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ICT in Agriculture: Creating SMART Farmers

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Abstract

Agriculture is the backbone of any country and India is blessed to have agriculture as the main occupation of a large population. The varied geographical terrain of India provides an opportunity for year long production of crops. With the onset of technical revolution in all the areas of life, all over the world, agriculture is not untouched. The developments in ICT has revolutionized agricultural operations many folds. Be it the meteorological information, soil health, seed health, fertilizer application or even the insect attack on the crops, all are being regulated by the ICT applications in one form or other. Our today's farmer is well informed about the use of new technologies in agriculture and is very efficiently utilizing the information in an intelligent way. All these are irrespective of the region, season, crop, place or the location. The use of Information Technology has made our farmers SMART, i.e., they are Self Monitoring, Analyzing and Reporting through the use of adequate Technology. The use of proper IT tools has given both the scientists and farmers a suitable platform to interact more frequently and on time. The scientists are using ICT tools to reach the farmers on their fields and our farmers has brought their knowledge to the labs for further growth and development in the field of agriculture. The present paper is a review on the current ICT applications which is making our farmers SMARTER and self reliant. There are many initiatives of government and private organizations to bring our farmers closer to the technologies developed for their benefit. The current paper is an attempt to visualize the efforts made by scientists and technologists in the field of information and Technology for the benefit of farmers and towards the end it conceptualizes the application of ICT and its use by our farmers.

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Introduction

Timely and reliable information related to agriculture acts as a magic for agriculture and farmers. There are many telecom devices and services for supporting our farmers today. Computers, mobile phones, television are a few of them. Rapid growth in the field of information and technology has initiated a revolution in the field of agriculture also.

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Instant communication, swift exchange of information as well as the ease of adoption has made ICT tools 'must' for agriculture development.

Globalization of agriculture and related products, bumper production and demand of produce has widened the spectrum of agriculture. Today agriculture is not limited only to production and practices of crops but it also includes quality processing, packaging, marketing and even the exports. It not includes only the large land holders but the marginal and small farmers are also a part of it. ICT has brought them together on one platform and they are collectively contributing towards the development of the country.

Digital Revolution in India and Agriculture

Computers, World Wide Web, pagers, cellular phones, satellite networks and many more introduced and boosted digital revolution all over the world. Digital revolution in India is dated around 1980's when computers were introduced and with the launch of internet and satellite communication the whole system welcomed digital revolution and got involved. Computer education was introduced in school and university education, digitization of banks, transport, laboratories and more, marked the revolution. Use of television, radios for broadcast, telephones for communication were all revolutionized and the whole world got 'linked' in one way or other.

ICT Initiatives in India

The introduction of Information and Communication Technology tools revolutionized the Indian economy at a faster pace and there was a steep rise in the exchange of thoughts, ideas and techniques. Although ICT tools were not new to any community all over the world and the exchanges took place through telephones, telegraphs and other modes of communication, however introduction of satellite communication and internet brought the wide spread community much closer at a faster pace. The traditional agriculture has been reformed and revolutionized with the use of digital technology and it has definitely changed the scenario of Indian agriculture making it more sustainable and profitable.[1] The technology has proved to be beneficial in disseminating right information, at the right time which stands helpful for farmers in choosing the farming operations at the appropriate time. Many International and National agencies, Departments, organizations, institutes are involved in collection, evaluation and processing of data logically through electronic modes. The speedy analysis of data, logical evaluation and effective dissemination of information at the right place and time has benefitted farmers in controlling diseases, evaluating cropping systems, processing and marketing of their crops.[2] The technology is assisting our farmers in judging the health of soil, suitable selection of crops, time of sowing and harvesting including many other on-farm operations like irrigation, insect-pest control etc. ICT tools are helpful in spreading the information on weather conditions, disease outbreaks, swarm and locust issues and many more which makes the farmers alert and aware before hand.

ICT has three major roles to play viz., Education, Awareness and Dissemination. It very efficiently covers all aspects of a farmers' life. Crops, livestock and poultry, health and nutrition related issues of family members, all are very conveniently covered by ICT.

Education

Varied type of ICT tools including computers, mobile phones, television, radio etc can be used to educate the community through films, stories, discussions, e-books, e-messages and many more. These tools can be used to spread the information amongst the related community on symptoms of diseases, insect-pest infestation, processing and preservation operations, fertilizer applications, irrigation tools, storage techniques and some aspects related to livestock and poultry operations. This information will make the farmers educated on various aspects and will make him ready to deal with such problems before hand.

Awareness

Various ICT tools are helpful in creating awareness amongst farmers on different aspects like health issues of their livestock and birds, availability of suitable seed varieties, soil conditions, extreme weather conditions, expected outbreaks and its control, processing and preservation operations, marketing opportunities and many more. An alert and aware farmer is capable to taking timely decisions and this will help him to reap his profit.

Dissemination

Proper selection of ICT tool for disseminating information will help in spreading the wise words amongst the community at a faster pace in a short time. This could be helpful in controlling insect-pest, diseases, problems like water-logging, floods, drought etc. A prior spread of information on health-hygiene of livestock, availability of new varieties, seeds centers, fertilizers etc will help farmers to manage their crops and livestock in better way and keep them ready for the forth coming issues.

Advantages of Using Ict Tools in Agriculture

1. These can be best tools for disseminating agriculture related information on a wider front in a short time
2. As an awareness and education tool
3. As an alerting tool
4. For creating online farmer groups to carry out discussions and other exchange of information
5. For generating real time pricing and marketing information
6. For popularizing Government schemes and programmers
7. As a tool to support agri-clinics and agri-finance systems
8. As a tool for connecting to agri business units and outlets
9. For providing real time information on new technologies on insect-pest control, irrigation and other related practices
10. As a tool for one to one contact of farmers and scientists or experts, all over the world, for success stories.

ICT Initiatives for Farmers

ICT has been able to support farmers by giving them exposure to exchange their experiences, practices, doubts and ideas using electronic medium.[3] Simple agriculture has now been transformed to e-Agriculture and that too is not only limited to rich or large land holders but it has entered the households of small, marginal and poor farmers as well. Many agriculture specific applications are targeting small holders with major two objectives:

1. Empowering small and marginal stakeholders with assets and services to enhance their productivity and incomes and to improve their livelihoods by ensuring food security.
2. To exploit all the possibilities of ICT to match the rapidly changing global markets.

ICT is a boon to both public and private sector players who are continuously working towards finding out effective solutions to address both the long term and short term challenges being faced by farmers.[4]

Public and private sector actors have long been searching for effective solutions to address both the long- and short-term challenges in agriculture, including how to answer the abundant information needs of farmers. ICT is one of these solutions, and has recently unleashed incredible potential to improve agriculture in developing countries specifically

Some of the initiatives of farmers' interest include:

Crop Specific Applications

Some of the mobile and computer based applications for farmers dealing in specific crops include (icar.gov.in):

Ikshu Kedar

Application developed by IISR Lucknow, is a beautifully designed app to support sugarcane farmers. The app suggests the date of irrigation in sugarcane crops as per prevailing environmental conditions. Also the app suggests certain pre-cautions and other related advisories for different types of soils that otherwise affects the sugarcane crops.

Farm Tree

Developed by ICAR-CAFRI, Jhansi, Uttar Pradesh, this is one of the beautifully designed and technically sound mobile app. It not only supports the tree growing farmers but is also knowledgeable for the use by scientists, students and other professionals. It is a well decorated app with all essential technical details of planting a nursery to potential utilization of produce received from a tree.

There are some other apps for specific crops like cashew, banana, cotton, tobacco, various fruit crops including mango, sapota, herbs of different kinds and even the flowers like orchids, tubrose etc are helpful for farmers. Some of these are also available in their own regional language.

Livestock Specific Applications

Some of the computer based or mobile based apps are designed specifically for livestock care and maintenance. To name a few from ICAR organization includes; Buffalo Nutrition, BHealth and others. Other animals covered include cattle, sheep, goat, pig, poultry and fish. Some of these apps are available in both Hindi and English language. These apps have vaccination schedule, disease symptoms with diagnosis and treatment, gestation calendar, rationing tips and suggestions. Also, the processing, marketing and food safety concerns are an essential part of some of these applications

E-Learning Applications

Having knowledge and learning more is essential for continuous growth and development. Some of the fully devoted portals and applications are also designed and made available for farmers who want to learn and explore more and more opportunities in their traditional agricultural practices.

E-Krishisiksha

is one such portal devoted to e-learning. The portal has lots and lots of e-contents for training and learning through reading. Farmers can explore new opportunities in the guidance of experts and the e-content on various topics supports their queries from time to time which can be accessed any where any time.

Krishi

a fully devoted knowledge based research information system for innovation in agriculture. It is a type of repository of ICAR research data for knowledge management

E-Krishimanch

is a query management system which is like a scientist-public interface. Here farmers can directly to the subject experts and get their queries solved at the earliest.

Similar types of apps like Kisan Mitra are also available in Gujrati language and Krishi Gyan is also a regional language app.

Some of the apps for the benefit of farmers are available on the portal of Department of Agriculture and Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers welfare, GoI. These include;

Kisan Suvidha

deals with all types of issues of farmers and farming community.

Pusakrishi

is a helpful app to promote agri-business ventures including commercialization of technology and the market ready technology.

M-Kisan

shares advisories by expert which are both season and crop specific. Also it is a platform for sharing programme launched by Government for the benefit of farmers. It is a SMS based app and constantly updates the farmers.

Kisan Call Centre (Kcc)

It is a telephone based app. Experts from different fields respond to the queries of farmers on telephone.

Shetkari Masik Android App

is a type of monthly magazine in digital form. It contains articles, advisories and related information from the experts for the farmers. Being a monthly circular it is convenient for farmers to keep themselves updated with the latest development in the field of agriculture.

Farm-O-Pedia

is also a digital information portal. It has lots of information for our farmers on package and practices on almost all types of crops, weather conditions, soil health, animal health, food processing, storage practices and many more.

Bhuvan Hailstorm App

is specifically designed to alert farmers in the areas of extreme weather conditions. It alters farmers on expected hailstorm conditions. Also the app is specifically designed to ascertain the losses incurred by farmers due to these bad weather conditions. It has an inbuilt GPS and camera system which locates the field of farmers and clicks photo graphs. This data is immediately transferred to the portal for further analysis and can be used for claims.

Agri Market
is a synonym to its name and is helpful for farmers in selling their produce at MSP's directly. The portal continuously flashes the current prices of the crops. The farmer can directly approach the nearest market using the GPS locator and sell his produce.

Some of the private firms, non-government organizations, civil society organizations, research groups are also working for farmers and making them more techno-friendly and smart by innovating specific apps, viz;

- AGRISCIENCE
- KRISHI
- AGRIBOLO
- Agrolee
- Kheti Point
- AgroEx
- KrishiGuru
- SmartKrishi
- Agrisetu
- Kheti Buddy

There are many more applications and portals for the benefit of farmers. Some of them are in regional languages

Creating SMART Farmers
Traditionally, Indian farming was based upon the indigenous knowledge our farmers had from their forefathers and other fellow farmers. However those who revolutionized farming followed advice of their friends, input dealers, visitors and others which were sometimes not as successful as it had to be. With the advancement in science and technology some of the practices in traditional agriculture improved and our farmers adapted it beforehand. But still the output was not at par. With the introduction of ICT tools the communication and dissemination of information moved at a faster pace and the developments in the field of science and technology were also geared up. The information related to agricultural practices reached our farmers directly from the experts in the field.

Introduction of in-hand ICT tools including mobiles, smart phones, computers made our farmers SMART, i.e., they are Self Monitoring, Analyzing and Reporting through the use of adequate Technology.[5] They are now able to decide on the cropping pattern, seed selection, application of fertilizers, insect pest and disease management, processing, marketing etc, With the timely dissemination of information related to agriculture they can Self Monitor their crops, they are able to Analyze cropping conditions including soil health, weather conditions, water availability and more and Report the results using suitable Technology. Farmers have become self reliant and informed. ICT tools have brought laboratories to the farmers' field and today a real time data can be assessed to modify the cropping pattern inorder to enhance the output. Adaptation of techniques related to Precision farming, micro-irrigation, fertilizer application, soil health, seed health, livestock, integrated farming practices and more, today's farmer is smart enough to deal with it. ICT applications have generated authentic database on weather forecast, soil health, crop cultivation practices, processing, marketing, storage and many more to help our farmers.[6]

Conclusion
Agriculture is the backbone of Indian economy and needs to stay updated with new technologies from time to time. ICT tools have proved to be very helpful in updating the data base and disseminating the related information to our farmers. They have empowered our farmers by providing right information at the right time to the right person. It has reduced the gap between the learned scientific community and the traditional farmers. Today they are working in coordination with each other by using appropriate ICT technologies and achieving the growth targets at a faster pace.

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Conflict of Interest
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