

THE COMPLEMENTARY ROLES OF INFORMATION AND COMMUNICATION TECHNOLOGY IN BANGLADESH AGRICULTURE

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ABSTRACT

Agriculture is the important sector and key contributors to the national GDP of Bangladesh. Around 20.60% of the total GDP of the country comes from the agricultural sector. But, most of the farmers of Bangladesh are still in lack of modern agricultural knowledge. Farmers need to access ICT and take information of agriculture and others which put them in better position in economic activities. So, it is very important to provide the farmers with the modern ICT facilities as soon as possible. This paper also provides a present status of ICT in agriculture for the potential users (policy makers, researchers, teachers and students, and other activists) of agricultural information to work cooperatively. In this paper gives a concept of database that may be applied to provide agricultural information in the effective way in digitally divided geographical areas using Location Based Services. Proposed system will assist the govt. to provide services & accessibility of proper digital contents not only the farmers but also the researchers and other people who are interested in this sector.

Keywords: Roles, ICT, Agriculture

INTRODUCTION

Agriculture of Bangladesh approximately 60% derives their livelihood from the agricultural sector. Today's farmers are not only wait for three-time food for their families from their hard sweat, but also surplus food production, which can be sold in the market to get sufficient money to fulfill their other daily needs. Also, private sector initiatives like contract farming have commercialized the agricultural sector of Bangladesh. It has also seen many new concepts and theories substituting the traditional methods. Introduction of Information and Communication Technology (ICT) is one of them, which enables the dissemination of requisite information at the right time. This revolution in information technology has made access to the information easy and cost-effective.

Bangladesh is one of the most densely populated countries of the world. During the last three of decades the population has grown rapidly, which has put intense pressure on

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the scarce land resource of the country. The land-man ratio is decreasing at an alarming rate; the current estimated per capita arable land stands at 0.05 ha only. The economy of Bangladesh is based on agriculture, industry and services. The agriculture sector contributes a major share in the GDP, which is about 20.60% and employs about 48.07% of the working force (BBS 2008). Services sector is also an important sector in the economy of the country; about 50% of the GDP is generated through this sector and engages 43.28% of the work force.

Globally, the development of Information and Communication Technology (ICT) has proven its potentials for enhancing development efforts, but also virtually reduced the distance and turned the world into a global village (O'Farrell, 2003). Worldwide, ICTs are playing a vital cross-cutting enabler role to address many problems. In countless ways ICTs leveraged as a tool for e-Governance. It is necessary for ensuring government accountability, decentralization and providing effective service delivery. Additionally, bidirectional information flow between citizens and government can provide the power of consensus building within a society. Mr. Ban Ki Moon, UN Secretary General, stated that

“...let us use all our energy and innovation to harness ICT to our work towards the Millennium Development Goals. Let us turn the digital divide into digital opportunity. Let us promote new business models, public policies and technology solutions in the global approach to development. The United Nations family is a willing and able partner in that process”.

In the context of Bangladesh, the leveraging of ICTs for development may be termed as “e-Development”. On the e-Development front, the need to leverage ICT tools for overarching development goals have been well demonstrated globally, and as such the use of ICTs has been mandated in all program outputs UNDP Bangladesh is committed to attain (UNDP, 2008).

The proposed National ICT Policy-2008 states that ICT is one of the most important tools to achieve economic prosperity of a country through improving the management and efficiency in every sphere of life.

The experience of the developed and emerging economies supports the above concept. To effectively exploit the power of ICTs, Bangladesh formulated its first National ICT Policy in 2002 (NICTP, 2002). The National ICT Policy 2002 could not reach the perceived levels of success due to lack of appropriate plans to achieve the goals set in the policy as well as poor implementation of the underlying actions. Consequently, the Government took an initiative in 2008 to update the National ICT Policy 2002 and make it befitting with the current and foreseeable future needs of the nation (MoIST, 2008).

Although computer was introduced in the Bangladesh more than 50 years ago, application of ICT in agriculture was initiated only in 1979. A major ICT initiative was taken during 1979-1985 to computerize the reconnaissance soil survey information generated through a UNDP/FAO funded project during the period from 1963 to 1975,

which is known as the Land Resources Appraisal of Bangladesh. As follow up of this, several ICT initiatives/programs were undertaken and the outputs of these were used for agricultural research, development and extension and disaster management. Services are being provided to the Ministry of Agriculture and other Ministries, various NARS institutes, various extension agencies, Universities, International Organizations, and GOs and NGOs by catering to their needs.

As ICT can play a significant role in research and development of agriculture. This paper is presented status of ICT in agriculture and suggested some outline to develop ICT in agriculture in future.

Need of ICT in Agriculture

E-agriculture helps in dissemination of gathered information to the farmers, mostly lived in rural areas, to use in their routine work (World Summit on the Information Society, Geneva 2003). These services are provided and enhanced through the Internet and related technologies. This ensures the effective and efficient use of information and communication technologies for analyzing, designing and implementing existing and innovative applications to help the agricultural sector. The information disseminated by e-Agriculture can be divided into several major areas, which is called as services of e-Agriculture (Panchatopa D. and Karmakar C. K. 2006). These are:

- Weather Information
- Production and Cultivation Techniques
- Diseases and Insect Information
- Plant Nutrients and Water Usage
- Price Information
- Demands and Current Stock Information
- Educations and Health Information
- Government and Non-government Facilities

Among the above services the first five are directly connected with the production system. To establish e-Agriculture, the use of database to store agricultural information that varies according to geographic condition, and use of both Local Based Service (LBS) and Internet to disseminate information through both wired and wireless technology.

At present, the ratio of the farm families to the extension agent is 1000:1, which is really very less (NAEP, 1996). Although the appointed Village Local Workers (VLWs) disseminate the information, they hardly accept any accountability. These two issues have created the urgency to help and guide the poor farmers properly. The cost factor in face-to-face information dissemination at the right time, and the difficulties in reaching the target audiences, has also created the urgency to introduce ICT. It is only by the introduction of ICT that information can also be upgraded at the least cost.

There are several models of ICTs may be used in agriculture of Bangladesh, which have made a significant difference operation. The main technologies involved in Farmer's call centers are:

- Desktop computer system with Internet connectivity

- High bandwidth telephone line (preferably 128 kbps ISDN line)
- Telephones with headphones and teleconferencing facility (if required).

The main aim is to deliver the extension services to the farming community in the local languages. The farmer dials the help line, a toll free number, 777 (symbolic), and the agricultural graduates provide the initial enquiry. The cost to the farmers is almost zero, and they get the response in their local languages. If needed, the agricultural scientists also visit the field to resolve any further queries.

ICT and its Current Status in Agriculture

ICT is an integration of the technologies and the processes to distribute and communicate the desired information to the target audience and making the target audience more participative in nature. ICT is used in agriculture through E format. Food and Agriculture Organization (FAO) defines – "e-Agriculture" as an emerging field, which combines agricultural informatics, agriculture development and entrepreneurship (FAO website). E-Agriculture is not a new concept in Bangladesh. Both government and private organizations have taken initiatives for implementation of ICT in agriculture throughout the country. Some of them were only research purposed and some are direct implementation. But unfortunately it's not satisfactory up to the time country. In 2003, under the "**Support to ICT**" taskforce program the ministry of agriculture of Bangladesh did set up an agricultural information system. At initial this system used the data of 10 different districts of Bangladesh for collecting and disseminating the information of the products produced by the different agricultural sectors. But it was incompatible for extension due to traditional database (Computer Jagat, 2004). In 2005, a group of researchers of **D.Net** (Development Research Network, Bangladesh) proposed the idea of "**Pallitathya Help Center**" and conducted a project on it. The idea centred on the use of relatively less fashionable ICT, the mobile phone, as an effective 'last mile solution' to improve access to livelihood information for the rural people. They found it most challenging to understand the problems (related to health, agricultural, weather information) of rural people and to provide the appropriate information (Raihan A. *et. al.*, 2005). The application of **Geographic Information System** (GIS) as a computer assisted spatial information system in Bangladesh started more than a decade ago in early 1990s. There are about 30 GIS installation in the country so far but GIS installations in different organizations work with their specific mandates. Still the farmers are not getting the modern agricultural information when needed (Rashid, M.S. and M. M. Ali. 1997). Recently Grameen Phone and Banglalink established call centre, provided agriculture information through their large mobile network to all over the country for target people.

Knowledge Management System

Knowledge Management System (KM System) refers to a (generally IT based) system for managing knowledge in organizations for supporting creation, capture, storage and dissemination of information. The design of a KM system is to enable stakeholders to have ready access to the documented base of facts, sources of information, and

solutions. There are many aspects of ICTs. Extensive incorporation of ICTs may have both positive and negative impacts.

Economic Impacts

In recent decades, because of widespread incorporation of ICTs into many tiers of agri-business and political processes, they have played an important role in structuring of the global economy. ICTs have increased international interconnectedness and sped up the process of globalization. They have been instrumental in the information revolution, facilitating the transition from industrial economies, driven by the manufacturing sector, to knowledge economies. ICTs, in conjunction with globalization and the information revolution, have reshaped the workforce. In spite of the international widening of ICTs, the economic impacts have been geographically uneven. They have exacerbated pre-existing disparities between developed countries, which can afford to produce and consume the latest technologies, and developing countries, which cannot. This gap is known as the digital divide.

Social Impacts

ICTs have impacted societies on many levels. These technologies have generated to new forms of employment in innovation and production of ICTs and a demand for highly-skilled specialists. However, ICTs have also enabled professionals in certain industries to be replaced by unskilled workers, or even made entirely redundant. People who are in favour of ICTs depict this as a 're-skilling' of the workforce, while to those who are against consider it as a 'de-skilling' process. The dissemination of ICTs within societies is mixed, access to ICTs varies sections of society, some having greater than others. Even then, it is believed that ICTs can be used to promote equality and empower marginalized groups. These could be a means of providing accessible and affordable information and as a platform for voices that might otherwise go unheard.

In the Millennium Development Goals: Bangladesh Progress Report 2008 (Planning Commission, 2008) under the section 8, ICT services described that in recent years, the use of telephone services has increased remarkably in the country with the wider use of cellular phones. However, the growth of land phones was steady. In 1991, per 1000 people two telephone sets were used, which has increased to nine telephone sets per 1000 people. Information on cellular phone use shows that the use has increased sharply from 0.02 percent in 1991 to 30.8 percent in 2008. Internet services are mostly available in metro city areas and at best the district head quarters. Only three connections were available per 1000 population in 2008, but in the base year, it was almost zero.

The present government has taken holistic initiatives to promote ICT by taking positive steps such as tax and import duty cuts on computers, promoting ISP (Internet Service Provider) services, etc. in order to improve the situation. There needs to be infrastructural development and technology transfer throughout the country to diffuse ICT knowledge to even the remote regions of the country. The present government has been taking interventions to promote ICT among all spheres of people, including the

population in hard-to-reach areas, in order to fulfill the government vision of a ‘Digital Bangladesh’ by 2021.

ICT and its Challenge in Agriculture

It is very important that the application of ICT in agriculture is increasing. E-Agriculture helps in dissemination of gathered information to the farmers, mostly lived in rural areas, to use in their routine work. These services are provided and enhanced through the Internet and related technologies. This ensures the effective and efficient use of information and communication technologies for analyzing, designing and implementing existing and innovative applications to help the agricultural sector.

Those who are involved with agricultural industry also need information and knowledge to manage their occupation efficiently. Any system applied for getting information and knowledge for making decisions in any industry should deliver accurate, complete, concise information in time or on time. The information provided by the system must be in user-friendly form, easy to access, cost-effective and well protected from unauthorized accesses. An important role could be played by ICT in maintaining the above mentioned properties of information.

An authentic agricultural database based on soil and climate condition, crop cultivation history, farmers interest, demand of raw material, pest and disease management technologies, storage facilities, marketing system, etc. have to be developed with the help of ICT and GIS (Geographic Information System). Government has prioritized quick dissemination of agricultural technologies to the farmers level. Reduction of yield gap between research and farmers field has been identified as important parameter to increase production.

Number of action plans has been prepared to reduce the yield gap of the pulses, oilseed and spices. The gap between know how and do how of the knowledge based production system is being implemented through target oriented production plans. Action plans are being implemented with improved seed supply, demonstration and imparting training, coordinated by BARC and implemented by the NARS institutes, namely BARI, BRRI, BSRI and BINA as well as DAE.

Developed countries some time failed to perform their responsibility to address the problem of unfair trade and rationalizing global financial system and transferring new technologies for productive youth employment in developing countries in order to achieve MDG 8: Develop a global partnership for development. Developed countries should come forward and assist the least developed countries in exploiting potentials of international trade and should fulfill their obligation as signatories to the MDGs. It would be a huge challenge to bring together the donors and recipient countries to form an effective partnership to attain MDGs in the stipulated period.

The Paris Declaration promotes partnerships that improve transparency and accountability on the use of development resources. This encourages donors and partners jointly assess mutual progress in Bangladesh in implementing agreed commitments on aid effectiveness by making the best use of local mechanisms. There

needs to be infrastructural development and technology transfer throughout Bangladesh to diffuse knowledge as soon as possible to spread information and knowledge to the remote regions of the country. There are national strategies to promote ICT with the recent government vision of “Digital Bangladesh” by 2021 (Planning Commission, 2008).

Proposed Architecture of ICT for agriculture

The general architecture of the proposed system is shown in Figure. The main component of the architecture is database server, which contains all the information that be provided. Now the way to access the information may be different based on the stakeholders. Farmers information system is a place connected with the central database and ready to provide information over mobile. A mobile server which is connected with the central database to provide information over mobile application. The application resides in the mobile server which eventually inherits information from the database server. A secured web-based system connected directly with the database server enables user to access the information over internet. An administrative end will be responsible for insert, delete, modify and update the information.

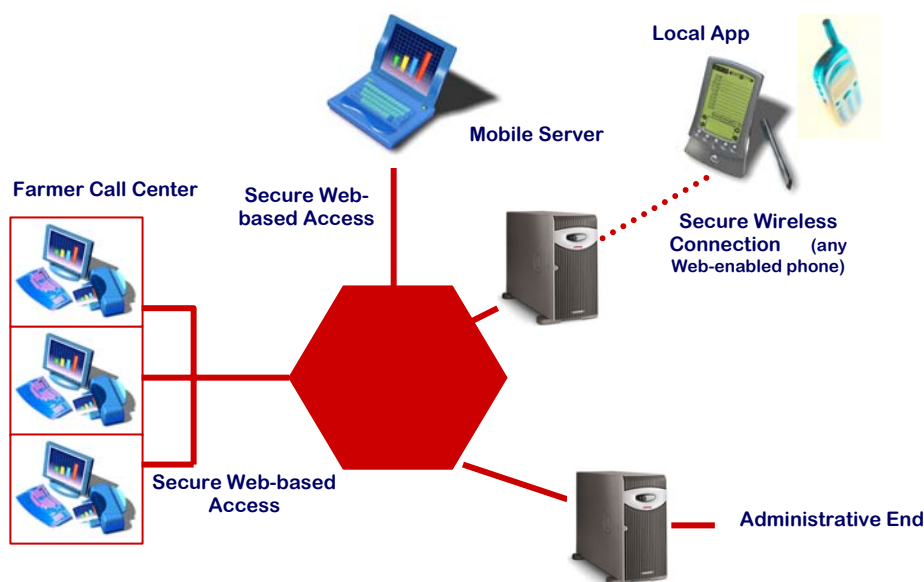


Figure. Proposed Architecture of ICI for Agriculture of Bangladesh

Future Outlook in ICT for Agricultural

For sustainable development of agriculture and national economy to emphasis on ICT and its use in agriculture very important. The following issues are very important for ICT management in sustainable agriculture.

1. Crop zoning map
2. Crop suitability database
3. Crop area, production forecasting system
4. Availability of updated bio-physical database
5. variety/agricultural technology database
6. Climate change scenarios

7. Irrigation and water management information
8. Pest and disease information
9. Information on salinity, drought, flood, etc.
10. Fisheries information systems
11. Research management information
12. Livestock information systems
13. Socio-economic database
14. Marketing information
15. Farmer information system and
16. ICT personnel and ICT unit at NARS

CONCLUSION

In this age of technology it is very difficult to compete in any form of business undertaking if one is not up to date with technological advancement. ICT in Agriculture is a tool for information generation and dissemination, its outputs is basically service-oriented in nature. However, computer and mobile network based modeling could be undertaken to provide all information for marginal users. This paper may cover both short and long-term objectives including future projections or forecasts/predictions through development of Expert Systems (ES) and Decision Support Systems (DSS) for food security. ICT should be used as a carrier of dissemination of technologies generated by the ARIs. The technology should be used as a tool for monitoring and evaluation. In order to address all the above mentioned issues activities in ICT must be institutionalized in the NARS and other organizations. Enabling conditions must be created at the Institution and at National levels.

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