Role of Information and Communication Technologies in Modern Agriculture

Seyed Reza Zahedi¹, Seyed Morteza Zahedi²

1. Computer Engineering, Khalkhal Branch, Islamic Azad University, Khalkhal, Iran
2. PhD Student, Department of Horticulture, Faculty of Agriculture, Bu-Ali Sina University, Hamedan, Iran

Corresponding author email: Seyed.reza.Zahedi@gmail.com

ABSTRACT: Information and Communication Technology (ICT) refers to the broad range of hardware, software, network infrastructure and media that enable the processing, storage and sharing of information and communication both among humans and computers, locally and globally. Information and Communication Technology (ICT) is a merger of computing and telecommunication technologies for information acquisition, retrieval, and dissemination. Agriculture constantly experiences advances in technology. Recently, the use of information technologies (IT), such as e-mail and the World Wide Web, has become commonplace. Information technologies afford the agriculture industry the opportunity to increase information flow to all industry participants at a decreased cost. The agricultural extension mechanism is becoming dependent on IT to provide appropriate and location specific technologies for the farmers to furnish timely and proficient advice to the farmers IT can be a best mean not only to develop agricultural extension but also to expand agriculture research and education system. The crop forecasting, input management, command area management, watershed management, land and water resources development, drinking water potential mapping precision management, natural disaster management, fishery management, hill area development and postharvest management are the key areas, where Information Technology can play its imperative impact.

INTRODUCTION

ICT has become a global tool often used by individuals, organizations, governments and intergovernmental organizations for personal or official activities. Its application cut across all fields of human endeavour like medicine, commerce, engineering, architecture, education, library services, and agriculture. ICT is also known as Information Technology (IT). According to Aina (2004), IT is an omnibus term that combines computer and telecommunication technology; hence, it is sometimes called Information and Communication Technology (ICT). It is concerned with the technology used in handling, acquiring, processing, storing, and disseminating information (Afolabi, 2012).

The computer is useful for processing information while the telecommunication facilities provide means for information communication or transfer using networks. However, for computers to be able to communicate with one another there has to be a network which provides a link, and when this link is across the globe, an international network called Internet results. The Internet is a connection of millions of computers all over the world by networks (Ogbomo, 2004;Ibegwam, 2002). The availability of the Internet as a major component of ICT has improved access to information, by information users tremendously (Afolabi, 2012). Information Technology is the buzz technology now-a-days. It is the technology that is helping to exchange the information in fast and easier way. Due to this technology the distance between or the difference between the nations is reduced and now world is becoming a global village. This technology provides an opportunity to the developing nations and under developed nations so that can build up their strategies and compete with the developed nations.

Agricultural decisions on: timely land preparation, planting, weeding, irrigation, harvesting, storage and marketing have always been central concerns to agricultural stakeholders. ICT especially mobile telephones can speed the way farmers in rural areas of Kenya get, exchange and manipulate information. They rework the way farmers interact with markets and cities. A variety of innovations that integrate ICTs into the dissemination of agricultural information to farmers (Farmers Information Services –FIS) have been developed at local, national and
regional levels. They have currently demonstrated a promising field of new research and application in agriculture whilst bringing new sources of information and new tools for local knowledge dissemination. They are increasingly enabling farmers to focus, search and extract useful and up-to-date market information. Because of its potential to ameliorate this old rural farming problem an evaluation of its usage among farming communities becomes necessary (Muriithi et al. 2009).

Information Technology and its Components

Induction of IT as a strategic tool for agricultural development and welfare of rural requires that the necessary IT infrastructure is in place. The rapid changes and downward trend in prices in various components of IT makes it feasible to target at a large scale IT penetration into rural. Some of the broad factors to be noted with respect to various components of IT are listed below: 1. Input devices: Radical improvements are witnessed with respect to the means of communication by human beings with computers such as key boards, mouse devices, scanners. 2. Output devices: Monitor screens, printers & plotters, data projectors support high resolution and good quality output. The qualities of these output devices have the potential of generating renewed interest in the farmers in using IT based services. The light weight portable data projectors can be easily carried by the agricultural extension personnel for serving larger audience. Similarly, speakers can also be attached to the computers to incorporate voice based trainings for farmers. 3. Processors: The processing speeds of computers have gone up. At present, Intel P-IV based processors @ 1.5 Ghz are available in the PC range which makes it possible to undertake substantial processing of data at the client side. 4. Storage Devices: 40GB and even higher hard disk drives have become common in PC range of computers. This makes it possible to store substantial information at the local level which facilitates faster access. Similarly, high capacity floppy disk drives, CDs make it possible to transfer large volumes of data to locations which cannot be connected to networks immediately. 5. Software: Various operating systems are available which act as interface between the user and the machine. The graphic user interface (GUI) has become an accepted prerequisite for end users. Microsoft’s ‘Windows’ continues to be a favourite. Application softwares which can support complex user requirements are available. Of the shelf solutions for office automation packages, groupware applications, complex database solutions, communication products, solutions based on remote sensing & geographical information systems are available. In addition, solutions based on some or all of these are also readily available. The present downward trend in the IT industry provides an opportunity get customised application for any specific task developed at an affordable price. Rapid Application Development and Deployment (RADD) is a popular model for quick development and deployment of applications. 6. Networking devices: The capacity of modems, used to convert the data from digital to analog and vice versa, which are popularly employed to use telephone lines have increased. Internal modems are available integrated into the computer so that they are not exposed to outside environment. 7. Transmission Media: The media through which the data transfer takes place has also undergone revolutionary change. Telephone lines are still the popular source although the reliability and low bandwidth are still major issues. 8. Other accessories: Uninterrupted Power Supply (UPS) devices are crucial to ensure the longevity of the IT equipment as well as provide backup mechanisms. The potential of solar power packs to provide a feasible solution to shortage of power in the rural areas needs to be exploited.

ICT and Agriculture

The application of Information and Communication Technology (ICT) in agriculture is increasingly important. E-Agriculture is an emerging field focusing on the enhancement of agricultural and rural development through improved information and communication processes. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (IT) in the rural domain, with a primary focus on agriculture. E-Agriculture is a relatively new term and we fully expect its scope to change and evolve as our understanding of the area grows. Information Technology (IT) has long been viewed as having great potential for improving decision making in agriculture. IT has connected the world globally and is now changing our life style and social consciousness dynamically. In all phases of the agricultural industry, information technologies are vital to the management and success of a business. Agriculture has also been greatly influenced by IT. Information Technology is rapidly becoming more and more visible in society and agriculture. IT refers to how we use information, how we compute
Information and communication technology for weather forecasting

The International Center for Agricultural Research in the Dry Areas (ICARDA) uses weather forecasting ICT tools, including meteorological stations and global information systems (GIS), so that scientists can collect and elaborate data to address the challenges that rural communities in dry areas face from the climatic stresses of aridity, drought, heat and cold.

Weather stations are used to collect daily climatic data (for example precipitation, air temperature, land temperature) that are analysed by researchers to determine timely planting, crop development, climatic risk assessment and water-use efficiency practices. During the learning event between ICARDA and the International Fund for Agricultural Development (IFAD), some attendees had the opportunity to visit the Aleppo Plain project area and see one of the meteorological stations in northern Syria. This station is located in the Surbaya Research Centre, a specialized hub of irrigation management solutions, new irrigation techniques and supplemental irrigation research. GIS is another powerful ICT tool that plays a fundamental role in ICARDA’s research. GIS aims to capture, manage, integrate, manipulate and display spatially-referenced data through mapping. It also helps ICARDA researchers to accurately target their analyses/studies while detecting biophysical constraints to agricultural development in dry areas. In addition, GIS technology helps identify potential areas where new technologies and new scientific tools developed by scientists can be applied to raise agricultural productivity, enhance farm incomes and promote better natural resource management. The tool is often used for integrated assessments of land degradation and water-harvesting techniques that consider different parameters, including economic and social factors.

Climate change will particularly affect dry land areas in developing countries and poor rural communities. Early detection of the so-called “hot spots” of vulnerability, where the worst consequences are expected, is crucial to address policy initiatives and target research to help farmers cope with water scarcity and other environmental constraints. ICARDA scientists, using GIS analysis of satellite images, have been able to rapidly identify, at a low cost, such hot spots in the CWANA region (for example North Africa, West Asia, Central Asia and part of the Horn of Africa), where dry land areas are mostly concentrated. Long-term projections also have been produced by GIS technology using modeling instead of realistic data. Although this type of climate change forecasting is done at a
research level because the best modeling techniques are not yet established, some international organizations, including the World Food Programme, and government bodies have already commissioned ICARDA climate change/long-term projection maps to identify climatic stress risks (e.g. droughts, land degradation, famines) and develop strategies for the upcoming years. In IFAD, GIS technology could be used for poverty mapping and assessment to improve:

- Targeting of needed interventions and investments for poverty alleviation
- The availability of information on issues related to small-scale agriculture

**CONCLUSION**

The rapid strides made in information technology (IT) in recent years have encouraged many development communication to extend it’s benefits to agricultural and rural development (Mukherjree, 2003). It is universal truth that access to information holds the key for successful development of agriculture and some dedicated and enterprising scientists and technologies are making their best efforts to derive the benefits of IT revolution to rural poor. It is the view of the pioneer in information technology that computerized communications will fundamentally change the world through their large networking system. It is powerful tool that will help to accelerate the development process particularly in the world where seventy five per cent of world’s poor live in rural area. Extension scientists play a vital role with the help of IT in ensuring effective transfer of modern technology from lab to land and it’s proper adoptions. Efforts are underway for close liaison between scientists and farmers with the help of IT by creating a farmer portal. Empowering farmers with relevant timely information about different crop varieties, including details about their ability to withstand biotic stresses (e.g. drought, salinity, nutrient deficient growing conditions and water logging) can significantly reduced farming risk. New ICT technologies, including “Geographic Information System (GIS)” can make such information available more widely in rural areas through a hub and spoke model of information dissemination. Another effective tools which is very effective in present context is “Computer Simulation Modeling”. By the technique a proper crop modeling is done that will enhance crop productivity by resisting from various biotic and abiotic stresses. It is time that full potential of Attention has been focused mainly on the nature of the process. The step involved therein, and has best this knowledge could be utilized in bringing about planned change in social system. Latest information and communication technologies can accelerate broad-based rural growth and by increasing awareness, help make it a central pillar of overall development strategy, only then we will be able to achieve sustainable development in the truest sense of the phrase and possibly a sustainable future to all.

**REFERENCES**


