

Re-Examining the Factors Influencing the Adoption of ICT for Agricultural Information Dissemination in Uganda (Rubanda, Mayuge Districts, and Mbarara City)

Meneliti Semula Faktor-Faktor yang Mempengaruhi Penggunaan ICT untuk Penyebaran Maklumat Pertanian di Uganda (Daerah Rubanda, Mayuge, dan Bandaraya Mbarara)

Willbroad Byamukama, Phelix Mbabazi Businge & Rebecca Kalibwani

¹*Department of Agriculture, Faculty of Agriculture, Environment and Technology, Bishop Stuart University & Faculty of Agriculture and Environmental Sciences, Kabale University P. O. Box 317, Kabale, Uganda*

²*Faculty of Computing, Library and Information Sciences, Kabale University, P. O. Box 317, Kabale, Uganda*

³*Department of Agriculture, Faculty of Agriculture, Environment and Technology, Bishop Stuart University, P. O. Box, 09, Mbarara, Uganda*

**Corresponding author: bwillbroad@kab.ac.ug*

Received 17 January 2023

Accepted 19 June 2023, Available online 1 December 2023

ABSTRACT

The purpose of this research was to re-examine the factors influencing ICT adoption for agricultural information dissemination in Uganda. The study adopted a cross-sectional survey design of the ex-post facto type to guide the study, a structured questionnaire that was subjected to face and content validity and reliability test and analysed using descriptive statistics of frequency counts and percentages. Findings revealed that the foremost inhibiting factor influencing the adoption of ICT for agricultural information dissemination was the lack of training and re-trainings hindering farmers from getting the technical knowledge in the use of ICT devices in accessing and sharing of agricultural information. The study recommended that training and re-training by introducing government facilitated programs and other non-government programs in the usage of ICT devices be conducted for the farmers from time to time such that they become conversant and experienced with all the required and necessary devices and able to take advantage of the entire alternative device as each device is uniquely difference, serving uniquely different purposes.

Keywords: Adoption, ICT, information dissemination, Uganda

ABSTRAK

Tujuan kajian ini adalah untuk meneliti semula faktor-faktor yang mempengaruhi penggunaan ICT untuk penyebaran maklumat pertanian di Uganda. Kajian ini mengambil reka bentuk tinjauan rentas bahagian dari jenis ex-post facto untuk membimbing kajian ini, soal selidik berstruktur yang telah diuji untuk kesahihan muka dan isi kandungan serta ujian kebolehpercayaan, dan dianalisis menggunakan statistik deskriptif yang merangkumi perhitungan kekerapan dan peratusan. Hasil kajian mendapati bahawa faktor utama yang menghalang penggunaan ICT untuk penyebaran maklumat pertanian adalah kekurangan latihan dan pembelajaran semula yang menghalang petani daripada memperoleh pengetahuan teknikal dalam penggunaan peranti ICT untuk mengakses dan berkongsi maklumat pertanian. Kajian ini mencadangkan agar latihan dan pembelajaran semula dengan memperkenalkan program yang dibiayai oleh kerajaan dan program bukan kerajaan dalam penggunaan peranti ICT dijalankan untuk petani dari semasa ke semasa supaya mereka menjadi mahir dan berpengalaman dengan semua peranti yang diperlukan dan dapat memanfaatkan semua peranti alternatif kerana setiap peranti adalah unik dan berfungsi dengan cara yang berbeza.

Kata kunci: Penerimaan, ICT, penyebaran maklumat, Uganda

INTRODUCTION

Despite the high potential of ICTs in rising small-scale agriculture in Africa, there is a low usage pattern and unreliable adoption (Mzomwe et al. 2021). This case is especially as a result of ICT initiatives that are scattered and uncoordinated (Ayim et al. 2022).

Further, there's poor involvement of women and alternative deprived teams, inadequate acceptable content, weak establishments, inadequate collaboration and awareness of existing ICT facilities and resources, poor information-sharing culture, and low awareness of the role of ICTs in development in the slightest degree levels (Ogutu et al. 2014). Consequently, there is a high price of obtainable technologies, inadequate infrastructure and ICT skills, poor and high-priced property, inappropriate ICT policies, language barriers, the high price of ICTs and telecommunication, low information measure, inadequate and/or inappropriate credit facilities and systems (Hemeson 2006).

According to Awojide & Akintelu (2018), geographical location plays an important role in the determination of communications costs and practicality. In rural communities, where there is a sparse population implies that potential users sleep in a section of low demand density, communications prices are higher and services are less well developed. This can be because of what is called the social science of networks and therefore ICT in rural areas costs more as a result of the association from one line to the other, and since it is also impossible to realize economies of scale in switching. The results of this will be seen within the penetration of ICT into rural areas while not a whole indicator. Tele-densities (the range of mainlines per one thousand people) provide some plan of the extent to which this may be a problem for farmers in rural Africa once employed in combination with mobile phone densities (mobile phones per one thousand people) (May et al. 2007).

The use of ICT needs a positive attitude from the actors as emphasized and proved by many previous studies (Levi et al. 2015).

The perceived usefulness is crucial for constructing a positive attitude towards ICT usage. Once communities understand that ICT is beneficial, it'll produce a positive perspective toward ICT usage (Chhachhar et al. 2014). According to Rodrigues and Rodríguez (2013), the perceived usefulness should be persistent. For ICT to be perceived as helpful it should be a low price to reach a wider market and be able to gather massive data within a brief time.

The researcher observed that there are some notable factors influencing the adoption of ICT for agricultural information dissemination in Rubanda District, Mayuge District, and Mbarara City that necessitates the majority of the farmers not to have access to effective agricultural information and such factors had been left unchecked and the farmers are so denied access to agricultural enhancing information affecting their chances of finding out and apply improved and economical agronomic practices that can improve productivity and household food security. Thus, a need to re-examine the factors influencing the adoption of ICT for Agricultural Information Dissemination in Uganda namely Rubanda, Mayuge Districts, and Mbarara City.

EMPIRICAL REVIEW

The study done in Kenya indicated that there are seemingly influencing factors in accessing agricultural information via exploitation of some ICT channels. It utilized a scientific sampling technique, an interview, and a chi-square technique to test the hypothesis (Maina et al. 2021). The study disclosed that radio was used among the farmers at age forty and higher and with low formal education, whereas farmers at age below forty most preferred TV, Mobile Phones, and Computers. It also revealed that most farmers were utilizing their smartphones for chatting instead of profitable agricultural activities. It had been conjointly disclosed that farmers who possessed education used their mobile phones for vital activities like receiving and retrieving agricultural information. The main gap during this study is the lack of awareness of the relevance and use of mobile phones particularly smartphones for agricultural information. Additional studies ought to investigate however how ICT tools may be promoted among farmers. Lack of awareness and education attainment is among the main attributes limiting smallholder farmers once it involves the adoption and usage of ICT for development in rural areas.

Naik et al. (2021) studied the dissemination of agricultural information using ICTs. The study utilized a structured questionnaire and interviews were employed to gather relevant information among the selected farmers. Armstrong & Gandhi (2012) believed that the key stakeholders claimed that there ought to be an improvement in information delivery. For this reason, there ought to be a lot of studies on how agricultural information dissemination using ICT is effectively delivered to the end-users which means that extension professionals have to be compelled to answer the task ahead by collaborating with key stakeholders to produce effective agricultural information to the end-users.

To and Trinh (2021) state that, though there's perceived appropriateness of ICTs in African countries and Vietnam, a broad variety of factors are known for inhibiting the widespread introduction and use of the new technologies. These factors embody cognitive content concerning the importance of and want for ICTs that makes even those made enough to acquire them indifferent to ICTs; general impoverishment that results in the perception of computers, as an example, as foreign and luxury acquisitions; When equipment crashes down, spare parts and

technical experts from the manufacturers are imported, which is a poor maintenance and repair culture, it wastes resources, time, and money. Poverty leads persons to perceive computers, for instance, as foreign and costly expenditures. (Chavula 2014) states different factors such as poor infrastructural support base; examples embody inefficient electricity and telephone systems; lack of support from the government resulting in under funding of science and technology programs in tertiary institutions; illiteracy and lack of basic computing skills; the absence of a culture of democracy, this feeds political unrest and also the temperament of foreign investors to speculate within the space of ICTs; and perception of the technologies (example, computer) as a standing image or statement of one's hierarchy in society.

Aker et al. (2016) argued within the results of their study that the foremost vital limiting factor that affects the utilization of ICT in agriculture is the cost of technology. Lack of training and therefore the inability of farmers to use ICT is the second issue that affects usage. The other is; trust level within the ICT system; lack of technological infrastructure and lack of ICT proficiency is the third level category that affects the utilization of ICT in agriculture. Thus, in general, to confirm the effectiveness of ICT, the agricultural community particularly their leaders should have a positive attitude toward ICT usage.

METHODOLOGY

Study Area

The study was conducted in three (3) agricultural areas namely Rubanda District, Mayunge District, and Mbarara City for comparison purposes. The reason why these areas were selected was based on the fact that Rubanda district was an agricultural rural area where farmers need to adopt innovations and technologies to boost agricultural productivity, Mayunge district has had ICT infrastructure put in place to help farmers share agricultural information through RCDF program while Mbarara City was an urban agricultural area where ICT usage and the facilitating factors were assumed to be high and therefore, there was need to compare the adoption and usage levels in these areas.

Study Population

According to UBOS (2016), Rubanda has a total of 43,323 households, Mayuge has a total of 95,340 households and Mbarara City has a total of 52,335 households. This gives a total population of 190,998 households. These areas have humid climate conditions, and their major economic activity is farming the target population for this study included the population of smallholder crop farmers.

Data Collection and sampling

In this study, an agricultural information household questionnaire (AIHHQ) was designed. Only households that met the inclusion criterion were sampled and the household head or any other person (household member) above 18 years of age with knowledge of their household agricultural activities was interviewed.

The sample was selected in 3 stages using stratified sampling. First, the district tracts were allotted in 3 strata per district outlined by their urban/rural state and population groups of the municipalities (counties). The tracts were selected using probabilities proportional to the individual households. Within the second stage, households were selected with equiprobability (assuming that they needed equal probability) using an inverse sample design to make sure that they respond to all the

questions: households to be interviewed per tract. Within the last stage, the household head or an adult who was eighteen years or older per home was selected with the equiprobability to reply to all or any of the questionnaires.

In this study, a formula developed by Yamane (1967) was used. This formula was preferred because the population of the different strata was known, and the study intuitively deals with population proportions. The mathematical formulation of the Taro Yamane formula is illustrated in Equation 1.

$$n = \frac{N}{1 + Ne^2} \text{ (Eq.1)}$$

Where,

n signifies the required overall sample size,

N signifies the population under study (total number of households in the 3 districts),

e signifies the margin of error or precision required ($e=0.05$).

Therefore,

$N = (\text{Rubanda} + \text{Mayuge} + \text{Mbarara})$ population

$N = 190,998$

n_r is the desired sample size; N is the patients' population; e is the allowable error taken as 5%

$$n = \frac{190,998}{1 + 127(0.05)^2}$$

$n = 399.16$ approximately 400

Hence n was **400** smallholder farmers/respondents.

In this way, it was easier to sample from each stratum using probability proportionate to the size of a stratum as shown in the table below.

TABLE 1. Showing sample size per study area

S/N	Study area	Population	Sample
1.	Rubanda District	43,323	90
2.	Mayuge District	95,340	200
3.	Mbarara City	52,335	110
	TOTAL	190,998	400

Research Design

The study adopted a cross-sectional design of survey research and the instrument for this study consisted of structured questionnaires and key informant interviews. The questionnaire was subjected to face and content validity and reliability test. The study employed a pilot survey, first to confirm the validity of the questionnaire and the interview guide got the judgment of 2 people that are informed of this research; one every of whom was the supervisor. Also, the instrument was tested on language clarity, relevance, and comprehensiveness, and the accuracy and significance of inferences in the collection of correct data were ascertained.

According to Bland and Altman (1997), there are several devices for checking reliability in scales and tests such as pre-test, alternative forms methods, or the split-half method to assess the internal consistency of the test. As she recommends, the reliability of this study's instruments was ascertained by a pilot test on 30 respondents' farmers outside the main sample for this study. The researcher established the reliability of the instrument using Cronbach's Alpha Coefficient and the

instrument yielded 0.95. The implication is that the instrument was reliable and was therefore suitable for this study.

The target population of this study comprised all farmers in the Rubanda District, Mayuge District, and Mbarara City. 374 farmers were randomly selected and made to participate in the study at a response rate of 94% and this was suitable for the study since respondents were readily available and ready to participate in the study.

Data Analysis

Data collected were analysed using descriptive statistics of frequency counts, percentages, mean and standard deviation with ranking means score. For research question three, the interpretation of the means obtained was based on the ranking by (Cohen et al., 2018) as given below for the 5-Likert scale:

Mean Range	Response Range	Interpretation
4.21-5.00	Strongly Agree	Very High Influence
3.41-4.20	Agree	High Influence
2.61-3.40	Neutral	Moderate Influence
1.81-2.60	Disagree	Low Influence
1.00-1.80	Strongly Disagree	Very Low Influence

RESULT AND DISCUSSION

The results in Table 2 reveal the factors influencing the adoption of ICT for agricultural information dissemination in Rubanda district, Mayuge district, and Mbarara City. A simple majority of the respondents (54.5%) strongly agreed that lack of training, low awareness of the roles of ICT (54.5%), not enough time to spend on technology (54.3%), perception and want to use ICT (53.7%), do not understand the value of ICT (53.7%), level of education (52.9%), lack of technological infrastructure (52.1%), the inability of farmers to use ICT tools (51.8%), cost of technology (51.6%), low usage and unreliable adoption (50.8%), availability of ICT tools (48.1%), poor information sharing culture (42%), age (38.5%), geographical location (35.8%), lack of collaboration (32.9%) are all the factors inhibiting the adoption of ICT for agricultural dissemination in Rubanda district, Mayuge district and Mbarara City except gender (30.5%) and land and agricultural policies (30.5%). These results conform with the study by Rashid et al., (2016) who stated that the significant factor to empower farmers was the use of e-agriculture which contributed to 84% of the total empowerment and recommended governments implement and invest in e-agriculture projects on a massive scale.

TABLE 2. Factors influencing the adoption of ICT for agricultural information dissemination in Rubanda District, Mayuge District, and Mbarara City

Influencing factors	SD	D	N	A	SA
The inability of farmers to use ICT Tools	26 (7.0)	29 (7.8)	24 (6.4)	193 (51.8%)	100 (26.7)
Age	24 (6.4)	76 (20.6)	55 (14.7)	144 (38.5%)	75 (20.1)
Lack of technological infrastructure	20 (5.3)	35 (9.4)	27 (7.2)	195 (52.1%)	97 (25.9)
Cost of technology	23 (6.1)	27 (7.2%)	22 (5.9)	193 (51.6%)	109 (29.1)

Not enough time to spend on Technology	23 (6.1)	39 (10.4)	38 (10.2)	203 (54.3%)	70 (18.7)
Do not understand the value of ICT	20 (5.3)	41 (11.0)	34 (9.1)	201 (53.7%)	78 (0.9)
Lack of training	16 (4.3)	31 (8.3)	24 (6.4)	204 (54.5%)	98 (26.2)
Geographical location	19 (5.1)	83 (22.2)	71 (19.0)	134 (35.8%)	67 (17.9)
Poor information-sharing culture	14 (3.7)	65 (17.4)	63 (16.8)	157 (42.0%)	75 (20.1)
Low awareness of the roles of ICT	17 (4.5)	34 (9.1)	43 (11.5)	204 (54.5%)	76 (20.3)
Low usage and unreliable adoption	11 (2.9)	41 (11.0)	60 (16.0)	190 (50.8%)	72 (19.3)
Perception and want to use ICT	13 (3.5)	35 (7.4)	59 (15.8)	201 (53.7%)	66 (17.0)
Level of education	12 (3.2)	30 (8.0)	29 (7.8)	198 (52.9%)	105 (28.1)
Lack of collaboration	19 (5.1)	61 (16.3)	118 (31.6)	123 (32.9%)	53 (14.2)
Gender	28 (7.5)	114 (30.5)	73 (19.5)	98 (25.7%)	63 (16.8)
Land and agricultural policies	35 (9.4)	114 (30.5)	96 (25.7)	76 (20.3%)	53 (14.2)
Availability of ICT tools	16 (4.3)	38 (10.2)	63 (16.8)	180 (48.1%)	77 (20.6)

Source: Field Survey, 2022 (SD=Strongly Disagree, D=Disagree, N=Neutral, A=Agree, SA=Strongly Agree)

Results in Table 3 show the means ranking of responses for the factors influencing the adoption of ICT for agricultural information dissemination in Rubanda District, Mayuge District, and Mbarara City. It is observed that among the factors, the level of education (mean of 3.95) is the most prominent factor. This was in agreement with a study done by (Luqman et al. 2019) who asserted that education is one of the prominent socio-economic attributes of the respondents and had a significant contribution in the adoption of agricultural innovations and uptake of modern technologies i.e. ICTs. This is followed by lack of training (mean of 3.90) This conquers with findings of (Vasa & Trendov 2020) who argued that communication via trainings with farmers that are early adopters is one of the main channels for increasing awareness, but still this process is going very slow especially in developing countries, followed by the cost of technology (mean of 3.90), followed by lack of technological infrastructure (mean of 3.84). This is followed by the inability of farmers to use ICT tools (mean of 3.84), followed by low awareness of the roles of ICT (mean of 3.77), followed by perception and want to use ICT (mean of 3.73). The least factor of influence in the adoption of ICT for agricultural information and communication dissemination is the land and agricultural policies (mean of 2.99).

TABLE 3. Responses on factors influencing the adoption of ICT for agricultural information dissemination in Rubanda District, Mayuge District, and Mbarara City

Items	Mean	Std. Dev.	Interpretation	Ranking
The inability of farmers to use ICT Tools	3.84	1.119	High influence	5
Age	3.45	1.202	High influence	13
Lack of technological infrastructure	3.84	1.079	High influence	4
Cost of technology	3.90	1.089	High influence	3
Not enough time to spend on Technology	3.69	1.082	High influence	11
Do not understand the value of ICT	3.74	1.074	High influence	7
Lack of training	3.90	1.019	High influence	2
Geographical location	3.39	1.162	Moderate Influence	14
Poor information-sharing culture	3.57	1.105	High influence	12
Low awareness of the roles of ICT	3.77	1.020	High influence	6

Low usage and unreliable adoption	3.72	.991	High influence	9
Perception and want to use ICT	3.73	.974	High influence	8
Level of education	3.95	.984	High influence	1
Lack of collaboration	3.35	1.070	Moderate Influence	15
Gender	3.14	1.233	Moderate Influence	16
Land and agricultural policies	2.99	1.205	Moderate Influence	17
Availability of ICT tools	3.71	1.040	High influence	10

Source: Field Survey, 2022

Furthermore, findings show that:

- (i) Married people are more settled and stable, they tend to have equipped the home with some electronics among which is television unlike their singles counterparts who are less settled and less stable and often time do not have a television set.
- (ii) That the younger farmers who were mostly singles were vaster in ICT-related skills and more comfortable with the use of computers for agricultural information. The implication of this is that the younger farmers who were mostly singles were more comfortable with the use of the mobile phone for agricultural information.
- (iii) That the highly educated farmers were more comfortable with the use of Television for agricultural information than their counterparts.
- (iv) That the most educated farmers were vaster in ICT-related skills and more comfortable with the use of computers for agricultural information.
- (v) That the well-educated farmers were also having better use of mobile phones resulting from their vastness in ICT-related skills and can comfortably use mobile phones for agricultural information.
- (vi) That it's obvious that the majority of the farmers do not know how to operate the computer system. Secondly, the financial implication of having a personal computer may be on the high side for many poor rural farmers.
- (vii) That middle-aged to older farmers were more comfortable with the use of Television for agricultural information.
- (viii) That the middle-aged to the younger farmers were more comfortable with the use of computers for agricultural information.
- (ix) Middle-aged farmers to older farmers seem to be having better usage of mobile phones for agricultural purposes than the young ones who use them for social media purposes.
- (x) That the farmers with average to higher monthly income seem to be more comfortable with television for catching up with agricultural information than their low monthly income counterparts.
- (xi) That the farmers with average to higher monthly income seem to be more conversant with computers for assessing agricultural information than their low monthly income counterparts and,
- (xii) That the farmers with average to higher monthly incomes seem to be more comfortable with the mobile phone for catching up with agricultural information.

Findings from interviews

Overall, all (100%) of the farmers that were interviewed had access to one, two, or more ICT devices. This is because, with the evolution of technology, ICT devices (radios, TVs, computers, and mobile phones) have become more readily available and cheaper for the common man to own which makes their access easy and also the consideration for inclusion criteria.

These findings were also complemented by those from the majority of key informant interviews (KIIs) who pointed out that there was access to ICT devices among the farmers. One of the KIIs in Rubanda district had this to say:

“...Yes, farmers have access to ICT devices especially radios and mobile phones”. *Assistant Agricultural Officer*. The major sources of agricultural information as highlighted by the KIIs included: radios, social media platforms (WhatsApp, Facebook), agricultural shows, TVs, phones, and communal gatherings among others.

ICT devices especially radios and phones have increasingly become cheaper in the 21st century given governments’ investments in rural development and enhancement of satellite, internet, and frequency modulation (FM) waves and rural electrification, which makes personal ownership very easy. This finding is also complemented by that from the majority of the KIIs who said that they used radios and mobile phones to access and disseminate agricultural information but with varying constraints ranging from limited training to power supply in rural areas. One of the KIIs in Mayuge district said;

“...I use my radio and smartphone to access agricultural information and usually also to communicate with farmers, especially over long distances”. *Agricultural Officer*

CONCLUSION AND RECOMMENDATIONS

Finding shows that the foremost inhibiting factor influencing the adoption of ICT for agricultural information dissemination in Rubanda district, Mayuge district, and Mbarara city is the lack of training. It is recommended that training and re-training in the usage of ICT devices be conducted for the farmers from time to time such that they become conversant with all the required and necessary devices and able to take advantage of the entire alternative device as each device is uniquely difference, serving uniquely different purposes.

CONFLICT OF INTEREST

The authors declare no conflict of interest and affirm that the study was self-sponsored.

REFERENCES

- Aker, J. C., Ghosh, I., & Burrell, J. 2016. The promise (and pitfalls) of ICT for agriculture initiatives. *Agricultural Economics*, 47(S1), 35–48.
- Armstrong, L., & Gandhi, N. 2012. Factors Influencing The Use Of Information And Communication Technology (ICT) Tools By The Rural Farmers In Ratnagiri District Of Maharashtra India. *Proceedings of the Third National Conference on Agro Informatics and Precision Agriculture*, 58–63.
- Awojide, S., & Akintelu, S. O. 2018. Empirical Investigation of factors affecting information and communication technologies (ICTS) in Agric-Business among small scale farmers in Esan Community, Edo State, Nigeria. *Journal of Research in Marketing*, 9(1), 713–722.
- Ayim, C., Kassahun, A., Addison, C., & Tekinerdogan, B. (2022). Adoption of ICT innovations in the agriculture sector in Africa: A review of the literature. *Agriculture & Food Security*, 11(1), 1–16.
- Bland, J. M., & Altman, D. G. 1997. Statistics notes: Cronbach’s alpha. *Bmj*, 314(7080), 572.

- Chavula, H. K. 2014. The role of ICTs in agricultural production in Africa. *Journal of Development and Agricultural Economics*, 6(7), 279–289.
- Chhachhar, A. R., Qureshi, B., Khushk, G. M., & Ahmed, S. 2014. Impact of information and communication technologies in agriculture development. *Journal of Basic and Applied Scientific Research*, 4(1), 281–288.
- Cohen, L., Manion, L., & Morrison, K. 2018. Research methods in education (eight edition). *Abingdon, Oxon*.
- Hemeson, C. J. 2006. Digital divide: M-Africa. Available at SSRN 1285231.
- Levi, C., Kyazze, B. F., & Sseguya, H. 2015. *Effectiveness of information communication technologies in dissemination of agricultural information to smallholder farmers in Kilosa district, Tanzania* [PhD Thesis]. Dissertation for Award of MSc Degree at Makerere University, Uganda. 81pp.
- Luqman, M., Yaseen, M., Ashraf, S., Mehmood, M. U., & Karim, M. 2019. Factors influencing use of information and communication technologies among farmers in rural Punjab, Pakistan. *Journal of Agricultural Extension*, 23(2), 101–112.
- Maina, C. M., Nyang'anga, H. T., Mburu, J. I., Kasina, J. M., Guantai, M. M., Nderitu, J. H., & Gathaara, V. N. 2021. Determinants influencing farmers' use of macadamia nut information sources in central Kenya. *Journal of Agriculture and Food Research*, 100184.
- May, J., Karugia, J., & Ndokweni, M. 2007. *Information and Communication Technologies and Agricultural Development in Sub Saharan Africa: Transformation and Employment Generation*.
- Mzomwe, M., Tambwe, M., Mapunda, M., & Kirumirah, M. 2021. ICT and Marketing for Agricultural Products: Determinants Of Mobile Phone Usage To Small Scale Orange Farmers In Tanzania: Key words: ICT, Marketing, Small scale farmers, Mobile phone usage, UTAUT, Tanzania. *Business Education Journal*, 10(1).
- Naik, B. J., Rao, B. M., Rambabu, P., & Rekha, M. S. 2021. *A Study on Profile of Information and Communication Technology (ICT) Tools Usage Farmers of Anantapur District of Andhra Pradesh*.
- Ogutu, S. O., Okello, J. J., & Otieno, D. J. 2014. Impact of information and communication technology-based market information services on smallholder farm input use and productivity: The case of Kenya. *World Development*, 64, 311–321.
- Rashid, S. M. M., Islam, M. R., & Quamruzzaman, M. 2016. Which factor contribute most to empower farmers through e-Agriculture in Bangladesh? *SpringerPlus*, 5(1), 1–14.
- Rodrigues, M. dos S., & Rodríguez, A. G. 2013. *Information and communication technologies for agricultural development in Latin America: Trends, barriers and policies*.
- Statistics, U. B. of. (2016). *The national population and housing census 2014–main report*. Uganda Bureau of statistics Kampala.
- Vasa, L., & Trendov, N. 2020. Farmers' experience in adoption and usage of ICT solutions for agriculture in the Republic of Macedonia. *Applied Studies in Agribusiness and Commerce*, 14(3–4), 25–30.
- Yamane, T. 1967. *Statistics: An introductory analysis*.