

ICT in Agriculture India

and way forward

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The ICT initiatives include development of ICT infrastructure for agricultural content and services delivery, capacity building in ICT for adapting or response to the fast changing requirements of research, technology development and knowledge dissemination in the scenario of globalized agriculture. The aim of various ICT initiatives has been mainly to create a conducive environment that could ensure better flow of knowledge, collaborations, experimentations and implementation of innovations in terms of information, communication and dissemination systems, advanced learning and state-of-the-art capacity building initiatives, value added market intelligence services, ERP based advanced planning and management systems, e-education, e-extension, online examination system, automation in agriculture, ICT enabled research platforms etc. The activities are focussed towards creation of an enabling environment for the agriculture ecosystem in the country.

Key words: Information Communication Technology, Knowledge management

CHALLENGES to the agriculture include increasing the production of agricultural crops as the population continues to grow globally and more so in developing countries. Climate change is also a threat to agriculture besides shrinking land productivity.

Now-a-days, Information Communication Technology (ICTs) play an important role in almost all the domains. Agriculture is no exception to the role of ICT. ICT implemented by multitude of agencies in the Indian agriculture including government, non-government and private have been benefitted various stakeholders in farming. Some of the major ICT initiatives are detailed below:

Development of ICT Infrastructure in Agriculture

- Under National Knowledge Network (NKN) project, high bandwidth Internet connectivity 100 mbps/600 mbps/1000 mbps has been set-up in 87 agricultural institutions and 41 State

Agricultural Universities. A giga-bit wired and wireless network of 1000 nodes has been set-up in ICAR headquarters.

- Centralised secure data center for consolidation of web portal and agricultural e-services including communication system for NARS at Indian Agricultural Statistics Research Institute, New Delhi.
- Setting – up of online examination centers at 23 locations across the country dedicated for conducting NET and ARS preliminary examinations entirely transforming the selection system at ASRB. The online examination has brought transparency and efficiency in the examination system. Moreover, the online submission of application forms is convenient for candidates for applying for the exams from different parts of the country.
- ASHOKA – a 30 TF supercomputing hub for distributed computing in genomics research in agriculture and allied areas along with five small supercomputing clusters at five National Bureaus

have been connected through a high bandwidth network forming national agricultural bioinformatics grid.

Development of online knowledge management systems

- Agropedia, an online knowledge repository (<http://agropedia.iitk.ac.in/>), has been set-up for management of knowledge related to agriculture in India. It includes universal meta models and localized content for a variety of users with appropriate interfaces built in collaborative mode in multiple languages. This national portal, designed as an “agricultural Wikipedia” hosts wide range of agricultural information on a variety of crops, with an aim to empower farmers with crop information.
- AGROWEB, an ICAR’s web portal (<https://icar.org.in>), has been developed as web based system on concept of collaborative process to create, edit, approve, and publish content for timely delivery to



stakeholders. The portal provides a single point of access to all modules such as users registration, award system, tenders information, online admission system, IPR management system, latest news and events, institutes information, speeches, circulars, ICAR success stories and innovations etc. The system provides intensive web 2.0 features of sharing on social portals, commenting, emailing, printing and rating on various ICAR articles.

- A scalable web based e-publishing and knowledge system in agricultural research system (<http://epubs.icar.org.in/ejournal>) for publishing of scientific journals covering the entire life cycle of research paper publishing and online production has been created and successfully implemented. The portal provides role based access to users including authors, reviewers, editorial staff and readers. The e-publishing helps authors by faster publication lifecycle, more visibility of current status, and online availability of article and provide its global visibility, leading to greater impact and international exposure. The system is being used for 40 scientific journals including ICAR journals (3), semi-technical journals (2) and scientific society journals of NARS (35). These ICAR journals are being accessed online from 192 countries globally, and 82 cities nationally. The numbers of online readers of e-journals were increased to 2-3 folds, and it has helped in increasing the impact factor of journals. The online system has an integrated repository of twenty years back issues of journals.
- Rice knowledge management portal (<http://www.rkmp.co.in>) is one of the largest portals on a single commodity (Rice), developed and made available online. It serves as an information highway for rice sector in sharing rice knowledge along with specific content for 15 states in 8 different languages to a wide range of stakeholders including policy makers, farmers, extension professionals, researchers, traders, NGOs, etc.

ICT in Agricultural Education

- An exclusive e-learning portal (<https://ecourses.icar.gov.in/>) for e-Courses for the degree level programmes in seven agricultural disciplines namely Agriculture, Fisheries Science, Dairy Science, Veterinary and Animal Husbandry, Horticulture, Home Science and Agricultural Engineering with 1107 credits and 15820 lessons have been developed as per ICAR approved syllabus. The e-learning system are aimed at bringing reforms in agricultural education in the country.
- University management systems have been implemented to computerize the management of students, courses, exams, marksheets etc. The system has brought transparency and efficiency in the processes.
- The National Information System on Agricultural Education Network in India (NISAGENET) portal (<http://nisagenet.icar.gov.in>) has been developed to provide State/ University/College level reporting on agricultural education in India. It provides unified information base for collection, compilation and analysis of academic information, infrastructural facilities, budget provision, manpower and research & development activities of all the AU's and Deemed universities of ICAR along with their constituent/ affiliated colleges.

e-Extension in Agriculture

- A service delivery platform called vKVK, to connects KVKs with farmers through internet and mobile technology, was developed to bridge the gap between the farmers and the KVK experts. The service, started in 24 KVKs is now being up-scaled in 191 KVKs covering more than 35,000 farmers.
- The Central Marine Fisheries Research Institute (CMFRI) has developed a mobile app "Fish Finder" to identify commercial reef and reef associated fishes. As many as 369 fishes from 66 families can be identified using the app. The app can be used to identify fish and classify them scientifically using their common names.

- KVK Portal has been implemented for centralised monitoring and reporting of the KVKs across the country. The portal also provides information about weather and market prices to the farmers.
- An app mKRISHI@AFisheries, a mobile advisory service has been developed to aid fishermen to increase their catch and reduce the cost of operations by providing information on Potential Fishing Zone (PFZ), sea surface temperature, weather and the presence of phytoplankton which form the food of several fish species.
- Several mobile apps (142) have been developed in NARS to help the farmers in various aspects of agriculture, livestock, dairying and poultry.

m-kissan, an SMS Portal for farmers' enables all Central and State government organizations in agriculture and allied sectors to give information/services/advisories to farmers by SMS in their language, preference of agricultural practices and location. This mobile telephony (with or without internet) app is the most potent and omnipresent tool of agricultural extension in India.

Some other notable ICT initiatives in e-extension in agriculture and allied areas include Dairy Information System Kiosk (DISK) of NDDB, which aims at helping the dairy farmers with timely messages and educating them on the care for their milch cattle and enhance the production of quality milk. It also aims at assisting the dairy unions in effectively scheduling and organizing the veterinary, artificial insemination, cattle feed and other related services. The application uses Personal Computers at the milk collection Centres of the Dairy Cooperative Societies (DCS) having connectivity to an Internet Service Provider (ISP).

Digital Content Repositories

- Digital libraries have been setup at national libraries in NARS. The e-Granth repository portal provides digital access to library resources of 38 institutions of NARS. These resources include important institutional repositories, rare books



and old journals, which have been made publically accessible over the internet. This repository has 1.6 lakh digital items like old books, old journals, and reports including theses in agricultural research.

- IDEAL, a ready platform for Agricultural Libraries of Indian National Agricultural Research & Education System (NARES) has been developed to implement Integrated Library Management System for day-to-day operations in libraries. The platform has been built on 'Software as a Service' (SaaS) concept to provide hassle free, ready to use platform for sharing library holdings through union catalog (AgriCat).
- A national digital repository for fisheries has been implemented at CMFRI, Cochin which has articles, books, theses, reports on fisheries sector.

ICT in Management Systems

A robust and flexible Enterprise Resource Planning (ERP) System which includes solution for Financial Management, Project Management, Material Management, Payroll & Pension and Human Resource Management at ICAR has been put in place in ICAR. The ERP system, integrates all of the organization's functions by allowing the modules to share and transfer information freely.

In addition, all information is centralized in a single relational database accessible by all modules.

ICT in e-Marketing in Agriculture

e-NAM: Small Farmers Agribusiness Consortium (SFAC) has created National Agriculture Market (eNAM) which is a pan-India electronic trading portal which networks the existing APMC mandis to create a unified national market for agricultural commodities. The portal is aimed at promoting uniformity in agriculture marketing by streamlining of procedures across the integrated markets, removing information asymmetry between buyers and sellers and promoting real time price discovery based on actual demand and supply.

Way forward

As ICT in agriculture like in several other domains have made significant impact in agriculture sector in India, it is desired to continue the impetus with enhanced fund support from Government of India and private sector organizations. The key activities include modernization of ICT infrastructure, implementation of cybersecurity systems, consolidation of software, portals, Mobile Apps and services, strengthening of Datacenter and development of data repositories

in agriculture.

Some latest ICT like Big data analytics, aerial imaging, image processing and AI together with GIS and remote sensing have been found to be helpful in implementation of precision agriculture tenets like variable rate irrigation, variable rate pesticide application, variable rate fertilizer application and variable rate seeding/ planting. These can help in agriculture cost reduction and enhanced production for enhancement of farmers' income. Blockchain technology which provides an open, decentralised, distributed digital ledger to record transactions across many computers in secure manner, has been found to be suitable in crop insurance sector and building infrastructure for traceability in agricultural commodities for trade and export. There needs to be fund allocations for these specific technologies in the Union budget 2019 to boost the agriculture sector in India for enhanced production and creating enabling environment for reducing cost of agriculture for farming community.

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Introduction of New Agricultural Innovation and Practices

India's National Agricultural Research System (NARS) comprising the Indian Council of Agricultural Research (ICAR), other central research institutes, and national research centres set up by the ICAR, together with State Agriculture Universities (SAU) played a key role in the Green Revolution. In more recent years, however, agriculture research has been plagued by severe under investment and neglect. The SAUs have been plagued by: (i) resource crunch, (ii) difficulty in attracting talented faculty, (iii) limited linkages and collaborations with international counterparts, (iv) weakening of the lab-to-land connect; and, (v) lack of innovation as recently indicated by the NitiAayog(2015).The weaknesses of SAUs imply that extension systems critical for the diffusion of new agricultural innovations and practices, or even dissemination of information about public programs such as MSP, are unable to achieve their intended objectives. Urgent intervention in this respect is, therefore, currently required of the states. Second, investment in public agricultural research in India needs to be augmented. Given the large externalities, the centre needs to play a more important role. India's current spending on agriculture research is considerably below that of China and as a share of agriculture GDP even less than that of Bangladesh and Indonesia. Third, resource augmentation can go only so far unless accompanied by changes in incentives. There is a strong need to take steps to enhance research productivity among the scientists in public agriculture research institutes by instituting performance indicators.

