E- agriculture: A vibrant nerve of improved farming

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Access to right information is the key to addressing many problems faced in the agriculture sector. "Disaster preparedness and management, with practices such as smart water management, maintenance of watersheds, accurate weather information and so on can go a long way in reducing the impacts brought about by the uncertainty of weather and climate change.

Today, agriculture has become knowledge intensive and access to right information at the right time makes a huge difference in the livelihood of small and marginal farmers. "With right kind of ICT services, governments can provide rural communities with information on weather, market prices, package of practices and insurance that contributes to their livelihoods.

Primarily focusing on agriculture, information and communication technologies (ICTs) can help boost agricultural development by improving farmers' access to improved information so that they make the suitable, need based and best decisions for use their resources sustainably.

The e-agriculture framework can help countries develop their national e-agriculture strategies. In Asia, Bhutan and Sri Lanka were the pilot countries that used this framework to develop their own national e-agriculture strategies.The Bhutan e-agriculture strategy, called the e-RNR master plan, has been approved as of May 2016. The Sri Lanka e-agriculture strategy is now lying with the ministry for approval. Bhutan and Sri Lanka have become the first two countries in the world to have full-fledged e-agriculture strategies.

E-agriculture strategy guide: Many stakeholders acknowledge the need for a national e-agriculture strategy - a guideline on leveraging the advances in ICT to address some of the challenges faced in agriculture. However, most countries are yet to adopt a strategic approach in making the best use of ICT developments for agriculture.

E-agriculture strategies will help to rationalize resources (financial and human) and address, holistically, ICT opportunities and challenges for the agricultural sector in a more efficient manner. Such strategies will also help to generate new revenue streams and improve the livelihoods of the rural community as well as ensure that the goals of the national agriculture master plan are achieved. The existence of an e-agriculture strategy and its alignment with other government plans will prevent e-agriculture projects and services from being implemented in isolation.

The food and agriculture organization (FAO) with their domain knowledge in agriculture and in the use of emerging technologies for food security, agriculture and rural development and the International Telecommunication Union (ITU) the lead UN specialized agency on ICTs, together with support from partners, have developed the E-agriculture Strategy Guide. This framework assists countries to develop their national e-agriculture strategy and master plan.

It has made an impact on how information is shared, and being able to use this information for the advancement of the agricultural sector gives a great positive impact that is beneficial for everyone. IT has become a bridge for people from entire world.

Agriculture in India is the core sector for food security, nutritional security, and sustainable development and for poverty alleviation. It contributes approximately 18 per cent of GDP. Milestones in agriculture development in India includes: green revolution, evergreen revolution, blue revolution, white revolution, yellow revolution, bio technology revolution and the most recent one is Information and communication technology revolution.

Central, state governments and private organisations have taken ICT measures for agriculture extension which

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include ITC-e-choupal, Kisan Kerala, Aaqua, Rice knowledge management portal , e-krishi, Mahindra Kisan Mitra, IFFCO Agri-portal, Village Knowledge Centres (VKCs)- M.S Swaminathan Research Foundation (MSSRF), Village Resource Centres (VRCs)- Indian Space research organisation, KISSAN app, Pusa Krishi, e-NAM, e-Pashuhaat, Expert systems, Kisan Call Centres, etc. We cannot go into the detail of each one, we will focus the important and recent ones, may be not given in the above list.

ICT and agriculture:

– Agriculture and Information and Communication Technology seems to be the most distantly placed knowledge sets in the world. Farming being the most primitive and most basic of the jobs and IT related being the most advanced and most modern.

– The information related to policies and programmes of government, schemes for farmers, institutions through which these schemes are implemented, new innovations and interventions in agriculture, good agricultural practices (GAPs), Institutions providing new agricultural inputsand training in new techniques are disseminated to farmers through use of information technology to ensure inclusiveness and to avoid digital divide.

– Access to marketing information, access to agriculture information, access to national and international markets, increasing production efficiency and creating a conducive policy environment' are the beneficial outcomes of e-Agriculture which enhance quality of life of farmers.

– Soil management, water management, seed management, fertilizer management, pest management, harvest management and post-harvest management as well as overall package of practices are the important components of e-Agriculture where technology aids farmers with better information and alternatives. It uses a host of technologies like remote sensing, computer simulation and assessment of speed and direction of wind, soil quality assays, crop yield predictions and marketing using IT.

– In India, there have been several initiatives by NGOs, State and Central Governments to meet the various challenges facing the agriculture sector in the country.

– The e-Agriculture is part of Mission Mode Project, which has been included in NeGP (under National E-governance Plan) in an effort to consolidate the various

learning's from the past, integrate all the diverse and disparate efforts currently underway and upscale them to cover the entire country.

– The MMP is to be operationalized by Department of Agriculture and Co-operation (DAC) and aims to provide services, such as:

Information to farmers on seeds, fertilizers, pesticides:

– Information to farmers on Govt. Schemes

– Information to farmers on soil recommendations

– Information on crop management

– Information on weather and marketing of agriculture produce

– Government steps to provide e-aid to farmers.

National policy for farmers, 2007:

– It has important provision for use of technology: New technologies which can help enhance productivity per unit of land and water are needed. Biotechnology, information and communication technology (ICTs), renewable energy technology, space applications and nano-technology to provide opportunities for launching an "Evergreen revolution" capable of improving productivity in perpetuity without harming the ecology.

National mission on agricultural extension and technology: The aim of the mission is to redefine, restructure and strengthen agricultural extension to enable delivery of appropriate technology, information's and improved agronomic practices to farmers. This is envisaged to be achieved by a judicious mix of extensive physical outreach and interactive methods of information dissemination, use of ICT, popularisation of modern and appropriate technologies, capacity building and institution strengthening to promote mechanisation, availability of quality seeds, plant protection, etc. and encourage aggregation of farmers into interest groups (FIGs) to form farmer producer organisations (FPOs).

– Under Bharat Nirman, has registered the increased tele-density in rural areas and it is this base which is being used to provide 'm' service to farmers, giving them right information at right time and place.

– Universal service obligation fund (USOF) launched wireless broadband Scheme in 2009. USOF is also funding the National Optical Fibre Network (NOFN), which is being managed by Bharat Broadband Network Limited. Bandwidth from NOFN will be eligible to give wide range of services to rural India for farmers.
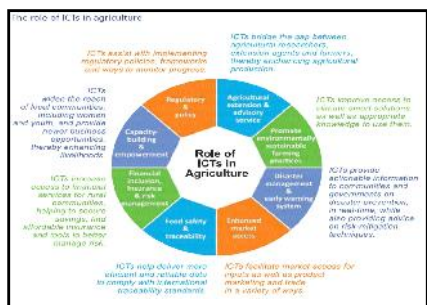
– Pilot project scheme for Mobile values added services (m-VAS) for rural women's self-help groups (SHGs) is also part of USOF's Sanchar Shakti Programme. In this the SHG on the basis of their activities are provided with information in local languages through SMS, outbound diallers (OBDs) and Integrated Voice Response System (IVRS).

– Bharat Nirman Kendra shall be a single window for providing the information on the NREGS and shall provide feedback on the quality of implementation of the program. The idea is to slowly move on the wage employment to self-employment by providing skill development facilities to the rural people and in the process gives a fillip to the rural economy. In future it can also become centre for e-enabled study or e-learning centre.

– For farm credit, service of ICT is being harnessed like Smart Cards, Expert Systems, Internet Kiosks and cell phone messaging and also disbursement of all social security benefits through electronic direct benefit transfer to all rural areas. Mobile-enabled kisan card system to help the agricultural community engage in cashless transactions,

– Kisan credit card: It uses the ICT to provide affordable credit for farmers in India. It was started by the Government of India, Reserve Bank of India (RBI) and National Bank for Agriculture and Rural Development (NABARD) in 1998-99 to help farmer's access timely and adequate credit.

– Kisan Choupal in collaboration with Krishi Vigyan Kendra is a successful model in Bihar. It is being conducted in identified village on the basis of need assessment of the farmers by the scientists on agriculture and allied enterprises.

– Kisan call centre: An expert advisory system and the farmers needs to call the toll free number 1800-180-1551 to seek expert advice on different matters related to agriculture and allied sectors.

– Kisan SMS portal : Here farmer keeps getting SMS messages providing information or delivering service or giving advisories on his mobile from experts, scientists and officers at various levels after once opting for messages on agricultural practises / crops of his interest. In short, messages are customized based on farmer's preferences in the different language chosen by them.

– The Sandesh Pathak application, developed jointly by C-DAC Mumbai, IIT-Madras, IIIT Hyderabad, IIT Kharagpur, and C-DAC Thiruvananthapuram will enable SMS to be read out loud, for the benefit of farmers who may have difficulty in reading. It is usable by people who cannot read. A large population of farmers belongs to this category. So when they receive an SMS message either containing agriculture-related advice or some other thing, this app will read aloud the content.

Village Knowledge Centre (VKC):

– Village Knowledge Centre (VKC) serves as information dissemination centre providing instant access to farmers to latest information/ knowledge available in the field of agriculture, starting from crop production to marketing. A "VKC In-charge" who looks after the operations of the VKC mans every VKC.

Village Resource Centres (VRC):

– The VRCs are connected to Knowledge/Expert/ Research Centres like Agricultural Universities, Skill Development Institutes and Hospitals.

– Over 6500 programmes have been conducted by the VRCs in the areas of, Agriculture, Horticulture, Fisheries, Livestock, Water resources, Tele health care, Awareness programmes, Women empowerment, Supplementary education, Computer literacy, Micro credit, Micro finance, Skill development / vocational training for livelihood support, etc. So far, over five Lakh people have availed VRC services.

More advanced use of ICT in farming:

– *Irrigate via smart phone*: Mobile is playing a big role in monitoring and controlling crop irrigation and monitoring systems. With the right equipment a farmer can control his irrigation systems from a phone or computer instead of driving to each field.

– Moisture sensors in the ground are able to communicate information about the level of the moisture present at the certain depth of the soil. This gives more precise control of water and other inputs like fertilizer that are applied by irrigation pivot.

– GPS mapping for an input to the field using variable rate technology, which helps farmer in accessing the need *i.e.* where they need to put more fertilizer or less, according to the requirement of the soil. GPS enabled services are also helping in field documentation about yield, moisture, maps for field drainage, etc.

Benefits of IT to farmers: Information and Communication Technology act as a bridge between tradition and latest technology into the agricultural sector,

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and with positive results. To name a few, here are some of its effects:

Improved decision making: By having the need based and necessary information, farmers big and small can make better and more informed decision concerning their agricultural activities. May it be about whom to get their grains from or perhaps who to sell it to, the communication channels that information technology brings makes production upto distribution easier for and to the farmers. The exchange of technology from various countries and organization also helps farmers be more aware of factors to consider before making their decisions.

Better planning: ICT has paved the way to come up with farming software which can keep better track of crops, predict yields, when to best plant and what to plant, to intercrop or focus on just one product or determine the current need of the crops just about everything needed to improve production and income.

Community involvement: There are several programmes which are made possible by IT and its applications and community involvement in agriculture can be increased as well. When a community adopts modern practices for agriculture, the production of local goods can be increased.

Agricultural breakthroughs: IT makes the communication of information concerning the latest agricultural breakthroughs more possible. When scientists and researchers develop new and improved grains or find techniques to help crops become stronger against the different uncertainties, farmers from all over the world may benefit from the same breakthroughs simply by being connected to the rest of the agricultural world. Sharing information to help everyone progress is made much easier through resources made available and accessible by ICT.

Agriculture for everyone: Farmers have in-depth knowledge when it comes to their trade. However, interested individuals who may be called backyard farmers may also benefit from how modern technology has changed how agriculture is fast moving. Growing your own sustainable garden of herbs, fruit trees and other agricultural produce can be possible in a smaller scale. Planting is beneficial in more ways than one and having your own produce even helps assure the freshness and quality of the food your family eats.

Problems in effective use of Technology: Though lots of problems like feasibility of connectivity in rural areas, cost involved in ensuring services, need for basic computer literacy and literacy hinders the fast development of e-Agriculture, it will definitely be an engine of growth in agricultural specific areas in India once the initial hiccups are overcome. Some of those problems are:

– The reach of the technology is still very poor and large chunk of farmers are still ignorant about such advancements. The distribution of technologies is not uniform throughout the country. Farmers of prosperous states are at the receiving end like- Punjab, Haryana, Maharashtra and the farmers of backward states still practise their age old techniques and knowledge.

– The use of technology is being used by the already few rich farmers and utilising these services they are further prospering. The small and marginal farmers are again being left out in the process of development.

– Due to low literacy rate among farmers and digital divide, there is a rise of new class of middle man, who provide ICT services to farmers. They are also believed to distort the information for their own benefit.

– The rural infrastructure for the use of ICT is also not uniform and lot of regional disparity persists.

Conclusion: With the diverse cultures and languages in India, ICT provides a good platform for different opportunities here. Thus, in future there would be substantial upliftment and sustainable development in agriculture and allied sectors. ICTs are changing all the spheres of human lives and agriculture cannot be an exception. ICTs now may act as an agent for changing agrarian and farmer's life by improving access of information and sharing knowledge. The ICT tools can change the ideas, activities and knowledge of the farmers. Farmers feel empowered and can adopt appropriate measures at the time of need. With the new extension of ITC initiatives like Krishivihar, i-Kisan,e-kutir, e-Sagoo, ICT models- AGROWEB, Agropedia, Agro Innovate, etc. Indian agriculture has come to a long way and established several records in terms of production and productivity. IT had the potential to transform agriculture into a better prospect in the wake of climate change and decrease in the cultivable land.