluating the relationship among technology trust and adoption exists and these have been founded on the need to explore the risks associated with technology (Beneke & Adams, 2011).

The following responses in verbatim proves this:

Table 3: System benefits are dependent on the availability of basic infrastructure (electricity, broadband coverage)

Participants	Response
A	<i>I think it is very reliable and information is readily available for farmers to explore.</i>
B	<i>It is not reliable considering poor internet networks in this area.</i>
C	<i>Also, the system is being used to terminate customer account also when you adding a new meter.</i>
D	<i>We are using solar system as a source of power and we are affected by bad weather, resulting in us not being able to use the ESO.</i>
E	<i>I think it is fairly reliable and available, more work still needs to be done in training farmers on how to use it.</i>
F	<i>This system is not reliable because it cannot work offline and therefore limits farmers when there is no internet access.</i>

G	<i>The system is greatly useful and I like it.</i>
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The finding from Theme 3 shows that poor availability or unstableness of basic infrastructure such as electricity and broadband coverage, amongst others in rural areas negatively affect the use of computers by rural farmers. This finding agrees with the finding of the work of Mbagwu, Benson & Onuoha (2018) who state that lack of infrastructure that are ICT related through which internet-based services are made available and accessed by people constitute the challenges experienced and affecting farmers in rural areas in their use of computers and other ICT related gadgets.

Theme 4: Perceptions and adapting to change are key.

Attitudes, basic infrastructure, involvement of young people and change management are seen as key contributors in adoption of technology. Older people in the rural areas predominantly practise agricultural activities and there is correlation between adoption and age group.

The following responses in verbatim attests this:

Table 4: Perceptions and adapting

Participants	Response
A	<i>Sceptic people are generally scared of trying new things. Change is normally regarded as a threat to old systems.</i>
B	<i>Also the training is inadequate.</i>
C	<i>Most women are not generally given enough space and time by their husbands to study new technologies through use of computers and mobile phones yet they contribute significantly to farm output.</i>
D	<i>The network challenge: the network gives us problem when the new system is introduced, there will be delays because of that.</i>
E	<i>We don't know how to pinpoint these challenges, but obviously when a new thing is introduced there will be a challenge. For example, the introduction of new system changes how we do things that affect how we do our work. The problem is that they do not ask</i>

	<i>or consult us before introducing a new system so that we can have our inputs. Because at the end of a day we are one who going to use this system.</i>
F	<i>Technology has in some instances has been viewed as a destruction of culture and religion therefore when such kind of technologies are introduced people do not normally want to engage.</i>
G	<i>Only young people rely completely on technology and throw away our traditional ways of doing things.</i>

Theme 5: Advisors and farmers understand the value of technology in agriculture in accessing information.

Technology adoption changes lives as it improves the older ways of doing things. Reporting and decision-making are quicker. However, there are aspects that need a changed mind-set for technologies to be fully effective. The following responses in verbatim proves this:

Table 5: Advisors and farmers understand the value of technology in agriculture in accessing information

Participants	Response
D	<i>Fair enough to say it has positively affected on the farmers' side however farming has more other things that are influential to it. For instance weather, legislation, socio-economic factors etc.</i>
E	<i>Small scale farmers lacked sufficient knowledge about farming processes and the system is useful for managing their decisions.</i>
F	<i>Subsistence farmers are not educated enough to be good farmers and need guidance.</i>
G	<i>Technology might help farmers but adoption of the technology is a challenge.</i>

Findings from the interviews reveal that not everyone is computer literate in the rural region of Qunu. While most participants of the study have the basic understanding of what a

computer is, they however lack knowledge of some applications such as excel and power point. Additionally, respondents indicated that they are not equipped with the knowledge of how to install software and other programmes on the computer. Some respondents indicated that they would recommend other people to use the ESO. Some of the respondents credited their skills to colleagues from within the departments. This finding agrees with the finding of the works of Levine & Donitsa-Schmidt (1998); Mzirai (2017); as well as Saiz-Rubio & Rovira-Más (2020) who hold the view that there is need for farmers to have computer knowledge, thus, the reason for them to be trained in that regard. Mzirai (2017) goes further to show that the need for computer knowledge in farming in the 21st century is crucial. This accounts for the reason why farmers should be equipped with the knowledge of various computer skills useful for their practices.

Theme 6: Lack of computer skills amongst rural farmers.

Most of the interviewed farmers in the Qunu region indicated that they struggle with performing highly technical tasks using computers. In the quest to advance the agriculture field through technology, lack of computer skill and limited training about technology could work against the pursuit. Cross sectional analysis of the farmers shows that phobia for computer technology generates negative attitude among users. A number of farmers seem not to have knowledge of the benefits associated with use of the ESO. Ignorance is therefore a cause for negative attitude towards the extension online system. Technology benefits were dependent on the availability of basic infrastructure (electricity, broadband coverage). Small scale farmers lacked sufficient knowledge about farming process and they are not educated enough to be good farmers.

Research Question 2

Theme 7: ESO system and diagnostic questions as the main purpose.

The interviewed farmers who had experience with using the ESO indicated that its services were of a good quality because it assisted them in completing their search for relevant information. The system enables users to obtain and use extension services that they otherwise would not have accessed in the absence of the ESO. Some users however indicated that they have experienced service failure in some instances. The failure has appeared in the form of slow service and unresponsive buttons on the system. Meanwhile, technology has been broadly researched inside the context of rural agriculture as regards to agricultural extension projects (Danso-Abbeam, Ehiakpor & Aidoo, 2018). They further opine that agricultural extension includes catalysing high quality modifications in the behaviour of farming communities by each engaging and applying technological innovation. The idea of agricultural extension emerged from the perception of “extending” the scientific agricultural production expertise. Based on the views expressed in literature, it could be concluded that

the ESO is of considerable quality. Trust was however highlighted as one of the risk factors creating illusion in users in terms of their perception of e-service quality. The following responses in verbatim proves this:

Table 4: The system assists a great deal with diagnostic questions as the main purpose

Participants	Response
A	<i>It has met my desired expectations so far. I have been able to reach markets that were unattainable before it was introduced.</i>
B	<i>It does not meet my desired expectations. It could be simplified and made understandable to us.</i>
C	<i>As of now I can say it meets my expectations. The platform has opened doors for me I can now readily access extension services that were not easily obtainable before.</i>
D	<i>It does meet some of my expectations.</i>
E	<i>It does not meet my expectations because it is only for the computer literate.</i>
F	<i>It meets some people's expectations and definitely not mine.</i>
G	<i>It answers most of our questions and it has helped many farmers in this area. It fairly meets my expectations.</i>

The findings from Theme 7 show that ESO contributes immensely to rural farmers positively. This finding coincides with the findings of the work scholars such as Letshele (1999); Chisita (2013); Haruna & Baba (2017); as well as Mbagwu, Benson & Onuoha (2018) who opine that information is key especially in the 21st century and the place of technology in retrieving such is important. A further finding from Theme 7 also shows that certain factors hamper the retrieval of needed information through the use of technology. This finding agrees with the works of Nicholas-Era (2017) as well as Mbagwu, Benson & Onuoha (2018) who opine that factors such as poor or no internet facilities, ignorance and timidity, amongst others hamper rural farmers' use of technological gadgets in retrieving needed information.

Theme 8: Technology combined with other factors can improve productivity, food security and poverty levels.

The use of ESO would significantly drive down costs for farmers and eliminate the need for middlemen. For instance in West Africa, many rural cocoa farmers have remained poor despite their product being among the world's best. In the absence of technology, these farmers operated without the necessary information essential for profit making (Conradie, 2007). Substantiating evidence from the gathered information from interviews shows farmers indicated that they have benefited from the ESO in terms of improved productivity. Improved productivity has also had an impact on food security and poverty elimination. A critical analysis of the responses however reveals that productivity could be attributed to several other factors which are no linked to the ESO. Among the factors which could improve productivity include rainfall, employee participation and weather conditions. The following responses in verbatim proves this:

Table 5: Technology combined with other factors can improve productivity, food security and poverty levels

Participants	Response
A	<i>Yes there has been a positive change on food security and poverty levels have decreased significantly.</i>
B	<i>Improvement in yields has not been significantly observed in this area. Food security and poverty levels are still very high in this community.</i>
C	<i>Yes yields have been increasing from here to there but without a subsequent increase in food security and decrease in poverty levels.</i>
D	<i>Yields have been improving steadily, but I am not very sure if we can attribute the change to use of the ESO. Food security has not improved largely due to the erratic rainfall patterns.</i>
E	<i>Reducing poverty I don't think so, but all I can say is that it has led to improved food production.</i>
F	<i>The benefit of using the system has not been visible because the rainfall has not been good in our region.</i>

G	<i>Yes yields have fairly increased as compared to recent years.</i>
H	<i>Not a very big change has happened to food security and output.</i>

Findings from Theme 8 show that ESO services were of a good quality because it assisted participants in completing their search for relevant information. The system enables users to obtain and use extension services that they otherwise would not have accessed in the absence of the ESO. Suffice to state that technology combined with other factors can improve productivity, food security and poverty levels. Substantiating evidence from the gathered information from interviews shows farmers indicated that they have benefited from the ESO in terms of improved productivity. Improved productivity has also had an impact on food security and poverty elimination. A critical analysis of the responses however reveals that productivity could be attributed to several other factors which are no linked to the ESO. Among the factors which could improve productivity include rainfall, employee participation and weather conditions.

With regards to how easy it is to use the ESO system, most farmers indicated that the system is relatively easy to use. One respondent noted that, owing to the experience of using social media sites of Facebook, navigation on ESO becomes easy. Most of the interviewed respondents generally view the ESO as a beneficial system. It was also reviewed that the quality of ESO service meets the expectations of users. The system enables users to obtain and use extension services that they otherwise would not have accessed in the absence of the ESO. In relation to the importance of computers in farming, farmers indicated that we are now living in the digital era in which technology is the lifeblood of most aspects of life. Although farmers have had successful seasons in the absence of ESO technology, its introduction revolutionised the manner in which farming processes are conducted. Most importantly, farmers indicated that they have benefited from the ESO in terms of improved productivity. Improved productivity has also had an impact on food security and productivity. Few of the respondents however indicated that they could attribute the increased productivity to rainfall.

Conclusion and Recommendations

The majority of farmers in the rural Qunu area are not educated and as a result this posed a challenge when it comes to understanding key concepts of technology or basic computer skills. Most participants indicated that training can help a great deal as they were not exposed to any form of change management. Older participants had a perception that computers are difficult to use and that they are way above the age of mastering computer skills, some even indicating that computers are meant for younger participants. Other contributing factors to technology use are infrastructure related issues and this needs to be addressed even before the

introduction of new technology. Also, the system aided subsistence farmers and Extension Supervisors in sourcing information relating to farming activities. The findings from the majority of the participants indicated that the ESO is always available and provides very reliable information. Also, although few participants explained that the quality of service offered by the ESO is poor, the majority expressed that the service was either good or excellent. Some participants explained that most farmers have since managed to improve but without subsequent increase. They also attributed increased produce to other external factors like good rains and favourable temperatures.

Sequel to the findings of the study, the following recommendations are made:

- There is dire need for farmers to be provided with training of all Microsoft applications normally used on computers. Hence, universities can be saddled with the responsibilities of training rural farmers on the use of such applications. This can be done through the offering of short term programmes by universities; either through physical contacts or online. This will aid the exposure of rural farmers while assisting them to fight their fears.
- Responsible faculties in universities can help to sensitise rural farmers on the importance and need for ESO system. This will enhance the acceptability of the system by rural farmers.
- The government of South Africa through the Department of Agriculture has the obligation to improve the knowledge that consumers have with regards to benefits of new technologies. Initiatives such as formal training throughout the rural parts of South Africa are necessary to raise awareness of the benefits of technology in farming. Additionally, farmers could be served with trainer manual guides that they could use in their respective geographical places. This can be done through the forming of an alliance between universities and the government of South Africa through the Department of Agriculture.
- Basic infrastructure services such as electricity and broadband coverage should be made available by the government for farmers.



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