

# The Challenges of Utilizing Information Communication Technologies (ICTs) in Agriculture Extension

Bhavesh Kataria

Department of Computer Engineering and Information Technology, LDRP Institute of Technology and Research, Gandhinagar, Gujarat, India

## ABSTRACT

The use of Information and Communication Technologies (ICTs) in agriculture and rural development has surged in the past decade. Growing attention has focused on the contributions of these technologies to agriculture and rural development. ICT includes computers and communication technology along with associated software. The activities of generating, processing, transmitting, disseminating, sorting, archiving and retrieving information constitute the information industry. Innovation in ICT to an increase agriculture production and helps farmer's in decision making in growth of their crops. ICTs have the potential to reach many farmers with timely and accessible content. But the content that the ICTs deliver has more relevance if it is localized and context specific, as this improves the value and action ability of the information, which can have important impacts on farm management. In this paper covered challenges of utilizing ICT in agriculture extension, as ICT took initiate many projects agriculture development, many of these projects were started by NGOs, private organisations, cooperative bodies and governmental organisations.

**Keywords:** Information Technology, ICT Projects, NGO, Agriculture, Farmers

## I. INTRODUCTION

Information and Communication Technology (ICT) consists of three main technologies. They are: Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging and managing data, information and knowledge.

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. (ICT) can play a significant role in maintaining the above

mentioned properties of information as it consists of three main technologies. 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 in agriculture is an emerging field focusing on the enhancement of agricultural and rural development in India. It involves application of innovative ways to use Information & Communication Technologies (ICT) in the rural domain. The advancements in ICT can be utilised for providing accurate, timely, relevant information and services to the farmers, thereby facilitating an environment for more remunerative agriculture. Given the development scenario in Indian Agriculture, ICT movement is still evolving.

However, all the ICT initiatives are not uniform with disparities between regions in the level and quality of telecommunications, information and the effort of individuals, public and private organizations, and differentiated nature of demand of the farmers in different areas. As a result, there have been many successes, failures, lessons learned and experience gained, so far. While these initiatives are intended to address the needs of the farmers through ICT, their actual usage and their ability to bring significant impact on the farm productivity and socio-economic development of the intended beneficiaries is to be understood. It is relatively unknown as to whether the ultimate beneficiaries actually use the facilities provided for them meaningfully to meet their needs. The common problems in adoption of ICT in rural segments are ICT illiteracy, availability of relevant and localized contents in their own languages, easy and affordable accessibility and other issues such as awareness and willingness for adoption of new technologies among the rural peoples etc. One critical aspect in the usage of ICT's for farmers and their groups, as seen in some of the ICT driven initiatives, is the involvement of human interface at the last mile indicating that there is a human dependency in transmission of Information/Knowledge to farmers.

## II. METHODS AND MATERIAL

### A. ICT Initiatives for Agriculture And Rural Development

Under NATP, ICT infrastructure is created in NARS by ARIS in order to bring information management culture. More than 400 ARIS cells have been created in NARS. These cells and their campuses house PC (Personal Computer) workstations, servers, UPS (Uninterrupted Power Supply) and all major network equipment such as switches, hubs, routers, network management, LAN cabling, Internet etc. The basic infrastructure required for linking all ICAR Institutes and SAUs has already been created. These cells are expected to promote the use of information technology in agricultural research, education and extension all over the India. Libraries of NARS are improved with ICT (Hardware, Software, LAN, Internet, Digitization, On-line/Off-line resources etc), under the Library Improvement and Networking of NATP. ICT has been implemented for agriculture extension activity under ATMA. Under NATP, e-Extension by connecting 200 selected KVKs and 8

Zonal Coordinating Units (ZCUs) through an Intranet and Internet has been taken-up by ICAR to strengthen these selected KVKs to enable them to deliver extension services through Internet. These KVKs will be developed as Information hubs. Village information kiosk is supposed to be an Internet connecting node with minimum facilities to link to Internet and provide access to information sources. These kiosks may run on paid basis like STD/ISD telephone booths. Some of the states viz., Andhra Pradesh, Maharashtra, Karnataka, Madhya Pradesh, Kerala, Tamil Nadu etc. have already established such kiosks which are growing at fast pace. Use of ICT for rural development and transfer of agriculture technology has been done by Government and private organizations (including NGOs). The Ministry of Communication and Information Technology of the Government of India and the Telecom Regulatory Authority of India (TRAI), as well several state governments, have already developed strategies for accelerating the growth of the Internet and broadband connectivity in rural India. Bharat Sanchar Nigam Limited (BSNL) has laid fiber cables capable of reaching nearly 70 per cent of villages. Government of India and State Governments have been working in various e-Governance projects in India.

Till date, the available Indian ICT public service delivery models in Agriculture sector are very few and are mostly in private sector viz., knowledge centres of MSSRF ([http://www.mssrf.org/specialprogrammes/mission\\_2007\\_NA/namain.htm](http://www.mssrf.org/specialprogrammes/mission_2007_NA/namain.htm)), e-Choupal of ITC, Iktan of Nagarjuna Fertilisers & Chemicals Ltd and Parrys corner. Besides a number of Agribusiness Corporates viz., TAFE, Mahindra and Mahindra and several others are adopting ICT in their business. The Private sector initiatives are very critical and essential given the strong presence of the corporate in Agriculture sector. In Cooperative sector the often quoted old examples are Dairy Information Services Kiosk (DISK) of NDDDB and wired village WARANA. Amongst civil society, GRASSO of West Bengal is pioneering the ICT access in farm sector. Increased realisation of rural markets potential has become a driving force for the interest of corporate.

In government the major ICT based service delivery initiative is limited to

- (i) ASHA ([www.assmagribusiness.nic.in](http://www.assmagribusiness.nic.in)) initiative of Assam SFAC (Government of Assam) with its

networking with large ICT infrastructure (CICs) spread all over the state.

- (ii) Kerala is coming up with two different initiatives kisan kerala ([www.kissankerala.net](http://www.kissankerala.net)) and e-Krishi ([www.e-krishi.org/web/main/](http://www.e-krishi.org/web/main/)).
- (iii) The Government of Andhra Pradesh is providing agribusiness services through Rajiv Internet Village Centres in partnership with ikisan. The IIIT Hyderabad is experimenting with e-Sagu (<http://agriculture.iiit.net/esagu/esagu2004>).
- (iv) The Uttaranchal state is planning for Kisan Soochna Kendras in private partnership while the Haryana state recently inaugurated its first Agribusiness Information Centre.
- (v) The Tamilnadu and Maharashtra are pursuing comprehensive Agrinet. Several state agricultural universities launched telephonic help lines
- (vi) Related to land records the Bhoomi Project of Karnataka state has been one of the highly successful public sector initiatives in the country having direct impact in improving health of agriculture sector and is being replicated in several other states.

### **ITC e-Chaupal**

Effort driven by a company involved in grain trading

- 4000 Internet chaupals (kiosks) in villages to aid grain procurement, support agriculture
- Grain trading pays for ICT

### **n-Logue**

Partner with a Local Service Provider to connect every village in a district using terrestrial wireless

- Village kiosks
- No subsidy, possible bank loans
- Video-conferencing is key
- Focus on education, health and livelihood
- Operation in 40 districts, 2000 villages

### **Other Initiatives**

#### **Grant / Aid Driven**

- MS Swaminathan Center (in Pondicherry focussed on agri and fishery applications)
- Tara-haat (focus on rural enterprises)
- Akshaya (in Kerala with Government support)
- Gyaandoot (in MP with focus on e-governance)
- Rural E-seva (in east Godavari in AP with focus on e-governance)

- Warana Wired village (in Maharashtra by NIC) these projects are now operated by n-Logue

### **For profit initiatives**

Drishtee (uses existing telecom infrastructure)

There are several models of ICTs in Indian agriculture, which have made a significant difference in the delivery of services in Indian agriculture like, the establishments of Kisan call centers, Gyandoot project, Bhoomi project, Village knowledge centers, AGMARKNET etc,...

### **Kisan Call Centers (KCCs)**

KCCs were launched on January 21, 2004 by the Department of Agricultural and Co-operation. The main technologies involved in Kisan 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, 1551, and the agricultural graduates provide the initial enquiry. If the queries handled by the agriculture graduates are not satisfactory to the farmers or the farmers want more information, the call is forwarded to level II and level III executives. Thus, KCCs are the important information gateway for farmers. 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.

### **Village Knowledge Centers(VKCs)**

Village knowledge centers of MS Swaminathan research foundation were launched in 1998 in Pondichery. The main aim behind the establishment of VKCs was to provide sustainable food security in rural areas of Pondichery. To fulfill this aim, it provides technical information related to agricultural inputs. It helps in procuring quality seeds, in providing information about the daily marked priced from the government as well as private bodies, and advices farmers on rotation of crops as well as about the use of fertilizers and pesticides. VKCs receive information by voice mail, and

disseminate it through any public address system. It has also identified 13 districts in Pondichery, where there is a huge potential for agriculture business, and where the government will invest Rs. 170 cr.

## B. Some of the ICT initiatives which have been taken up in India includes

1. Help-line services
2. e-Extension (e- Soil Health card Programme): The Deptt. of Agriculture, Gujarat State is one of the ambitious programmes which aims to analyse the soil of all the villages of the state & proposes to provide online guidance to farmers on their soil health condition, fertilizer usage and alternative cropping pattern. The website is [www.agri.gujarat.gov.in](http://www.agri.gujarat.gov.in), [www.shc.gujarat.gov.in](http://www.shc.gujarat.gov.in).
3. ITC-e- choupal (<http://www.echoupal.com>).
4. Village Knowledge centre-hybrid wireless network comprising computers, telephones
5. aAQUA (almost All question Answered) is a multilingual online question and answer forum
6. AGRISNET- uses state-of-the-art broadband satellite technology to establish the network within the country. The website is <http://www.apgrinet.gov.in> for Andhra Pradesh and <http://agriculture.up.nic.in> for UP.
7. AGMARKNET is a comprehensive database which links together all the important agricultural produce markets in the country (<http://www.stockholmchallenge.se/data/agmarknet>)
8. Asha services portal offers services on five different sectors of farming- agri., hort., animal husbandary, fisheries and sericulture.
9. Ashwini Project-involves delivery of high quality healthcare, education, agri., livelihoods training and e-governance to the chosen villages.
10. Community Information Centres(CICs): This project creates awareness among the citizens, particularly those who do not have access to information about the various government scheme.
11. Digital Mandi Project: Creates an exchange for knowledge of farm practices and accurate information for optimizing operations (web site is [www.dealindia.org](http://www.dealindia.org)).
12. Digital Ecosystem for Agriculture and rural livelihood- It is a multimedia platform for creation, sharing and dissemination of agricultural information among farmers and experts.
13. Agri Business Centres: It provides a web based solution to the small and medium farmers as well as owners of large landholdings. It brings on a single platform all the stakeholders in agribusiness like farmers and farmer groups, institutions and autonomous bodies, agro machinery and farm equipment makers, cold chain tech., commodity brokers, cooperatives, food processors, pre and post-harvest management experts, packaging technology providers, insurance companies, warehousing and logistics agencies, surveyors and certification agencies.
14. e-KRISHI VIPANAN: It professionalize and reorganize the agriculture trading business of Mandi Board by installing cost effective digital infrastructure using latest advancement in ICT by collecting and delivering real time information, online. It makes the operations more effective, totally transparent, benefiting all stake holders (farmers, traders & the government), empowering them through accurate and timely information for effective decision making.
15. e-krishi(<http://www.e-krishi.org>)
16. e-Sagu(e-cultivation)system: The eSagu is a ICT-based personalized agro-advisory system. ("Sagu" means cultivation in Telugu language). It aims to improve farm productivity by delivering high quality personalized (farm-specific) agro-expert advice in a timely manner to each farm at the farmer's door-steps. In eSagu, the developments in ICT such as (database, internet and digital photography) are extended to improve the performance of agricultural extension services.
17. Query Redress Services: Empowering the farmer community through effective, need-based interventions. It enhances livelihood promotion of farmer community through information dissemination

and extension services, using ICT as tool. The project helps the farming community by making available a 10000 plus network of experts to them. Any queries from farmers are forwarded to the ISAP central office from where it is routed to the relevant experts. The service caters to information and knowledge needs of the farmers, professional members of ISAP, individuals and other stakeholders involved in the wider agricultural and allied sectors.

18. Kisan Call Centers: Kisan call centers have been established across the country with a view to leverage the extensive telecom infrastructure in the country to deliver extension services to the farming community. The sole objective is to make agriculture knowledge available at free of cost to the farmers as and when desired. Queries related to agri. And allied sectors are being addressed through the kisan call centres, instantly, in the local language by the experts of agri./hort. Departments, state agril. universities. ICAR institutions etc. There are call centers for every state which are expected to handle traffic from any part of the country. SMSs using telephone and computer, interact with farmers to understand the problem and answer the queries at a call centre. The infrastructure is placed at three locations namely-a professionally managed call center (level-I), a response center in each organization, where services of SMSs are made available (level-II) and the Nodal Cell (level-III).
19. i Kisan -<http://www.ikisan.com>
20. ishakti [http://www.stockholmchallenge.se/data/ishakti\\_bridging\\_digital](http://www.stockholmchallenge.se/data/ishakti_bridging_digital)

## C. Limitations in implementation of ICT and possible solutions {19}

Except the great potential that ICT has in improvement of agriculture, there are some limitations that can make implementation and expansion of ICT in agricultural sector difficult. Some researches (Rao, 2003; Mittal, 2012) explain factors and limitations preventing effective implementation and use of ICT in agricultural sector and rural areas. These limitations include

**Lacks of awareness about benefits of ICT** - Many people in rural areas have no computer and internet access. This contributes to their lack of awareness of the benefits from using ICT.

**Uncoordinated and chaotic development of systems** - If we take into account huge volume of work related to information systems (IS) development for improvement of agriculture, coordination mechanism in form of specialized agency should be created. Aim of the agency is to concentrate efforts on support to agricultural community.

**Easiness of system use and language barriers** - Success of strategy of ICT implementation in agriculture depends on easiness of system use by rural population. In many instances, ISs supporting agriculture are not easy to use and there is lack of appropriate internet information contents suitable to needs and abilities of rural population.

**Connectivity** - Cost of computers and fees for internet access are still high for the most rural population that is poor in developing countries. In addition, availability of internet access is low in rural areas because Internet Service Providers (ISP) delivers services mainly in urban centres. Although great advancement is made in several past years, connectivity in rural areas should be improved.

**Bandwidth of network** - Even where telephone and the other communication services exist, available bandwidth can be limitation for effective use of networks. Whereas internet services for rural and agricultural areas require intensive use of graphics, low bandwidth of network can be main limitation for providing of electronic services to farmers.

**Responsibility for implementation of ISs in agricultural sector** - Collective and coordinated effort of many stakeholders is necessity for creation of specialized web sites and portals in agriculture. This task is so great that it cannot be done by only one institution and organization. Main stakeholders in the agricultural sector such as the fertilizer or food industries should join effort in achieving of the task.

#### **D. Strategies and Policy Options**

Each initiative is a unique model in the application of ICTs to agriculture and has merits and constraints of its own. The study also helped in learning lessons from these initiatives for up scaling ICT-based initiatives. Accordingly, the following suggestions would be useful in framing appropriate strategies for greater use of ICT in agriculture sector.

- Involve local people in content development as in village knowledge centre' to assess information needs and collection of indigenous knowledge, which can be synthesized, with information from experts/institutions
- Prepare user-friendly content in the regional languages also with visuals
- In kiosks, supplement the digital information with public address system, vernacular print media, and bulletin boards for wider dissemination
- Appoint facilitators exclusively for information service; they should be motivated and accountable, well qualified with adequate knowledge on subject matter and computer operation
- Support these initiatives by other quality services and rural infrastructure (extension expert's advice, market access, transport service, roads, development schemes etc.) to translate knowledgebased decisions into actions without bottlenecks
- Encourage networking of institutions and public-private partnership for improving rural tele density, information generation and delivery, capacity building of the facilitators etc
- Public sector institutions have to play a greater role in synthesizing information while private sector institutions and NGOs disseminate it through information centres.

### **III. CONCLUSION**

In spite of their different approaches, all studied ICT initiatives try to provide locally relevant content to farmers while reducing the expert-farmer gap. ICT can play a main role in support of transformation of rural areas and agriculture in order to respond to these challenges and reduce digital inequality and divide between rural and urban areas. Fast changes in ICT domain enable development and dissemination of electronic services in agriculture. National strategies for implementation and use of ICT in agriculture should be formulated. National coordination agencies with consultative role can act as catalyst in this formulation process.

Moreover, farmers sometimes become averse to adopting technology as they think that it might result in their losing their traditional methods of cropping practices. They simply do not want to use such systems, even if the cost incurred is negligible. Therefore, the attitude and mindset of farmers needs to be changed first. There is a need to win their confidence and create awareness about the benefits of ICT in agriculture.

### **IV. REFERENCES**

- [1] Cecchini, S., Scott, C. (2003): Can Information and Communications Technology Applications Contribute to Poverty Reduction? Lessons from Rural India, *Information Technology for Development*, Vol. 10, Issue 2, pp. 73-84.
- [2] Cloete, E., Doens, M. (2008): B2B E-marketplace Adoption in South African Agriculture, *Information Technology for Development*, Vol. 14, Issue 3, pp. 184-196.
- [3] Courtright, C. (2004): Which Lessons Are Learned? Best Practices and World Bank Rural Telecommunications Policy, *Information Society*, Vol. 20, Issue 5, pp. 345-356.
- [4] Díaz, A. A. E., Urquhart, C. (2009): The value of Extended Networks: Social Capital in an ICT Intervention in Rural Peru, *Information Technology for Development*, Vol. 15, Issue 2, pp. 108-132.
- [5] Jefferson County Cooperative Extension Services. 2000. Precision Agriculture-Site Specific Farming
- [6] E-Agriculture And Rural Development :Global Innovation And Future Prospects-Blessing Maumbe And Charalampos Z.Pratikakis,Dec2012
- [7] U.S. Department Of Agriculture, Economic Research Service, Agricultural Resource Management Study, 1999.
- [8] Rolf A.E. Mueller. 2000. Emergent E-Commerce In Agriculture. Aic Issues Brief, No. 14, December.
- [9] Farmers Go Online In The Us - Fast. *Online Publishing News*, No. 16, 5 July 1999.
- [10] Parag Bhalchandra and others, ICT for Rural Developments: A Review of Lessons, ICT Humans 2010
- [11] <http://www.ictregulationtoolkit.org>