International Journal of Agricultural Extension and Rural Development Studies
Vol.4, No.1, pp.31-43, February 2017
Published by European Centre for Research Training and Development UK (www.eajournals.org)

ACCESSIBILITY AND RELEVANCE OF EXTENSION METHODS AND INFORMATION AND COMMUNICATION TECHNOLOGIES AMONG FARMERS IN MAURITIUS

Jaudoo Avilesh, Hardowar Shane and Ruggoo Arvind
Department of Agricultural Production and Systems
University of Mauritius

ABSTRACT: *The study aims to address the accessibility and relevance of different extension methods and information and communications technology (ICT) tools among farmers in Mauritius. A quota sample of 100 farmers was interviewed across the four extension zones of the island. The most efficient extension methods of farmers were firstly visits by extension officers (25.2%), followed by phone calls (19.8%) and video films (13.1%). The respondents claimed that training, short message service (sms), exhibitions and mass media were useful in providing beneficial information to them. Mobile phones were the main ICT device used by farmers (65%) to retrieve agricultural information. The access of smartphone (p= 0.009) and computer (p=0.001) was significantly associated with income rate. ICT needs to be integrated to agriculture to improve the livelihood of farmers. Extension methods such as visits, training and exhibitions should be intensified to allow accessibility to useful information. These extension methods should be reinforced to enhance agricultural productivity.*

KEYWORDS: Agricultural information, Extension methods, ICT tools, Agricultural productivity

INTRODUCTION

Despite a share of only 3% to the Gross Domestic Product (GDP), the agricultural sector still plays a vital role in the economy of Mauritius. Being the elementary mechanism in the food chain, the government is looking forward to boost the agro industrial sector. The number of people engaged in the agricultural sector has increased from 44,200 in 2013 to 44,900 in 2014, a total increase of 1.6% (CSO, 2014). Sugar cane production had a decline rate of 1.7% and this shows the diversification of producers from sugar cane to food crops. On the other hand the livestock sector had a growth rate of 0.8% and the only industry which is self-supporting is the poultry industry (CSO, 2014).

Agricultural extension can be elucidated as the delivery of pragmatic information to farmers via a range of communication channels. It is an on-going practice which enables farmers to exploit productive knowledge and advice for ameliorating their standard of living either by conveying information or technology transfer (Monu, 1982). Agricultural extension has forged ahead to be a key promoter to attain food security and to diminish poverty of rural population in developing countries and Mauritius is an example. Hence the dissemination of productive information plays a crucial role in the farming society.Communication

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

technologies can be described as the easy transfer of information by means of computers and telecommunication technologies and they can be viewed as a term that encloses acquisition, organisation, storage, pictorial and audio visual forms under a full range of information and communications technology *(*ICT) (Umar *et al*., 2015). Dependent on agricultural information, farmers need agricultural communication which is the key operation of extension agents and other extension methods to transfer agricultural news and information (Kamal *et al*., 2014).

LITERATURE REVIEW

According to Swanson and Claar (1984), over recent years, many distinctive approaches have been set up for promoting recent experimental and professional knowledge. Many types of extension approaches were established such as training and visit system, farming experiments organized by universities, commodity development and demonstrations. Umar *et al.* (2015) opined that the role of extension officers is to provide facilities to farmers and help them acquire good communication skills and become a savvy of technology.

ICT sources should be encouraged for their credibility and availability if farmers want to make greater amount of profit. This helps the farmers enormously to identify their weaknesses and strengths with a view to improving their performance in farming activities. Technologies are leading to an extensive development as they are ameliorating and facilitating the extension process through better interaction and understanding of the subject (Mwangi, 1998).

Internet facilities have been beneficial to users by making them accessible to vast and specific information, several useful websites, market price and farming equipment details. There are also mobile technologies such as voice, network and connectivity which are improving the rural farming system and also providing a range of services to farmers including Short Messaging Service (SMS), Multimedia Messaging Service (MMS), Global Positioning System (GPS) and web application via networking. SMS-based system is being used to propagate agricultural information especially in Africa and India (mAgriculture, 2011). Furthermore there is a wide range of other digital technologies in the agricultural sector such as e-extension, satellite farming, kiosk, e-books, web pages, online banking and drone application in agriculture. These technologies simplify the tasks of farmers by retrieving agricultural information, promoting marketing and innovation adoption.

Extension methods are generally standardized forms of disseminating information to farmers. They act as a bridge linking extension agents to producers thus enabling them to reach the final target and solve their hindrances. According to Hoffman et al (2009), extension methods are techniques of communication between extension workers and client groups and are categorized mainly as individual methods, group methods and mass and large public methods. Individual extension method is a ubiquitous method commonly known as face to face extension and can be considered as the best interactive process as information are exploited by farmers from extension agents. Group extension method targets a number of clients therefore reaching a greater extension coverage which is time and cost effective.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Mass extension also recognized as extension for lager public is acclimated to focus on a broad number of people at single and short time.

In Mauritius, extension services are normally executed by the Food and Agricultural Research and Extension Institute (FAREI), Mauritius Cane Industry Authority (MCIA) and the Small Farmers Welfare Fund (SFWF) but in some regions the private sector operates to satisfy agricultural producers. FAREI provides farmers with a wide range of services namely visits, trainings, publications, Agricultural Production Marketing and Information System (APMIS) service and Short Message System Disease Alert.

According to a census carried out by the Central Statistics Office (2014), it was observed that there are remarkable constraints encountered by farmers like pest and diseases, theft, unavailability of water, marketing and many other issues such as weed control, labour and late adoption of agricultural innovation. Consequently awareness of agricultural information and accessibility to extension services are the main requirements to reduce problems confronted by farmers and this can be achieved by promoting effective extension services.
The study seeks to investigate the usage of ICTs by farmers in Mauritius and the accessibility and relevance of extension methods. The specific objectives are:

I. To assess the level of awareness of agricultural information among farmers in Mauritius in both crop and livestock sectors.
II. To determine the accessibility and relevance of ICT and extension methods among farmers.
III. To investigate whether farmers are adopting the communication technologies being used to propagate information.

METHODOLOGY

This study was carried out in the different zones (North, South, East and Centre West) of Mauritius. The sampling frame of crop planters and livestock farmers was gathered with the help of the Small Farmers Welfare Fund (SFWF) and the Food and Agricultural Research and Extension Institute (FAREI). 100 farmers (60 food crop producers and 40 livestock farmers) were selected using quota sampling for the survey.The survey questionnaire used comprised six sections with several questions and choice of answers. In order to check the reliability and validity of the survey questions, the questionnaires were pre-tested from a sample of three food crop and two livestock farmers and necessary modifications done. Face-to-face interview was conducted to get the appropriate information required from the farmers as majority of them were poorly educated and were not familiar with the technical terms. The duration of the survey with each respondent was approximately 20 to 30 minutes.

The data obtained were analysed using the Statistical Package for the Social Sciences (SPSS) software and Microsoft Excel version. Data were summarised using descriptive statistics and appropriate charts and tables. Relationship of interest between variables was investigated using the chi-square test at the 5% level of significance.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

RESULTS

Socio-Demographic Profile of Respondents & Experience

Table 1: Socio-demographic profile of farmers

SOCIO-DEMOGRAPHIC PROFILE OF FARMERS (N=100)	
GENDER	**PERCENTAGE (%)**
Male	84.0
Female	16.0
OCCUPATION	
Full time	78.0
part time	22.0
EDUCATIONAL LEVEL	
Primary	44.0
Secondary	46.0
Tertiary	4.0
Vocational	3.0
Illiterate	3.0
INCOME RANGE	
< Rs 10,000	42.0
Rs 10,000- 20,000	37.0
>Rs 20,000	21.0
EXPERIENCE	
< 5	8.0
5-20	54.0
>20	38.0

Above 90% of the farmers had more than five years of experience. 84% of respondents were male and farming was their full time for 78%. The survey reveals that the majority of the livestock farmers and food crop growers were within the age of 46-55 years (35.0%) and 36-45 years (24.0%) (Table 1).

Table 2: Visits from extension officers to farmers

Frequency of visit	Percentage (%)
Every two weeks	2.0
Once per month	14.0
On request (Via Mobile)	40.0
Not at all	44.0

From table 2, it is revealed that 56% of the farmers received visits from EOs and 44% did not receive at all. 40% had to contact the extension officers via phones to meet them. However, the majority of the farmers (89%) pointed out that visits should be carried out regularly at a particular interval. 64% of the farmers interviewed, were aware of the different

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

courses provided by institutions, however only 24% had followed courses which are mainly provided by FAREI.

Agricultural Publication

Table 3: Accessibility to agricultural publication

Agricultural publication	**Percentage (%)**	
Accessibility to publication	**Yes** 61.0	**No** 39.0
Types of publication Books Journals and magazines Pamphlets and leaflets *Multiple response allowed	**Yes** 24.0* 38.0* 56.0*	**No** 76.0 62.0 44.0

Table 3 shows that agricultural publications are accessible to 61% of the respondents. Most of them said that pamphlets and leaflets (56%) are more suitable and understandable, followed by journals and magazines (38.0%).

Agricultural Exhibition

Table 4: Accessibility to agricultural exhibition

Exhibition	**Percentage (%)**
Importance of accessibility to exhibition Agree Neutral Disagree	 73.0 23.0 4.0

Nearly 3 out of 4 respondents attended agricultural exhibitions and 73% of them agreed that accessibility to this type of extension method is important for a farmer as exhibition is the most explicit platform displaying services, products and creates awareness for innovations.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Mass Media

Table 5: Mass media

Mass media	**Percentage (%)**	
Accessibility	**Yes**	**No**
Television	99.0	1.0
Radio	89.0	11.0
Press releases (Journals)	56.0	44.0
Do mass media bring agricultural information?	74.0	26.0
Viewing programme on radio	52.0	48.0

Table 5 reveals that a higher percentage of farmers had access to mass media tools (99% television and 89% radio) and 74% assumed that mass media is a good source of information. It can be observed that only 52.0% view agricultural programmes on radio.
A chi-square test was performed to analyse whether age, educational level and income rate were significantly associated to the accessibility of different extension methods and the results are shown below.

Table 6: Association between socio-demographic factors and accessibility to different extension methods

Accessibility to different extension methods	**Age Sig (2-tailed) (p-value)**	**Educational level Sig (2-tailed) (p-value)**	**Income rate Sig (2-tailed) (p-value)**
Visits from EO	0.628	0.717	0.107
Training	0.011*	0.000*	0.358
Publication	0.001*	0.001*	0.489
Exhibition	0.183	0.330	0.133
Mass media	0.933	0.102	0.098

Number of observation = 100, *= Significance level at 5%

Age and educational level were found to be significantly associated ($p < 0.05$) with training and publication.

Information & Communication Technology Tools

Figure 1. ICT tools possessed

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

26.8% of farmers had cellular phones, 21.9% possessed telephone and 19.6% had smart phones. 84.0% of the farmers purchased these tools for both personal and business use. About two thirds of the farmers used mobile phone as source of information followed by computer (28.0%).

Table 7 shows the chi-square test results obtained to find whether the possession of ICT tools depend on age, educational level and income rate.

Table 7: Association between possession of ICT tools and age, educational level and income rate

ICT tools	Age	Educational level	Income rate
Cellular mobile phone	0.110	0.199	0.980
Smart phone	0.000*	0.001*	0.009*
Computer	0.000*	0.000*	0.001*

Number of observation= 100, * = significance level at 5%

Age, educational level and income rate were found to have significance association on the possession of smart phone and computer ($p<0.05$).

ICT Tools and Online Applications

Table 8 reveals that 65% of the farmers had internet connection however, only few of them retrieved information from this source. Most of them used internal connection for personal use and entertainment.

Table 8: Use of internet

Use of internet	Percentage (%)
Entertainment	27.5
Personal use	39.4
Agricultural information	22.5
Agricultural marketing	10.6
Total	100.0

Only 31% of the farmers were aware of different online services provided by different institutions from which 23% knew about APMIS and 69% were willing to follow an ICT course. The reasons preventing farmers for not possessing technology tools were mainly lack of knowledge (39.0%), low surfing skills (26.3%), high cost of the device (20.5%) and high cost of internet (14.2%). The majority of farmers did not find information from desk kiosk as a satisfying source of information. Only 26% preferred to receive agricultural information from this electronic device.

The farmers were asked to rate the potential of ICT tools (e.g. mobile phones, computers) to assist them to solve different farming activities.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Table 9: Efficiency of ICT tools to assist the progression of cultivation

Crop cultivation	Level of efficiency (Frequency N= 60)		
Problems	**Low**	**Neutral**	**High**
Choose hybrid seeds	13	25	22
Control pest & disease	11	16	33
Fertilisation	19	18	23
Scheduling irrigation	27	20	13
Innovation adoption	7	11	42
Apply schemes	12	23	25

Table 10: Efficiency of ICT tools to assist the progression of rearing

Livestock rearing	Level of efficiency (Frequency N= 40)		
Problems	**Low**	**Neutral**	**High**
Choose breeding variety	18	15	7
Well-designed housing	12	9	19
Purchase feeds	14	14	12
Marketing	10	5	25
Innovation adoption	8	3	29
Apply schemes	11	9	20

The tables 9 and 10 illustrate that ICT tools are becoming effective means of information and services to both crop producers and livestock farmers. The majority of problems encountered by farmers could be resolved by the use of ICT tools.

Effectiveness and Preferred Sources of Information from Extension Methods

Table 11: Effectiveness level of sources of information from extension methods

Sources of information from Extension Methods	Mean	Mode	Standard deviation
Visit from extension officer	4.0	4	0.765
Phone calls	3.95	4	0.770
Video films	3.69	4	0.711
Training	3.6	4	0.964
Agricultural exhibition	3.44	4	0.903
Mass media	3.43	4	0.856
Agricultural publication	3.22	3	0.894
SMS	3.22	3	0.883
Online interaction	2.58	2	1.199
Email	2.41	2	1.016
Video calling	2.17	2	0.711

1= very low, 2= low, 3= neutral, 4= high, 5= very high

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

According to table 11, individual farm visit is the most effective extension method with a mean of 4.0. In second position farmers indicated phone call (mean=3.95), then video films come after with a mean of 3.69. From the mean value table, some farmers preferred training (mean= 3.6), agricultural exhibition (mean= 3.44) and also mass media (mean=3.43). Sources which are of low effectiveness are online interaction (mean= 2.78) and email (mean=2.41). According to the farmers, the least effective one was video calling (mean= 2.17).

DISCUSSION

Farmers' Profile

The farmers are predominantly male and half of them are below the age of 45 years. The implication of men in farming is evident as the work implies lots of force and energy compared to women who carry out light operations in the field. About 24% of farmers fall into the category of 18-35 years old, this affirms that youngsters are showing interest in the business and they are exploiting all the facilities and techniques provided to the farming community. Half of them are above 45 years old and it is significant for ICT usage as elder farmers might be less responsive to ICT tools and they will prefer other sources of information such as oral and printed information. This indicates that age is an important factor in adoption of ICT tools.

Accessibility to Information and Extension Services

Farmers considered extension services to be effective and have potential to solve their problems. FAREI is a fundamental institution in providing agricultural information to farmers and about 60% of farmers received visits from extension officers while others complained about the service. A greater number of farmers (89%) thought that visits should be carried out on a regular basis as this extension method provides them with precise information and it is time and cost effective. This finding is in line with the findings of Aremu *et al.,* (2015) who revealed that extension workers are best in creating awareness and disseminating information.

Individual visit was ranked first and this method needs improvement in order to deal with the majority of the farmers as it supports them with instantaneous recommendation. Many farmers think that training courses provided by FAREI and other institutions are efficient, however the enrolment of the farmers were low (24.0%) because of cost implication and low level of literacy. Moreover some farmers did not find this method time efficient as it retains them away from their farming activities and they preferred not to leave their field due to theft problems.

Mass media in agriculture can be determined as a powerful tool to create awareness, publicize agricultural issues such as outbreaks and weather forecasts. These are the main reasons why 74% of the farmers assume that accessibility to mass media is necessary. The best mass media device was television as only fifty per cent of farmers said they find time

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

to follow programmes on radio. Mass media can be considered as a modernized communication tool which clearly disseminates information and demonstration to farmers.

The findings on agreement of mass media (72%) as a good source of agricultural information follow the assertions of Abubakar *et al*., (2009) which revealed that the majority of farmers found mass media highly accessible and relevant. Besides, the use of local languages especially on television and radio make them good media for disseminating agricultural information. Based on the farmers' choice, video films were ranked third, and this method is considered as a good information medium to farmers.

There is significant association between age and access to training and publication (Table 6), which implies that as age increases farmers tend to seek less information from training and publication methods. Instead on depending on these two methods they tend to find other sources of information such as visits and participation in exhibitions. Moreover they rely more on self-experience to carry out their farm activities.

Educational level affects the access to information positively and it was found that the accessibility to training and publication was dependent on education level. Hence low level of literacy will lead to low enrolment of courses provided by institutions as shown in table 6. On the contrary, methods like visits, exhibition and mass media do not depend on level of education. The income rate was found to have no significant relationship with the accessibility to different extension methods as many of them are cost effective.

Information and Communication Technology Tools

Around 80% of farmers purchased ICT tools (cellular phones, smartphones and computers) for both personal and business use. The age and level of education attained are decisive factors which figure out the ability of the farmer to exploit valuable information and technology adoption.The usage of mobile devices among farmers was common as numerous farmers were knowledgeable in using them. 65% of farmers used mobile phones as the main ICT tool to receive information from extension agents. Mobile phones have enabled producers to link with extension services and in addition to Short Message Service (SMS) services.

Farmers are more comfortable with cellular phone compared to smart phone due to the complexity of the latter. FAREI promotes the SMS Disease Alert to 'registered farmers' via mobile phone thus creating alertness and making information accessible to them. The best ICT device for farmers is the mobile phone which is a developmental tool that can enhance their livelihood and respond to their troubling issues in the field.

From the findings, age, educational level and income rate have significant relationship to the access of smartphone and computer. Young farmers are at ease with smart phone, and as age increases the usage of smartphone decreases. The main reason is the complexity of the device, lack of knowledge and preference of cellular phones. The use of smartphone ($p= 0.001$) and computer ($p= 0.000$) also depends on education level. As educational attainment increases the users of smartphone and computers also increase and these findings

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

corroborate with these of Falola & Adewumi (2011) who revealed that education has a positive effect on the usage of mobile and computers. Most of the farmers who attained secondary or higher level of education were in possession of these devices. Another independent variable examined in relationship with the possession of the technology tools is income rate. It was found that the access to smartphone and computer depends on income rate. Small farmers earned less than Rs10 000 are not interested in purchasing technology tools (smartphone and computer) to explore information. However the accessibility of cellular phone was independent on the different characteristics as it was cheaper and less complicated.

According to Okeke *et al*., (2015) high illiteracy rate and lack of knowledge lead to low awareness and benefits of ICT tools and in the study it was found that more than half of the farmers had internet connection at home, however only few of them used this method to receive agricultural information (33.1%) due to inadequacy of knowledge and lack of training on how to manipulate latest technologies. In order to seize agricultural information from computers and laptops, there should be an understanding of the device and internet connection is needed thus as a result of low literacy level and complexity of the tool, computers are less preferred compared to mobile phones. The 28% of farmers who used computer as a source of agricultural information are predominantly using it to increase their knowledge by watching online agricultural videos, searching for latest equipment and techniques and seeking information about innovations.

Problems encountered by respondents for hindering the application of technology tools are principally lack of knowledge and low surfing skills. However the price of both the device and internet connection is also a meaningful factor in restraining accessibility of ICT tools to farmers. Being an ICT device, the desk kiosk scored less as source of information for farmers. Reasons for this cause are unfamiliarity of the device, preference of other extension method rather than self-service machines, complication of the technology and low user friendliness.

Some variables (age, educational level and income rate) were tested to find the relationship with the potential of ICT tools in helping producers to carry out farming activities. For crop producers, the application of ICT devices in choosing hybrid seed varieties, control pest and disease, fertilisation, technology adoption and apply schemes were dependent on age, educational level and income rate, which implies that all these three characteristics are playing significant role in applying ICT tools in farming. For livestock producers, the implication of ICT tool for constructing well designed housing, purchasing feeds, marketing, technology adoption and applying schemes are dependent on age, educational level and income rate.

Video films and training courses provide specific information in relating fields whereby farmers can find it very useful. Video films are relevant in providing latest practices and new ideas to farmers. However, due to cost implication and farmers having to leave their field for long time, the enrolment of courses is low (24.0%). ICT should be integrated to agriculture aiming at improving the status of the country and livelihood of farmers.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

IMPLICATION TO RESEARCH AND PRACTICE

ICT has a promising consequence on the upcoming farming system in Mauritius. Extension organisations in Mauritius need to review their extension service to farmers moving towards a more ICT based approach. Availability of information through ICT tools to farmers should be encouraged since ICT led extension system can become a key agent for changing farmers' situation. There is a strong need for a national ICT policy in agriculture.

CONCLUSION

The study analyses the effectiveness of extension methods and ICT among farmers in Mauritius. It is imperative that access to information is a considerable factor in establishing agricultural production. Therefore, in order to alleviate farmers' constraints on the field, the most efficient and relevant extension services should be supplied to them. Farmers have determined that ICT tools have greater potential in assisting the progression of their farming activities. Thus, in order to increase the efficient use of ICTs among farmers in Mauritius, it is essential to set up ICT training in place for them.

RECOMMENDATIONS

Based on the findings of this study, the following are suggested:

i. Governmental and non-governmental organizations should collaborate to sensitise farmers to produce more agricultural products through adequate agricultural policies and schemes.
ii. FAREI should increase its extension staff ratio to farmers.
iii. Collaboration of the government, Mauritius Broadcasting Corporation and FAREI is needed to diffuse more agricultural programmes in local language on either television or through radio.
iv. Due to low level of literacy and lack of knowledge resulting in low ICT tools adoption, ICT courses applied to agriculture should be provided to farmers.

FUTURE RESEARCH

Extension systems nowadays have become more demand-driven. The need for advisory service and agricultural information is likely to intensify in the future. The use of information technology is the biggest factor for change in modern extension. Future research may be concentrated on the use of drone technology in precision agriculture or satellite farming to help the farming community

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

REFERENCES

Abubakar, B.Z., Ango, A.K., Buhari, U. (2009) The Roles of Mass Media in Disseminating Agricultural Information to Farmers in Birnin Kebbi Local Government Area 0f Kebbi State: A Case Study of State Fadama II Development Project, vol. 13, no. 2, pp. 42-53.

Aremu, P.A., Kolo, I.N., Gana, A.K. and Adelere, F.A. (2015) The Crucial Role of Extension Workers In Agricultural Technologies Transfer and Adoption, Global Advanced Research Journal of Food Science and Technology, vol. 4, no. 2.

Central Statistics Office (2014) Digest of Agricultural Statistics 2014, Ministry of Finance and Economic Development, Mauritius. Available from: http://statsmauritius.govmu.org/.

Falola, A. and Adewumi, M.O. (2011) Constraints to use of mobile telephony for agricultural Production in Ondo state, Nigeria, vol. 4, no. 2, pp. 52-63.

Hoffmann, V., Gerster-Bentaya, M., Christinck, A. and Lemma, M. (2009) Rural Extension. Basic issues and concepts, Margraf Publishers, vol.1 3rd ed., pp 121.

Kamal, T., Nawab, K., Ullah, W. and Khan, M.S. (2014) Role of Agricultural Extension Agents in Enhancing Tomato Production in District Peshawar, Journal of Economics and Sustainable Development, vol. 5, no. 27, pp. 52-58.

mAgriculture (2011) Mobile Applications in Agriculture. Available from: http://www.syngentafoundation.org.

Monu, E. (1982), Improving Agricultural Practices among African Smallholders – The Contribution of Adoption and Diffusion of Innovation Research to Agricultural Development in Africa. African Studies Review, vol. 25, no. 4, pp. 117.

Mwangi, J. (1998) The role of extension in the transfer and adoption of agricultural technologies, vol. 5, no. 1.

Okeke, M.N., Nwalieji, H.U. and Uzuegbunam, C.O. (2015) Emerging Role of Information Communication Technologies in Extension Service Delivery in Nigeria: A Review, Journal of Agricultural Extension, vol. 19, no. 1, pp. 128-137.

Swanson, B.E and Claar, J.B. (1984) The history and development of agricultural extension. Available from: http://www4.fao.org/.

Umar, S. Musa M.W. Olayemi, Y.T. and Suleiman, R. (2015) Awareness and Use of Information and Communication Technologies among Extension Agents in Kaduna State of Nigeria, Journal of Agricultural Extension, vol. 19, no. 1, pp. 66-74.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107