

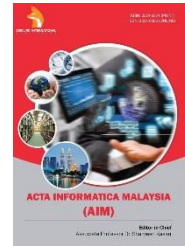
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## RESEARCH ARTICLE

# INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) MEDIATED EXTENSION SERVICES IN AGRICULTURE IN NEPAL- A REVIEW

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## ABSTRACT

This study is conducted to know Information and Communication Technology (ICT) mediated extension services in agriculture in Nepal. In this report, different ICT tools that are used for extension of agriculture in Nepal, organizations and divisions working for an extension, extension system of country, benefits and advantages from the use of ICT tools, constraints in the use of ICT tools in agriculture extension and their solutions are included. This report is prepared by studying different journal articles, reports, books and newspapers. Among ICT tools mobile phone is the most used ICT tools by farmers and laptop is the most used ICT tools used by the organizations for data processing. Radio and television are more popular in rural areas. This study shows that most of the ICT users are confined in urban areas. There are many advantages of the use of ICT tools in the field of agriculture. ICT tools can cover a large number of the population with high speed. ICT tools increase productivity, sustainability and efficiency of farms by providing relevant information timely and more easily. ICT tools provide information about quality seeds, transportation, marketing, new technologies and weather condition that facilitate the farmers for making the right decision. There are many agriculture-related mobile applications available at Google play store. These mobile apps give knowledge about cropping methods, crop management practices, crop protection, the market price of inputs and outputs etc. These mobile apps are managed in Nepali language for facilitating the Nepali farmers. Agriculture-related programs are broadcasted through national television channels and FM radio stations. There are technical, socio-economic, institutional and infrastructural constraints that limit the use of ICTs in agriculture fields.

### KEYWORDS

Agriculture, mobile, communication, extension

## 1. INTRODUCTION

ICT is "Information and Communication Technology". It is the technology that provides access to information through telecommunication. The devices and tools used in information and communication technology are called ICT tools. Computer, cell phones, radio, television, telephones, internet, wireless networks etc. are the ICT tools (*ICT Definition*, n.d.). At present ICT tools become an integral part of our life and modern agriculture can't imagine without ICT tools (Thapa, 2018). Agriculture extension is the transfer of knowledge of agronomic techniques and skills to improve productivity, food security and livelihood of the farmers. Agriculture extension aims at the dissemination of practical information, including improved seeds, soil quality tests, tools, water and nutrient management, pest control and application of this knowledge on the farm (Ferroni and Zhou, 2012).

Agriculture development is fundamental for poverty alleviation and national development. The agricultural growth has the potential in reducing poverty 4 times greater than the potential from any other sector (A/C to UNDP). In Nepal, about 60.4% (a/c to 2068) population engaged

in agriculture for their livelihood. Agriculture and forestry contribute 26.5% in national GDP (Krishi Diary, 2077). Agriculture is the second-largest export sector of the country after industry. The extension system helps in the dissemination of technical and basic knowledge and agricultural practices from researchers to farmers and helps to bring farmers problems and feedback to the researcher. It acts as a linkage between farmers and researchers (Gautam, 2018). In Nepal, the Department of Agriculture (DOA) and Department of Livestock Services (DOLS) under the Ministry of agriculture and livestock development (MOALD) are the public sectors for agriculture extension (MOALD, 2076). Many NGOs (like LIBIRD, FORWARD), INGOs (like UN agencies, action AID, IFAD, IRI, ICIMOD) and farmers groups are also working for the extension of agriculture services in Nepal. The Agriculture Information Section (AIS) was established in 1965 as a separate unit in DOA by realizing the growing importance of information in agriculture. In 1990, it is named as Agriculture Communication Division (ACD) and after the formation of the Ministry of Agriculture Development (MOAD) in 2000, it was named as Agriculture Information and Communication Center (AICC). AICC is responsible for providing information related to agriculture to farmers, traders, entrepreneurship and professionals and to deliver

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information through radio, television and print media. It also takes challenges and responsibility in modernizing agriculture in Nepal by using the digital information system (Bohara, 2011).

At the organizational level, the nearest extension providers are the Agriculture service center (ASC) and Livestock service and sub-service centers (LSSC). The ratio per ASC (378) is 1:11396 and at LSSC (999) it is 1:4312 (MOAD, 2071 BS). Thus, they are trying to serve 3831093 households (CBS, 2013). The public extension workers ratio is at 1:1580 HHs in the case of crop and fisheries and is at 1:1906 HHs in the case of livestock (Gautam, 2018). This data shows there are insufficient agriculture extension experts in the country which limits the farmers from getting extension services. The main reason for failure in crop production is the inaccessibility of timely and good information related to healthy farming in Nepal (Regmi, 2016). There is a knowledge gap between farmers and the best production practices. There is a loss in crop and livestock production due to various risks and uncertainties caused by geography, climate and natural disasters (Naharki, 2017).

In this context, coverage of technical knowledge and skill disseminations approach and tools may be needed and the use of ICT is observed as an effective tool (World bank, 2011). By using ICT tools like smartphones, wireless networks, internet we can disseminate information about geography, natural disasters and various crop production practices, information about improved seeds, innovative technologies, crop protection and marketing of crops in a short period of time. ICT tools also help in the coverage of large farmer populations. ICT can make a significant contribution to the productivity and sustainability of small scale farmers (Gautam, 2018). The rural areas which are disconnected from the greater world, ICT helps to connect to information and new technologies and provide a transformational opportunity for rural areas. Global studies show that ICT in agriculture affects economic growth and productivity of input positively. ICT has a vital role in addressing the challenges of agriculture and the uplifting livelihood of rural farmers (Naharki, 2017).

## 2. OBJECTIVE OF THE STUDY

The objective of this study is to know about the Information and Communication Technology (ICT) mediated extension services in agriculture in Nepal and the benefits and constraints of ICT tools in agriculture extension.

## 3. METHODOLOGY

The information was collected from secondary sources such as Research articles, books, reports, news, and other various e-sources including Google, Google Scholar, Research Gate, Directory of Open Access Journal, etc. during the preparation of this manuscript.

## 4. DISCUSSIONS

In the present context, there is an increase in the number of ICT users. Smartphone users, mobile and computer users, laptop users, radio, television users are increasing. The radio became a popular device in rural areas. There is a radical change in the nature of the information ecosystem due to the arrival of mobile coverage. Now the world's information is at tip of finger. By tapping mobile apps and scrolling mobile screens we can get information (Regmi, 2016). ICT tools help in equal access to information for all and help to reduce the information gap between farmer, extension expert and researchers. There are many radio programs and television programs that give knowledge about how to grow crops? What actions do we take for crop protection? What crop should plant? When to plant etc. (Thapa, 2018).

These radio programs also allow farmers to ask questions directly to agriculture experts. Call centers are established to give direct solutions to farmer's problems through telecommunication. ICTs are now being used in agriculture for receiving information such as the market price of agriculture products, various improved technologies, solutions to farmer's

problems, information about improved seeds, fertilizer and other inputs, climatic conditions etc. (Gautam, 2018). Nowadays geographic information system (GIS), global position system (GPS), computer control automated system such as robots and automatic milking, software technologies are used in field of agriculture (Naharki, 2017).

From the primitive era, people are sharing information among them about agriculture practices such as different cropping methods, quality seeds, new crops, time of planting etc. (Paudel et al., 2018). For effective managerial functions and performance, it is necessary to get relevant information on a timely. In conventional agriculture, agrochemicals and chemical fertilizers are used in higher amounts to increase the production of crops. Most of the farmers are using these poisonous chemical pesticides haphazardously that harms the environment and human health (Bohara, 2011). There are challenges in effective and timely dissemination of real-time research update to farmers due to many constraints such as geographical barriers, poor communication infrastructure, poor carriage services, bad condition of roads and insufficient roads. Transmission of information through physical contact has many bottleneck effects ICT can improve agriculture by providing access to information and making it less costly to obtain and adopt (Yahaya et al., 2018; Regmi, 2016). There is an increase in convenience and cost-saving by using mobile phones as basic communication reported by farmers (Bohara, 2011).

There are five initiatives of ICT's provided by different private and public agencies in agro-advisory services (Paudel et al., 2018):

- a) Telecommunication initiatives: there are farmer's call centers established by AICC, in where agriculture experts receive problems and provide solutions to farmers. There is also SMS services about market price-related information provided by DOA and Kalimati.
- b) Media Initiatives: national television and FM radios broadcast information related to agriculture issues and new technologies. Such as Krishi Samachar, Krishi Karyakaram etc.
- c) Internet-based initiatives: different mobile applications are available and other agriculture online portals of DOA, AICC provides information related to agriculture.
- d) Agro-meteorological initiatives: they help in weather forecasting and cropping pattern using GIS, GPS services.
- e) Printed initiatives: there are many newspapers, magazines, booklets and pamphlets in Nepali and local languages.

### 4.1 Different ICT tools used in the extension of agriculture

#### 4.1.1 Mobile phones

It a multidimensional device. Through mobile we can do voice calls, SMS, if we have a camera mobile we can send images, by using different mobile applications we can send data, emails. The mobile network can connect to world networks which help to get connected to the world. Mapping functionality can be provided by GPS and GIS and mobile phones also can be used for cash payments. It reduces the cost of transactions and also helps in the enlargement of trade areas. By using mobile networks more people can connect to high-speed networks and can be benefited from a growing number of applications. To mitigate agricultural risks and safeguarding the agricultural incomes mobile phones can serve as the backbone for the early warning systems. Mobile phones are more accessible, more affordable, have more appliances and many applications can run so that the mobile phone's coverage is increased day by day. More than 90% of Nepalese possess mobile phones (Chhetri, 2016).

Since 2007, with the aim of providing information on agriculture field and services there are many agriculture related apps are formed. Smart Krishi, Krishi Guru, Hamro Krishi, NARC Krishi, Krishi Kapurkots etc. are the mobile apps. These mobile applications provide information in Nepali languages. We can find information on market prices of agriculture produce, trainings, the government helps and climatic information on these mobile applications. There are also informations about crop growing and harvesting methods of different crops. Within the first 6 months of launching Smart Krishi, it had more than 7500 users (Regmi, 2016). With the decrease in the price of mobile phones, there is an increased rate of

mobile phone users (Chhetri, 2016).

#### 4.1.2 Internet

WWW drastically change the way of information. Different organizations and farmer groups are responsible for the adoption provision of subject matter content and funding for information generation and dissemination. It plays a crucial role in distance learning (Chhetri, 2016). Through the internet advertisement of many products can be done.

#### 4.1.3 Email and Skype

There is an increase in the number of Skype users. Between 2004 and 2010 there 30 times increase in Skype users with 560 million users worldwide. Farmers can join video conferences and conversations through Skype in a cost-effective manner. Through emails, people can be connected in the blink of an eye. It is a faster and effective way than the traditional method (Chhetri, 2016).

#### 4.1.4 Website

Information and different notice are published in websites of different organizations which are accessible to farmers. Different organizations have their website pages, where they publish notice useful to farmers.

#### 4.1.5 Television

There are total 36 television channels that help in the dissemination of information related to agriculture through different programs. ABC media, Avenues TV, Annapurna media network Ltd, Business TV, Himalayan TV etc. are the television channels that help to disseminate agriculture-related information to farmers (Krishi Diary, 2077).

#### 4.1.6 FM radio

Through national and local FM radio stations agricultural-related programs are conducted in Nepali and indigenous languages. It is most effective for rural areas where other ICT tools can't be used.

#### 4.1.7 Printed medias

There are total 22 national daily newspapers and 16 agriculture-related newspapers and magazines (Krishi Diary, 2077). Rapidly expanding ICTs in agriculture are Agriculture ICT (AgICT). AgICT can make a significant role in the efficiency, productivity and sustainability of the agriculture sector. There is 5.91% increase in farm productivity (rice production) by using AgICT while no exposure to ICT increase only 3.90% of farm productivity (compared to the immediate past year). AgICT alone can contribute 2.01% increase in farm productivity. While AgICT in poultry increases productivity by 24% contributing poultry in AGDP by about 3.42-3.56% (from current 4% to 7.42-7.56%). By the integration of ICTs in different sectors of the economy, 2-3% growth rate in the economy is estimated. By providing a facility in getting timely and relevant information about marketing, transport availability, new marketing opportunities and market prices of inputs and outputs helps in a productive agriculture economy (Chhetri, 2016).

TV and radios are the most common ICT tools in most rural areas of the world where internet access is limited. The percent of farmers aware of the role of AgICT are low. Only one-fifth (20%) farmers are aware of AgICT (Chhetri, 2016). PACT (Project for Agriculture and Communication Trade) and AMIS (Agriculture Management and Information System) under MOAD and other government and non-government organizations are working to increase access of farmers to mobiles (Regmi, 2016). It is reported that farmers prefer local resources than professional resources for getting farm information (Chhetri, 2016). Similarly, farmers use mostly mobile phones for connecting with stakeholders, agriculture experts and markets than other ICT tools. The mobile phone is the most used ICT tools by farmers for getting information while the laptop is the most commonly used ICT tool for data processing and data managing at the organizational level (Bohara, 2011).

## 4.2 Constraints and Barriers of using ICTs in Agriculture

Nepalese farmers least benefited by using ICT tools for getting essential information regarding quality seeds, market prices, agriculture finance, livestock and irrigation (Thapa, 2018). Government-led extension services can't give services as expected in the country (Paudel et al., 2018). This lead to the need of recognizing effective ICT tools for decentralization of information, productive delivery and accessibility to all rural farmers. In Nepal, the existing knowledge and information system does not embrace regular examination, reflection and learning for the improvement in the service delivery system. There is seldom internalization and replication of good practices and services and radio and television broadcasted programs (Bohara, 2011).

The use of ICT tools is limited in the urban areas of the country. Most of the farmers are illiterate and they don't know how to use these ICT tools. In the developing country, there is less penetration of ICT tools than in a developed country. There are many factors such as technical factors, infrastructure factors, financial factors and institutional factors that limit the use of ICT tools (Williams and Agbo, 2013). Most farmers can't afford ICT tools. In rural areas, there is no facility of electricity and less internet access areas that limiting the usage of ICT. Many farmers can't read the information wrote in ICT tools. Many farmers don't know how to use ICT tools. These are the main constraints of the country. The Socio-economic condition of the farmer greatly affects their access to the source of the information (Williams and Agbo, 2013). Language is also the main constraint that limits the efficient and productive use of ICT tools (Williams and Agbo, 2013).

## 4.3 Solutions

Poor ICT infrastructure of the country is one of the main limiting factor. In the country, there is poor electricity supply, poor telecommunication and poor internet access. For building ICT infrastructure throughout the country, investment in this area should be made (Williams and Agbo, 2013). The number of ICT users increases with the increase in level of access to ICT (Patel and Shukla, 2014). So that, programs and plans that help individuals (farmers) to get access to ICT tools should be launched. The provision of budgetary support for poor farmers should be done. The information system should be updated continuously for the effective extension program (Chauhan et al., 2016). Research conducted found that, if information broadcasted through ICT tools are translated in local language, farmers can be more benefited (Tata and McNamara, 2018). There should be the provision of ICT training programs for government officials to change the attitude of officers towards the use of ICT tools and potential development. Public awareness programs for local people and farmers should be organized. Technical and financial assistance from donor organizations helps to mitigate the challenges in the use of ICT tools (Williams and Agbo, 2013).

## 5. CONCLUSION

In Nepal different ICT tools such as mobile phones, laptop, internet, website, GIS, GPS etc. are using to disseminate the information related to agriculture. ICT tools users are increasing day by day. But ICT tools users are not in sufficient number as in developed countries. Smart cell phones have become popular among people. It is more affordable, easy to use, voice, text message and images can be sent by using mobile phone and it is portable. There are various agriculture-related mobile application which provides basic to important information about crop production. Government and private sectors working for the dissemination of agricultural information by using ICTs. By using ICT tools, we can cover a large population with high speed and farmers can get information about quality seeds, new techniques of agriculture, weather condition, crop protection, marketing etc. in a short time and also can reduce cost. ICT tools also help in getting connected between farmers, extension experts and researchers and it reduces physical distance among them. There are technical, infrastructural, financial and institutional constraints that limit the use of ICT tools. Most of farmers don't know how use ICT tools. To reduce these limits we should periodically train the farmers and extension experts on the operation of ICTs, subsidize ICT facilities and make

available of all networks.

## COMPETING INTERESTS

The authors do not have any type of competing interests.

## AUTHORS CONTRIBUTION

All the authors collected the information and Asha Thapa and Suraj Poudel prepared the manuscript.

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