Information and Communication Technologies (ICTs) in Agriculture

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Agriculture has made a significant contribution to India's development over the past four decades, with impressive contributions to food security and poverty reduction. However, the real challenge for the development practitioners remains to sustain the food production levels taking into account the incremental population pressure, urbanization, dietary changes due to enhanced income and increased risks due to climate change and related factors. Moreover, production efficiency and competitiveness, small farmer's viability, shrinking land and water resources, food quality and safety, knowledge and information disparities, increased uncertainties etc continue to be critical bottlenecks.

Still, there remains significant scope for improving performance of agriculture; the main source of livelihood for majority of the poor in India. An emerging tools for achieving faster socio-economic development is through the application of Information and Communication Technologies (ICTs) in areas such as agriculture, environment and natural resources, health, education and governance. Many of these initiatives demonstrated encouraging potential of ICTs in improving efficiency and effectiveness of development interventions benefitting rural communities significantly. As the objective of the Twelfth Plan is set as "Faster, More Inclusive and Sustainable Growth" with better performance in agriculture identified as one of six areas, ICT has to play a stellar role in rural transformation and sustained growth in agriculture.

ICT simply means using any technology to handle information and facilitate communication. Besides Information technology (computer, internet, hardware etc) it includes telephony, broadcast media such as radio, television, cinema and all kinds of audio and video processing and transmission and network based control and monitoring functions. With various proximal and remote sensing applications (GIS[1], GPS[2], Geo-spatial modeling, sensor technology, wireless sensor network-WSN etc) and other technologies – both extant and emerging – the ICT provides unique solutions through improved information and communication in the rural domain. Such applications are to be comprehensive; with its potential to benefit agriculture along with other interconnected areas of health, education, governance or employment.

Focus of application of ICT in Agriculture has to cover a range of commodity and farming sub-sectors – food, fiber, fodder, fruits & vegetables, spices, plantation crops, medicinal plants, livestock, dairying, fisheries, forestry, sericulture, apiary. Similarly, it can also be seen in terms of a host of agri-business functions - production processes and planning, land, water and nutrient management, plant protection, animal health care, procurement, grading, storage, transport, processing, trade & marketing, conservation of natural resources, research, education, training and so on.

Historically, Radio (All India Radio) has been disseminating wide range of development information since post-independence. Over the years, 'Krishi Vani in Hindi, 'Ponthottam' in Tamil[3], 'Ask the expert' through phone in programme, and recently 'Gyan vani'[4] through FM radio stations made good inroads into farm heartlands. Slowly, community radios have emerged to broadcast locally relevant information through

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narrow-casting and cable casting. Uttarakhand has several such initiatives; besides many NGOs in the South pioneered in this area.

National TV stations stepped in later to broadcast programmes relevance to local farmers and rural communities – at times targeting for rural women, children and youth. The Krishi Darshan[5] and Kalyani[6] - the health magazine of Doordarshan - have been well received programmes. Enadu TV's 'Jai Kisan', Etv's 'Annadata', IITM_K's 'Krishideepam'[7] in Malayam, 'Pon Vilayum Bhoomi' by Podhigal TV, 'Malarum Bhoomi' by Makkal TV are some other examples. With the proliferation of TV stations, many rural outreach initiatives have diversified in contents and purpose; with encouraging partnerships and critical technical support from many education and development institutions across the country. Similarly many print media, state departments and agricultural universities bring out farm magazines and information booklets in local languages to cater to the demands for timely and value added information and services.

New ICT revolution since nineties, in the form internet, telecom networks and mobile technology has opened up several avenues in the way information is accessed, managed and disseminated. India has the second largest net work of telephone connection covering every part under telecom services. IT and ITES have been leapfrogging. The country wide communication network NICNET[8] by the National Informatics Center (NIC) offered wider access of such technology and database.

The Common Service Centers (CSC) conceived to be the front end delivery interface for web-enabled public, private and social services are expected to change the face of rural India. National NIC Portal attempts to provide a single window access to over 7000 websites and portals associated with almost every government constituents – both central and states. AGRISNET[9], SEEDNET[10] and DACNET[11] from the Ministry of Agriculture, and many state level ICT initiatives in Odhisha, Gujarat, TN, AP, Rajasthan, Maharashtra, UP, Bihar, MP and others have achieved significant milestones in enabling access of knowledge and information to common people - improving livelihoods, governance, and inclusion. Many public, private, NGO and cooperative initiatives, namely, e-chaupal[12], e-krishi[13], e-sewa[14], e-sagu[15], i-kisan[16], knowledge center initiative of MSSRF, Kisan Kendras of Mahindra[17], Rallis and Tata, EID Parry[18], NDDB[19], Gyandoot[20], Tarahaat[21], Warna project[22], etc are quite popular with the populations they serve.

Several portals under NICNET have accessed, stored and made information over a range of topics from soil nutrients, crop management, pests and diseases to market and prices. C-DAC has initiated India Development Gateway[23] having a range of agricultural information. AGMARKNET[24], KISSAN[25], i-Kisan[26], Agri-watch[27], Indiaagronet[28], Agropedia[29] and others manage portals having good on-line information for various clienteles. Kisan Call Centers provide information through telephones to farmers through a nation-wide toll free numbers (1800-180-1551) in local languages. Several variants of call centers operate in States (TN, AP). Knowledge banks and knowledge networks such as the Honey Bee network[30], Haritgyan, Indian Society of Agribusiness Professionals (ISAP)[31], and various thematic e-groups in Google and Yahoo, tend to share specific information in different ways. UN Agencies have initiated Solution Exchange[32] that offers a neutral platform to share knowledge for crafting practical solutions for daily problems in many development fields. Alongside Communities in Water, Climate Change, Maternal health, ICT etc., the Food and Nutrition Community seeks to exchange experience and knowledge amongst practitioners in food, agriculture and nutrition. It has been managed by FAO for the past six years.

The astounding outreach and phenomenal growth of emerging mobile telephony network has opened up an amazing vista. Use of ICT becomes highly affordable and effective in customized content delivery to the farmers at their convenience. McKinsey believes that "India has an opportunity to lead the world by becoming the first truly mobile digital society. As the cost of network access and handsets is going down, wireless networks are going up, and Indian consumers are displaying an insatiable appetite for digital services. In addition, bypassing the personal computer -moving straight to widespread mobile access -

simply tends to sidestep a host of hurdles associated with delivering affordable Internet services to a population that is geographically dispersed and relatively poor, in a country where infrastructure development can be problematic." In the not-so-distant future, we may see appreciable progress in innovative uses of mobile technology for a series of development work.

IFFCO Kisan Sanchar Ltd[33], Reuters Market Light (RML)[34], Tata m-Krishi[35] are good examples of value added services to farmers on weather, crop, animal, market, pricing, government schemes - even deploying voice enabled internet protocol(VOIP) for ease and convenience. Many organizations such as SEWA (Gujarat), Digital Green(AP), PRADAN, BAIF, etc also adopt video as medium for their communication services. In its current wave of revolutionizing ICT applications, the potentials of PDA (personal digital assistant), RFID (Radio Frequency Identification) and Robotics (e.g. by Cornel University) have been witnessed encouragingly.

As agriculture is highly knowledge intensive enterprise requiring quality and timely information for decision making - right from soil selection, product planning, to selling of produce – application of ICT in knowledge management is well placed. Small farm unit living in geographically isolated areas with limited means, under diverse ecological endowment, poor physical infrastructure and financial resources, exacerbate such challenge. The ability of ICT to effectively address the challenge of generation, access, storage, exchange and dissemination of knowledge to millions in rural areas has been well-recognized. ICT can facilitate, in a fast, accurate and cost effective way, many areas of research activities, extension and emergency intervention.

Deployed properly, ICTs have been found to improve farm production efficiency in many ways; in crop, livestock, fisheries or inputs management. Weather monitoring, Crop planning or scheduling, crop or yield assessment, pests' surveillance and management, biotic and a-biotic stress levels, marine fish catch and sustainable management of marine fisheries resources, animal disease surveillance and monitoring etc are highly suitable for ICT adoption. Since long, information about the price, market, export-import dynamics, global food availability has been shared for skilled decision making. Of late, the ICTs in value chain assist in sound procurement planning, promotion of GAP[36], GMP[37], GACP[38] etc. All these bear significant relevance for food quality, safety and traceability – indispensible in today's global food trade.

One glaring application of ICT is to manage natural resources, i.e. land, water, forests, biodiversity or environment. Land use planning, land records, revenue system, land survey & classification, quality mapping, soil nutrient profiling, soil conservation are areas where ICTs can create wonders in terms of social, economic, environmental and administrative dividends. Similarly, in case of water, water resources utilization, irrigation planning and management, water pollution and quality, surface and ground water profiling and conservation, ICT applications could be of immense value. Remote Sensing and Geo-spatial technologies are applied in forestry– radically improving forest surveillance, deforestation, degradation and conservation. Adoption of ICTs in the realm of biodiversity, ecological monitoring or in reducing adverse impacts of climate change cannot be understated.

With all these exciting possibilities, the next question that arises is what the bottlenecks in realizing these potentials are. ICT uptake still remains a problem for agriculture and rural development. The primary action is to create widespread awareness and interest in people who will economically benefit from such technologies. If they are not convinced, no amount of effort or investment can ensure the acceptance and spread of even the best of these technologies. People must change their belief and be allowed to perceive the intended social and economic benefit through constant dialogue, exchange and engagement. Skills development, training and exposure are essential in human capacity development. Challenge of illiteracy has to be fought with that of e-literacy to enable people to use ICT in their work and life.

Development agencies have to realize that a significant proportion of the digitally excluded are at risk of deepening social and economic exclusion. Digital exclusion cannot be addressed in isolation from other policy issues. Again, unless basic infrastructure like power, telephony, roads and communication, health and education are improved, the e-intervention cannot be sustained.

Creation of and access to ICT infrastructure is the foundation that requires copious public funding. The people do not have means to build such facilities by themselves. Needless to say that the government and other IT partners must engage themselves in various tasks of technology generation, access and research along with the civil society, academia and private sectors.

Mobile telephony provides access to markets, strengthens farmers bargaining power with real time information and marketing alternatives. There is need for convergence between mobile telephony, internet, broadcasting networks and PDA's[39]. It is here that durable partnerships between public, private and other stakeholders are critical; where governments enforce enabling regulations and provide funding for basic connectivity and encourage the private sector to provide ICT infrastructure, technological know-how and services. In all these, people or the end users should be the dominant partner in terms of choice and design of technology, interface arrangements, decision on service providers, and assessment of costs and benefits. Essentially it has to be a bottom-up participatory approach.

Very soon, every Panchayat in the country will have an internet equipped service centre to ensure rural access to online services for farmers. The IT department is working to have 25 million of such centers across the country – one in every Panchayat by 2012 as a part of the National Broadband Policy to provide access to high speed connectivity. Along with spectacular mobile penetration, this is a formidable development that has strong promise to alter India's rural landscape – perhaps beyond comprehension.

These will facilitate implementation of many socially relevant interventions hitherto bypassing many; it will also provide endless economic and livelihood avenues in a rapid, inclusive, cost effective and transparent manner. People's indomitable spirit and unique cooperation, and enhanced commitment from both private and public sectors in forging viable links may now ensure that we can really unleash the vast untapped potential of India in near future.

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[1] Geographic Information System - system designed to capture, store, manipulate, analyze, manage, and present all types of geographically referenced data.
[2] Global Positioning System - is a space-based global navigation satellite system (GNSS) that provides location and time information in all weather, anywhere on or near the Earth.
[3] http://agritech.tnau.ac.in/radio.html
[4] Tune in 105.6 - http://tunein.com/radio/Gyan-Vani-1056-s68857/
[5] http://www.ddindia.gov.in/Kendra/Jaipur/Program+Column+2/Movie.htm
[6] http://www.ddindia.gov.in/About+DD/DD+DCD/Kalyani.htm
[7] http://www.iiitmk.ac.in/projects/kissan
[8] Satellite-based nationwide computer communication network set up by National Informatics Center connecting all Departments/Ministries of the Central Government, State Governments, NCT, UT and districts.
[9] Agricultural Information System Network
[10] http://seednet.gov.in/ - Brings seed users across the nation together and provides database on availability, supply, demand and utilization of seeds in the country.
[11] http://dacnet.nic.in/ - Provides information and services to the farming community on number of subjects like oil seeds, pest management, quality standards, machinery, organic farming, etc.
[12] http://www.echoupal.com/
[13] http://e-krishi.org/site/
[14] http://www.esevaonline.com/
[15] http://agriculture.iiit.ac.in/index.php
[16] http://www.ikisan.com/
[17] http://www.jaikisan.org/jaikisanNet/MGARH.aspx
[18] http://www.eidparry.com/index.asp
[19] http://www.nddb.org/
[20] http://gyandoot.nic.in/
[21] http://www.tarahaat.com/

[22] http://www.e-agriculture.org/content/warana-wired-village-project
[23] http://indg.in/
[24] http://agmarknet.nic.in/
[25] http://www.kissankerala.net/kissan/kissancontents/about.jsp
[26] http://www.ikisan.com/
[27] http://www.agriwatch.com/
[28] http://www.indiaagronet.com/indiaagronet/agronet_home/agrinethome.htm
[29] http://agropedia.iitk.ac.in/
[30] http://www.sristi.org/hbnew/index.php
[31] http://www.isapindia.org/
[32] www.solutionexchange.net.in
[33] http://www.iffco.nic.in/iksl/ikslweb.nsf/ef05d07df0ecee65652575040037b375/cba18de8cdc66cf8652577a600389765?OpenDocument
[34] http://www.reutersmarketlight.com/index.php
[35] http://www.tcs.com/offerings/technology-products/mKRISHI/Pages/default.aspx
[36] Good Agricultural Practices
[37] Good Manufacturing Practices
[38] Good Agricultural and Collection Practices
[39] Personal Digital Assessment