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Extension Worker's Views Regarding the Digital Mobile Technology Services in Addressing Climate Change Issues: A Case Study of Botswana

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ABSTRACT

This study aimed to investigate the views of agricultural extension educators about digital technology services in addressing issues about climate change. This study was designed to analyse extension worker's perceptions regarding the use of digital technologies in addressing climate issues in agriculture. The study used mixed methods involving qualitative and quantitative data. Four cohort groups comprising 32 in-service agricultural extension students, were admitted for a diploma program at the Botswana University of Agriculture and Natural Resources (BUAN).

Results showed that most (67%) of the extension workers surveyed indicated they have basic and intermediate skills rather than expert and advanced skills in digital applications. Almost half of the respondents (47.7%) indicated having smart mobile phones, and 45% showed international interest in bandwidth and secured internet systems in regions where they worked. Ninety percent (90%) of the respondents agreed with statements supporting agricultural digital revolution. The study found no significant association between gender and usage of digital mobile technology. The paper concluded that extension workers must be kept up-to-date to align with evolving

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*technologies such as digitalisation. It is also concluded that most extension advisors own a cell phon*e.

Keywords: Digital Technology, Extension Workers, Mobile Technology Agriculture.

1. BACKGROUND AND INTRODUCTION

This study aimed to investigate the views of agricultural extension educators about digital technology services in addressing issues about climate change. The digital technology revolution is one of the strategies used by extension organisations to address climate change issues in agriculture (FAO, 2013). The views, opinions and perceptions of agricultural extension workers are important (Guntoro, Wahyudi & Sulastri, 2014; Prodhan & Afrad, 2014) mainly on the emerging technologies as they contribute towards agriculture and community development (Khali, Ismail, Suand & Silong, n.d).

In 2014, the Botswana government, through the then Ministry of Agriculture, saw it appropriate to upgrade the level of education for frontline agricultural extension workers with a certificate to a diploma level. The decision is in line with the establishment register of the Ministry of Agriculture to ensure extension workers are eligible for promotion and can handle technological services to address agriculture issues of climate change. In addition, upgrading extension workers is also an indication of good and innovative governance, putting people at the centre of development to transform agricultural extension services to be relevant and competitive.

Four cohort groups came to the University for in-service training. Upon the arrival of in-service extension cohort groups at the university, a needs assessment survey is conducted to gather information on what they want to be offered. The outcome of the needs assessment conducted on each of the four groups that came to BUAN as in-service students since the beginning of the 2014/2015 academic year revealed that the groups desired competencies on the use of digital gadgets at work, including computers. The fourth cohort groups identified the need to learn simple computer skills such as logging in, typing, presentation skills, data storing, computing and interpreting data, and communication through emails, SMS, WhatsApp and other technological platforms. The groups pointed out that education on computer introduction will enhance their knowledge, skills and attitudes towards advancing technology, thus enabling them to use digital mobile technologies. As a -up of the interaction with the in-service students, a study was conducted to survey the group on the kind of mobile phones they own and use daily and to

establish their proficiency usage of technology. The specific objectives of the study included the following:

i. To determine the kind of mobile phones owned by extension workers.
ii. To describe extension workers' perceptions regarding digital mobile technology in agriculture.
iii. To describe extension worker's proficiency levels in computer usage and digital mobile technology.
iv. To describe extension worker's access to and frequency of use of WhatsApp, emails, SMS and web services for extension services by gender.
v. To determine the use of computers by gender.

2. THEORETICAL BACKGROUND

According to Rossi and Berglund (2009), perceptions and how extension workers hold them could be informative to provide direction on the quality of services digital technology provides for the promotion of agricultural development and the environment in agriculture. Digital technology is an element of the fourth industrial revolution prevalent nowadays. Extension services is a vital sector of the agriculture industry from long back in the development of agriculture, with its primary aim to educate farmers on the adoption and use of digital technologies. Thus fostering changes in knowledge, skills, attitudes and practices for improved production and living standards (Van den Ban & Hawkins, 1996; FAO, 1985; Van Woerkum, 1982; Ormandy & Maunder, 1973). FAO (1985) further stressed that extension is part of the development of rural societies, which is critical to the development of agriculture in many countries. Enhancing the knowledge and education of extension personnel on digital technology is imperative and should receive attention in the 21st century. This is so because the needs of agriculture are changing to encompass production challenges emanating from climate change (Van den Ban, 1996). This means the desirable societal changes demand some transformation in agriculture and strategies implemented by agricultural extension services (Embiyale, 2019).

According to Xu, David and Kim (2018), knowledge about the fourth industrial revolution is important because it brings about some fast shifts in power and wealth among economies of scale, which may affect economic growth. As defined by Schwab, the fourth industrial revolution describes a world where individuals move between digital domains and offline reality with the use of connected technology to enable and manage their lives

The framework for this study is based on climate changes influencing challenges to food security while the population is also increasing. All the increases are exponential and thus require exponential action facilitated through computer-generated products (Xu, David & Kim, 2018). Technology is growing with a device designed primarily to be held in the hand to carry out a particular function like gardening and become more complicated as a farm implements. The theory of exponential explains better as the population increases; it also demands the change in the technology required in agriculture. More so, there will be a need to feed the expected growing number of people in future; hence, the use of technology will be important in this regard. Generally, technology is seen to change and advance daily in many aspects of human lives, including education (US Department of Education, 2017), to respond to challenges found by human beings.

According to Kamel and Wahba (2002 and) Kamel (2008), information and communication technology (ICT) is not only an essential building block of a society but also the driving force behind social development in today's society. Noted also about ICT is that as the human population is growing, today's generation is in the period whereby mediated information and communication have become the catalyst of human progress that requires a deepened understanding of how social and technological revolutions transformed societies from simple adoption of a tool during the agricultural revolution to mobile ICT (Figure 1). The ICT progress and development are setting the pace for a changing community in developed countries where the process seems fast and realistic but a bit bouncy in the developing world (Kamel, 2008). Figure 1 shows the technology progression from a tool to ICT, which also helps explain the stages in the fourth industrial revolution described by Xu, David and Kim (2018).

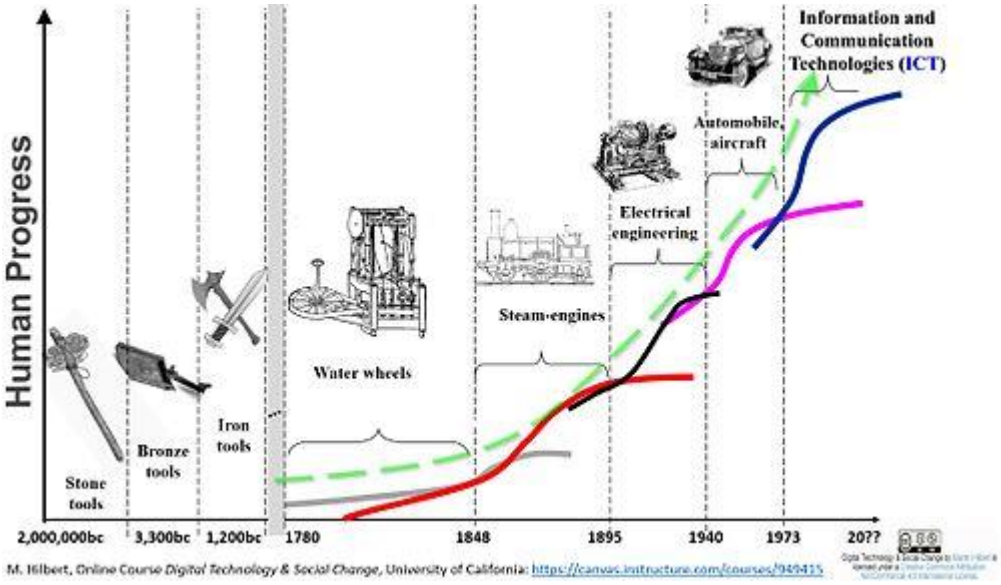

FIGURE 1: Technology Progression from a Tool to ICT

According to FAO (2017), information and communication technology (ICT) refers to a device, tool, or application that permits the exchange or collection of data through interaction or transmission from radio to satellite imagery to mobile phones or electronic transfers. This aligns with the continued digital growth due to big data in agriculture described by Sarker, Islam, Ali, Islam, Salam, and Mahmud (2019).

It is important to note that agricultural extension, among other responsibilities, is about delivering information, inputs and other services to farmers through ICT. Through extension, a variety of farm goods and services reach the farm. Altalb, Filipek and Skowron (2015) stated that agricultural extension is both a service and a learning process for farmers. Agricultural extension stimulates the adoption process by transferring technical information to the farming community. According to Adomavicius, Bockstedt, Gupta and Kauffman (2008), understanding the dynamics of technology evolution and transfer is a strategic challenge for stakeholders, particularly those involved in agriculture.

In the same vein, Kroma (2003) noted that agricultural extension contributes to transforming rural and agricultural systems in sustainable ways on account of the use of digital technology. Furthermore, Wallace and Nilsson (1997) pointed to the fact that successful agricultural education and training (AET) innovations, particularly for educators in sub-Saharan Africa, will need to consider policy issues. These unite government bodies, donors and education institutions

Vol. 51 No. 4, 2023: 147-168
10.17159/2413-3221/2023/v51n4a14686

coupled with high investment in training, curriculum reforms and adoption of new learning modes (ibid).

According to FAO (2005), the role of extension service in agriculture is irreplaceable in teaching farmers about strategies to improve productivity, which, among others, will promote the development of solutions for climate change. FAO further points to the fact that farming communities' needs are emerging as the world enters an era of globalisation, democracy, privatisation and decentralisation, affecting the farmers of both developed and developing countries. The role of leaders in agriculture, like those in politics, take a stance to support transformational skills. According to the United Nations (2015), in this conception of global change and the availability of information and communication technologies (ICT), there is a need to accept the change by those who work in development.

The World Bank, one of the top funders of agriculture programs in the African Continent, believes that Africa needs a digital revolution to handle climate change (Africa Adaptation of Agriculture, 2015). According to Shutske (2017), technology is one of the drivers of change in the agriculture sector that can positively impact food security. At least the majority of the African generations of African people own and use digital mobile technology. Shutske (2017) was also cited, stating that technology has increased rapidly and expanded people's computing capability, thus decreasing the costs of doing business. This could also contribute to the transformation of farm operations. Digital technology improves data that helps farms to be productive, sustainable and comparable to the global environment. It leads to digital farming, which can add value to the development of the agriculture sector. Digital farming can be defined as a system of farming whereby scientific and technologically advanced resources like computers and mobile phones are used.

Salama and Barros (2017) stated that Accenture Digital Agriculture offers an inclusive portfolio of business and technology services across digital marketing, mobility and analytics. Digital technology brings together several things: real-time data from a variety of sources, such as environmental sensors in the field, NDVI images from UAVs (that show crop stress before it's visible to the naked eye), and sensors mounted on the field equipment, weather forecast data, and soil databases. According to UNFCCC (2006), several technologies have been tried to mitigate climate change as natural climate-related factors like rains, heat waves, and droughts.

Vol. 51 No. 4, 2023: 147-168
10.17159/2413-3221/2023/v51n4a14686

3. RESEARCH METHODOLOGY

This descriptive study used open-ended and close-ended items to gather information about digital technology in agriculture. That is, the study employed mixed methods involving qualitative and quantitative data. Four cohort groups, each comprising 32 in-service agricultural extension students, were admitted for a diploma program at the Botswana University of Agriculture and Natural Resources (BUAN), formerly called Botswana College of Agriculture (BCA), for the academic years 2014/2015, 2015/2016, 2016/2017 and 2017/2018 were each surveyed twice.

3.1. Data Survey

The first survey was conducted to gather data on the needs of a course called DEE 118. A *computer studies module/course was* offered to the groups during August-December of each academic year. The information gathered through the open-ended questionnaire was descriptions and narrative statements. In-service extension students were asked to complete the open-ended questionnaire by writing their views about digital technology. The information gathered was used to develop subject matter contents to be offered to the groups, and they were further analysed to develop the close-ended survey questionnaire.

The open-ended survey used six open-ended questions: (1) The first question sought to find from the respondents the areas that would be appropriate to learn in computer studies, (2) The second question wanted to know the type of mobile phones they own and whether they do use it at work as an agricultural extensionist. (3) What is your understanding of digital technology in your day-to-day practice of agricultural extension work? (4) What platforms/applications do you frequently use your phones for as you engage in extension services? (5) How do you see digital technology benefiting your field of work in agriculture? (6) How would you rate your knowledge level in the usage of computers in your real-life situation of extension?

An analysis of narrative data was a process described by O'Connor and Gibson (2003) whereby the product of this analysis was a close-ended questionnaire to gather quantitative data.

3.2. Data Collection Instruments

The second survey questionnaire comprised close-ended items developed by the researchers to solicit information from in-service students who did not participate in the open-ended questionnaire. The groups qualified for interviews as they have worked as extension service providers.

Vol. 51 No. 4, 2023: 147-168
10.17159/2413-3221/2023/v51n4a14686

In part one of the questionnaires, the respondents were asked to provide information on the kind of mobile phones they owned, indicate 'YES' or 'NO' to the usage of voice communication, short message service (SMS), Multimedia Message Service (MMS), Internet services and Web browsing, WhatsApp application for communication and emails for communication. In part two, the respondents were asked to rate their views about digital technology (mobile phones) statements anchored with a 5-point Likert scale of 1 = strongly disagree, 2 = disagree, 3 = do not know, 4= agree, or 5= strongly agree. The statements described digital technology as a tool, device, and enhancement of the agricultural environment for food production.

In part three, the respondents were also asked to indicate their perceptions concerning how digital mobile technology is defined based on its usage in agricultural extension services. The in-service students were asked to rate their perceptions on a 4-point Likert scale denoting; 1 = strongly disagree, 2 = disagree, 3 = agree, or 4= strongly agree.

The statements for parts two and three were formulated based on the modification of the indicators for European technologies by Limton and Schuchhard (2009). In part four, respondents were also asked to indicate their proficiency levels in the usage of computers and digital mobiles in their extension jobs. Respondents were asked to indicate whether they have basic, intermediate, expertise, or advanced skills in computers.

3.3. Study Enumerators

To collect data, the researchers used two educational technology technicians operating in the departmental resource centre at Botswana University of Agriculture and Natural Resources (BUAN) to distribute the questionnaire to respondents at the start of the academic year. The respondents were asked to read instructions and complete the questionnaire by checking on the appropriate boxes at the end of each statement and returning the completed questionnaire to the administrator. Out of fifty-five (55) questionnaires distributed, forty-five (45), which was 82%, were completed and returned after seven days. To ensure rigour and trustworthiness in the study, a Delphi approach was used for data collection, and the analysis techniques were intermingled with feedback (Skulmoski, Hartman & Krahn, 2007). Analysis of Chi-square statistic for cross-tabulation was computed to establish if digital technology was associated with gender in agriculture.

3.4. Data Processing

Data was computed using the Statistics Package for Social Sciences (SPSS) version 22 to address the objectives. Analysis was calculated using frequencies and cross-tabs for associations of responses by gender. The outcome of the quantitative analysis was presented in tables and text interpreted to provide findings of the study.

4. RESULTS AND DISCUSSIONS

The results were presented in tables, and descriptions were arranged according to objectives set to be achieved. Narrative data revealed that in-service agricultural extension students at the Botswana University of Agriculture and Natural Resources [BUAN] demanded to be taught simple computer skills such as logging in, typing, presentation skills, data storing, computing and interpreting data as well as communication through emails, SMS, WhatsApp and other technological platforms.

4.1. Needs of the Cohort Groups

Simple counting of the frequencies of the technology concepts revealed that most respondents indicated the need for computer skills in their jobs. The results are supported by a study conducted by Tantisantisom (2011), whose findings revealed that ICT tools have been applied in several disciplines, including agriculture. Agriculture extension services are perceived as practical machinery for the uplifting of standards in disseminating information, which requires a role played by e-learning (Mundi & Tenebe, n.d). Results show that most extension in-service students own advanced mobile phones but would require employers to support their effort to adopt the technology in their job through education and training.

4.2. Objective 1: To Determine the Kind of Mobile Phones Owned by Extension Workers

Extension workers were asked to indicate the type of cell phones that they own. Their responses are indicated in Table 1.

TABLE 1: Kinds of Mobile Phones Owned by Respondents

	F	%	Missing
1. Kind of phones owned			
• Smartphone	29	47.5%	

• PDA (Personal Digital Assistant)	18	29.5%	
• Basic Phone (Sedilame)	13	21.3%	
• Other	1	1.6%	
2. Voice communications			
• Yes	38	86.4%	1 [2.3%]
• No	4	9.1%	
• I don't know	0		
3. Short Message Service (SMS),			
	41	93.2%	1 [2.3%]
	2	4.5%	
4. Multimedia Message Service (MMS),			
• Yes	18	40.9%	
• No	14	31.8%	
5. Internet services such as Web browsing, instant messaging capabilities and email.			
• Yes	24	54.5%	
• No	15	34.1%	1 [2.3%]
6. WhatsApp and other services for communication			
• Yes	27	61.4%	1 [2.3%]
• No	12	27.3%	
7. Emails			
• Yes	21	47.7%	1 [2.3%]
• No	15	34.1%	

Table 1 presents the kinds of mobile phones owned by the respondents and the services obtained. Close to half (48%) of the respondents indicated that they owned smartphones, thirty percent (30%) owned PDAs, and twenty-one percent (21%) stated that they owned a basic type of mobile phone called Sedilane. The majority (86%) of the respondents use voice communication, ninety-three (93%) use short message services (SMS), and about forty-one percent (41%) of the respondents said 'Yes' to the use of Multimedia Message Service (MMS), with approximately 32% saying 'No'. Slightly above half (54.45%) of the respondents indicated that they use

internet services such as Web browsing, instant messaging capabilities and email, 61% indicated the use of WhatsApp social media and other services for communication, and forty-seven percent (47%) of the respondents indicated usage of email services for communication.

The results align with a study by Orikpe and Orikpe (2013) that affirmed the need for ICT skills to enhance agricultural extension services in Nigeria when extension officers utilise mobile technology. Orikpe and Orikpe (2013) recommended that aggressive development of rural areas ensuring availability of electricity and recruitment of qualified and ICT literate extension agents is called for. Further investment should be made in training the in-service extension agents and the farmers on the usability of ICT for information dissemination.

4.3. Objective 2: Technological Application Services

Extension workers were asked to indicate the technological application services available through their mobile phones. Their responses are indicated in Table 2.

TABLE 2: Usage of Mobile Digital Technology Service 2016/2017

	Yes		*No*	
Technology service used	***F***	***%***	***F***	***%***
Whatsapp	30	62.5%	18	37.5%
Emails for communication	29	60.6%	19	39.6%
SMS	18	37.5%	29	60.4%
Voice communication	28	58.3%	20	41.7%
Radio	41	85.4%	7	14.6%

Table 2 shows the technological application services respondents indicated were available through their mobile phones. Generally, the majority (85%) indicated that they listen to the radio on their phones, followed by 63% who said they use WhatsApp, then 61% who use emails to communicate with farmers. This indicates that extension workers utilise the digital mobile applications available on their phones but do not access computers in their jobs. The results in Table 2 also agree with the results in Table 1, where the respondents said a 'yes' to the majority of the technologies.

These results confirm that mobile phones and the internet play substantial roles in agricultural development, as agricultural development also plays important roles in expanding mobile phones and the internet (Olaniyi, 2018). A substantial proportion (60%) said 'no' to using SMS. In comparison, 42% said 'no' to voice communication. One would expect that these were less complicated to communicate with than WhatsApp, and emails, therefore, could be used more frequently than WhatsApp. A comprehensive study could also establish the reasons for the high proportions of the two concepts. A study by Tantisantisom (2011) supports using such tools in agriculture.

4.4. Objective 3: Extension Worker's Perceptions Regarding Digital Mobile in Agriculture

A Likert scale with ratings from "Agreed to Strongly Agreed" was used to assess the extension workers in terms of their perceptions regarding mobile technology usage in agriculture. The responses are indicated in Table 3.

TABLE 3: Respondents Perceptions on Mobile Technology

	Level Of Agreement				
Digital technology [mobile phone]	SD	D	DK	A	SA
Increases the vision of the digital world	4.5%	2.3%	6.8%	43.2%	42.3%
Drives mass collaboration, enabled by communications networks	2.3%	0%	13.6%	45.5%	38.6%
Drives high-speed communications networks connected by the Internet.	2.3%	0%	11.4%	45.5%	45.5%
Growth will depend on the presence of smart systems	0%	4.5%	9.1%	47.7%	38.6%
Influence a pool of human talent, skills and creativity to benefit the farming industry.	0%	2.3%	11.4%	56.8%	29.5%
Successes depend on human talent, skills and creativity to exploit digital tools benefiting the farming industry.	4.5%	2.3%	4.5%	45.5%	43.2%

Gives rise to the internet as the world's dominant, converged infrastructure for information transmission	4.5%	2.3%	18.2%	47.7%	27.3%
Tools of mass collaboration draw human society closer together.	0%	0%	9.1%	45.5%	45.5%
Depends on today's investment in Research and Development	0%	4.5%	4.5%	38.6%	52.3%
Is efficient to increase computing power by networking computers together	0%	0%	13.6%	31.8%	54.5%
Is a key technology for the Internet of things in Radio Frequency Identification [RFID]	0%	6.8 %	25.0%	34.1%	34.1%
Is an RFID tag for microchip applied to incorporate into a product for the purpose of identification?	0%	4.5%	34.1%	40.9%	20.5%
Produces growth in the amount of data generating, capturing, replicating and storing	2.3%	2.3%	9.1%	36.4%	50.0%

Table 3 presents responses to extension worker's perceptions regarding mobile technology usage in agriculture. The results showed that most respondents agreed to *strongly agree* with all statements about digital mobile technology in agriculture. For example, 45% *agreed* and 45% *strongly agreed* that digital technology "*Drives high-speed communications networks connected by the Internet*", and 31.8% and 54.5% agreed and strongly agreed, respectively, to the statement that states that digital technology '*is efficient to increase computing power by networking computers together'.*

These results, therefore, imply a positive perception by in-service extension workers that digital mobile technology influences agriculture. This suggests that today's Research and Development involvement indicated by respondents = 38.6% and 52.3% strongly agreed. Even though the results showed that most extension workers have basic and intermediate skills rather than expert and advanced skills in digital knowledge, their perceptions of mobile technology were positive. This means there is a need to expose extension workers to advanced technology to develop their knowledge, skills and interest in using computers. Thus, this will keep agricultural extension workers updated with evolving technologies such as advanced digital mobiles and computers.

4.5. Objective 4: To Describe Extension Worker's Perceptions Regarding Digital Mobile Technology Definitions

Extension workers were assessed on a four-point Likert-type scale on changes brought to the agriculture sector through technology. Their responses are indicated in Table 4.

TABLE 4: Extension Worker's Digital Mobile Technology Perceived Definitions

Digital technology is:	SD	D	A	SA
Changing the face of agriculture,	**0%**	4.5%	50.0%	45.5%
Providing important tools for farmers worldwide.	0%	2.3%	47.7%	50.0%
Bringing highly automated tractors to the field	2.3%	20.5%	36.4%	40.9%
Allows a combination of equipment with a vast array of sensors	0%	13.6%	56.8%	29.5%
Enabling farmers to collect data about plant health, yields, soil composition and field topography.	22.3%	6.8%	50.0%	40.9%
Allowing drones and satellites likewise helping farmers work more efficiently to generate data.	2.3%	13.6%	50.0%	34.1%
Allowing satellite images to analyse a single patch of land at a resolution of just 30 centimetres.	2.3%	33.0%	48.9%	33.3%
Analysing highly accurate data from the growing season to compare with previous years	4.5%	13.6%	45.5%	36.4%
Bringing a whole new dimension to modern agriculture.	2.3%	2.3%	52.3%	43.2%
Better predicting influences affecting yields and respond more quickly to changes.	2.3%	9.1%	50.0%	38.6%
allows prompt action taken to prevent harvest losses	4.5%	11.4%	47.7%	36.4%

The results show that respondents indicated that digital mobile technology '*provides important tools for farmers worldwide*' as 47.7% agreed and 50.0% strongly agreed with the statement. Second is the statement that 52.2% and 43.2% of respondents strongly agreed and agreed, respectively, that digital technology is '*Bringing a whole new dimension to modern agriculture'*. Thus, technology is perceived by extension workers to bring change to agriculture. The views of in-service officers are supported by a study by Deen-Swarray (2016), which revealed that mobile

technology and the Internet were central to ICT in various sectors, including the agriculture industry.

4.6. Objective 5: Personal Characteristics of Extension Workers

The study also analysed the personal formation of respondents in terms of gender, experience in extension work, marital status, age range and area of specialisation. The majority of the respondents, 68.8%, have worked for a period ranging from 21 to 25 years, followed by those who have worked 26 to 30 years at 27.1%, and those who have 20 years and fewer years in the job amounted to 4.2%. At least close to half (47.9%) were married, 45.8% were not married while 6.3% indicated other. At least 68% were aged between 41- 50 years old, 27.1% indicated to be aged between 51 – 60 years old, and 4.2% were between 31- 40 years old.

This means most in-service extension workers will retire in 10 to 15 years and need the technology skills as most tend to divert into farming. The age range for participants in this study also requires the government to prioritise education and training to enhance performance in this era of the fourth industrial revolution. Responding to the area of specialisation, the results showed that 43.8% were frontline extension officers, 27.1% were working as Crop technicians and related fields, and 20.8% indicated to be Technicians and Animals and related areas, respectively. This implies that extension workers are not a specialised group.

4.7. Objective 6: To Describe Extension Worker's Proficiency Levels in Computer Usage and Digital Mobile Technology

The results showed that the majority of the extension agents surveyed, 67%, indicated having basic skills, 23% had intermediate skills, 8.3% had expertise, and 0.8% had advanced skills in digital knowledge. This is not surprising since this aligns with the areas identified to be offered in the course /module called DEE 118.

4.8. Implication for Extension

Based on the study findings, a few implications for extension can be drawn:

a) It has been indicated that the in-service training by the cohort's groups who have benefited from the training offered by the Botswana University of Agriculture and Natural Resources (BUAN) will indirectly benefit a huge number of people involved in farming when information is disseminated and shared among them. This has been highlighted by the fact that the extension

workers were found to have basic skills and advanced skills in digital knowledge after being trained.

b) Most extension workers will retire in the next 5-10 years. The Ministry needs to plan for the new intake so the advisory services do not suffer through *en masse* retiring. The older extension workers should mentor the new extension workers to manage their departure well.

c) Training in digitalisation will equip the extension workers to be prepared for the 4th Industrial Revolution, and those who intend to retire into farming will contribute in terms of agricultural productivity of the country due to the knowledge they will possess.

Is there any association between gender and usage of selected digital mobile technology services [WhatsApp, voice communication, and email and web services]? Data analysis also sought to understand if there was any relationship between the usage of technology services obtained in their phone and the gender of the user.

The study investigated the association between the usage of mobile technology by gender. The p-value was above the chosen significance level $p = 0.05$ in all five services provided through digital mobile technology. The Null hypothesis can be accepted and concluded that there was no association between gender and technology usage. That is, the response was the same whether respondents use WhatsApp, radio, SMS, voice communication and email as women or as men. This means women and male extension workers in Botswana have equal opportunity to use mobile technology services. This may also be because most extension workers owned their mobiles. In Botswana, women use technology in the same manner as men. Based on the results, it can be stated that there was no significant association between gender and usage of digital mobile technology.

5. CONCLUSIONS AND RECOMMENDATIONS

The six objectives of this paper have been discussed, and open room for understanding the circumstances surrounding extension workers in terms of access and utilisation. This conclusion will be based on the individual objectives of the paper. For example, as far as the first objective is concerned, the study revealed a weakness that extension workers need to be kept abreast to be in line with the evolving technologies such as advanced digital mobiles and computers, which represent a significant change in the way information is disseminated to address climate change

issues. Extension workers have developed Information and Communication Technology from a theory of exponential growth technology, which was later adopted for the benefit of humanity. The study revealed that Extension workers own personal mobile phones for voice communication, short message services (SMS), Multimedia Message Service (MMS), and internet services.

The results further indicated that several agricultural extension workers in Botswana have remained in positions with limited education and have not had sufficient exposure to computers. In this technology era, the expectation is to use technology to write reports, search for information, compute and analyse data, search the internet and even communicate through emails. At least an insignificant number (4.2%) of respondents have experience of less than twenty years in the field of extension. This is pronounced for both women and men, in extension. It also became clear that Extension workers should be provided with the course on DEE 118 Computer Studies because the course could capacitate them in terms of presentation skills (PowerPoint), computational skills (Excel spreadsheet), typing skills (word processing skills) and data interpretation as important content in their job.

Based on the findings, the following is recommended:

- The agriculture sector must adjust to the effects of climate change to address food security issues by linking the extension worker's knowledge with climate change.
- Owning a mobile phone is an advantage these days because of the many benefits it delivers, such as being able to fulfil social and official networks. This area needs to be explored further to understand what extension workers can achieve through technology in climate change. Necessary attention should be rendered to address computer literacy and operation in agricultural extension.

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