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INTRODUCTION OF INFORMATION COMMUNICATION TECHNOLOGY IN AGRICULTURAL DEVELOPMENT IN INDIA

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Abstract:-This article explores the role of Information Communication Technology in agricultural sector in India and transforming the country through increased growth and sustainable production of agricultural products. Large number of projects stuck as pilots only and very few continuously innovated, replicated and sustained over the years. However, the variety of Information Communication Technology initiatives are also added lot of lessons to take future course of action. With the available practical lessons, it is time to move forward in integrating Information Communication Technology s and Information and Communication Management (ICM) in agricultural If the agriculture sector performs well then only we can think of India marching ahead towards becoming developed nation due to economical autonomy. The challenges of the traditional agriculture are addressed signi?cantly by using information and communication technologies (Information Communication Technology) that play an important role in uplifting the livelihoods of the rural poor. Agriculture is most important sector with the majority of the rural population in developing countries depending on it. Information Communication Technology are changing all the spheres of human lives. Hence, it is a popular belief that, agricultural extension also no exception to this. It is also expected that the Information Communication Technology led extension systems are going to act as a key agent for changing agrarian situation and farmers' lives by improving access to information and sharing knowledge.

Keywords: Information Communication Technology, Agricultural Development, Indian Agriculture.

INTRODUCTION

This revolution in information technology has made access to information easy and cost-effective.

Information Communication Technology 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. Agriculture continues to be the most important sector of Indian Economy. Hence, there is an immediate need of vibrant, dynamic and innovative approach to be adopted for agricultural extension in order to achieve targeted growth rate and serve the farmers better. Further, Land and water resources are almost reaching their limits; hence achieving food security heavily relies on "Knowledge Resource". In India, there are about 120 million farm holdings and the number is

growing year by year. In this existing scenario, it is expected that integration of Information Communication Technology s in agricultural extension will provide needed impetus to agricultural sector and Information Communication Technology can complement the traditional extension system for "Knowledge Resource" delivery to the millions of the farmers.

NEED OF INFORMATION COMMUNICATION TECHNOLOGY IN AGRICULTURE:

There are several Information Communication Technology models in Indian agriculture, which have made significant difference to agricultural operations (Meera, Jhamtani, & Rao, 2004). At present, the ratio of farmers to extension workers is as low as 1000:1. Although the appointed Village Local Workers (VLWs) disseminate information, there is lack of accountability. These two issues have created an urgency to effectively It is only through the introduction of Information Communication Technology that information can also be updated and extended at the lowest cost.

OBJECTIVES:

Information Communication Technology in agriculture sector meets several objectives and thereby achieving agricultural growth, rural employment, enhanced productivity and happy livelihood. Following are some of the main objectives of Information Communication Technology enabled agriculture:

•To spread knowledge of technologies, crop cycle, suitable use of fertilizers etc.
•To ensure language and cultural pertinence and active participation of farmers.
•To help the villagers augment the growth of agriculture and contribute in GDP growth.
•To implement a framework for agricultural development strategies, investments and programs.

SCOPE OF INFORMATION COMMUNICATION TECHNOLOGY FOR AGRICULTURE:

It has been acknowledged by various reports of government that application of Information Communication Technology at the different levels of agricultural processes result in improvements of agricultural competitiveness. Management of technological information which includes price and market information; weather conditions; economic variables; communication with peers and business transactions etc., plays a signi?cant role in achieving competitiveness. The money is directly transferred to bank account of farmers that reduces the possibility of malpractices by agents and also addresses the corruption menace to large extent. The department of weather forecasting predInformation Communication Technologys about rain and weather in general, helps the farmers in planning managing of various stages of agriculture Information Communication Technology s provide transparency in implementation mechanisms that could be seen in paddy procurement systems of government of Chhattisgarh state, and several other purchase schemes of various crops all across the country.

Information Communication Technology plays crucial role in agriculture production, crop management and others, however, the implementation is affected by several factors such as: required infrastructure for access and affordability of Information Communication Technology tools and facilities; internet connectivity in production and commercial areas; outreach of awareness programmes, the quality and availability of suitable information content; limitation of the media; choices and appropriation of individuals Information Communication Technology based approaches

etc.

INFORMATION COMMUNICATION TECHNOLOGY APPLICATIONS IN AGRICULTURAL DEVELOPMENT:

In order to bring about development and enhance the quality of life of the villagers a definite policy with regard to communication support must be formulated and pursued. Communication has to emerge as an important policy instrument, integrating economic, social, education and cultural planning. In urban societies, the acquisition of literacy as a skill becomes both possible and necessary. Increased literacy, in turn, leads to greater exposure to the mass media which reciprocates by creating a further demand for literacy. The electronic mass media is considered a major tool for the development of people primarily due to its reach and secondly can transfer the improved agricultural practices to the farmers at different stages of adoption process. These electronic media are categorized into three broad groups. They are simple electronic media, advanced electronic media and other modern electronic media.

1) Simple Electronic Media:

These media involve complexities to lesser extent in their operation and maintenance as compared to others. Hence these are known as simple electronic media. These can be listed as Radio, Television, Satellite technology and Video and audio tapes.

a) Radio: All India Radio (AIR) was established in 1936 and the Radio broadcasting in India started since 1927 that became "Akashwani" in 1957. In 1965, ten intensive Farm and Home units were established at selected AIR stations to feed factual and technical information and utility announcements to the farming community. Farmers accord a very high credibility to it as a source of reliable and latest farm technology for them, also stated the same for rural women irrespective of their socio - economic status and literacy level. Radio Rural Forum is a combination of the mass media with interpersonal communication, where small organized groups of individuals meet regularly to receive a mass media programme and discuss its contents and forward their queries to be answered by the original broadcaster or the expert through the convener who keeps the records and seeks answers to the queries.

b) Television: Dr. Vikram A. Sarabhai was the first to accord highest priority to taking television to India's villages. Television was first seen in India in an industrial exhibition held at Delhi during 1955. In the words of Schramm (1953) "people would certainly learn from television and learning from television would not remain confined to facts only, but it extends to development of skills, critical thinking and problem solving". It is advantageous as it can communicate to the viewer through both audio and visual aids. It transfers the messages immediately and has a wide coverage in terms of area. Dale (1963) pointed out that an agricultural expert could influence more farmers by ten minutes of telecast than a week's travel. Krishi Darshan. It is the oldest, well established and best known program for the rural areas and farmers. It was started from 26th January, 1967 through the agricultural television pilot project. The foresight and the pioneering spirit of the visionary space scientist, Dr. Vikram Sarabhai and the initiative of Dr. M.S. Swaminathan crystallized it into the innovative program.

c) Satellite Instructional Television Experiment: The Satellite Instructional Television Experiment conducted during 1975 - 76, using the ATS-6 satellite loaned to India by the National Aeronautics and Space Administration (NASA) of USA was the convincing demonstration of the commitment of Indian Space and Research Organization (ISRO) to the rural development in all its dimensions and manifestation. This project involved the direct transmission of instructional programme to augmented TV sets in 2400 villages spread across the six Indian states.The programmes telecasted under SITE covered areas such as agriculture, animal husbandry, family planning, education and other development related issues as well as entertainment. The first six states where it started were the Rajasthan, Bihar, Orissa, Madhya Pradesh, Karnataka and Andhra

Pradesh. SITE was considered a learning experience to design, produce and telecast relevant educational and developmental programmes to widely dispersed areas with different problems and varying languages, using on a time sharing basis, a single broadcast channel of ATS-6 satellites hailed as "a teacher in the sky". A study on the impact of SITE carried out by the ISRO revealed that instructional programme blended with entertainment could make a significant impact on the rural society in a variety of ways. Direct broadcasting under SITE made it possible to take the programme to remote rural areas.

d) Video Tapes andAudio Tapes: Video is another suitable medium for generating and promoting interaction. It is an electronic motion Information Communication Technologyure with attendant sound. Both Information Communication Technologyure and sound reach an eye and ear simultaneously to make the message more effective. It can be easily handled and at the same time easy to carry. Video tapes are an ideal medium to promote motivation, attitudinal change, behavior reinforcement, community participation and entertainment. Videotapes have tremendous utility in the training of extension personnel. Videotapes can be recorded on successfully conducted training sessions and workshops. Different 'success stories' can be of great practical use to our trainers. Another very promising area of videotape recording is technology training. The most successful mixes of training methods and technologies can be videotaped and sent to Directorate of Extension (DOE). The DOE can multiply them and send to states and training institutions at national, regional, state and even divisional level.

2) Advanced Electronic Media:

These are those media in which relatively more technicalities are involved in their operations and maintenance. The advanced electronic media includes Interactive Computer Video Technology (ICVT), Computer aided system (CAS), Information and Communication technologies (Information Communication Technology) and Internet.

a) Interactive Computer Video Technology (ICVT): ICVT is the result of advancements in computer, video and laser technology. It is an amazing device for the storage and retrieval of audio and video information. ICVT fulfills the needs for the interaction in the communication process. In this, the learner controls the system through computers for his interaction with video recorded materials chosen for learning. This provides the opportunity for remediation as well as reinforcement of learning and individualization of instruction. For the first time in India in agriculture sector, Department of Electronics (DOE) has decided to take up a pilot project on the use of Interactive Computer Video Technology (ICVT) system at a cost of about Rs. 1.5 crores. The system was installed at MANAGE, Hyderabad on pilot project basis. To fulfill these objectives and opening a new chapter in training to extension personnel, one firm named National Informatics Centres (NIC), New Delhi has taken the contract. This is believed to be first centre of its kind in any developing countries in agriculture sector.

b) Computer Aided Agricultural Extension (CAEx): The Chennai Dialogue on Information Technology (1992) chaired by Dr. M. S. Swaminathan, resulted in the proposal for the establishment of a Computer Aided Agricultural Extension (CAEx) and Information Village which will complement and sustain each other. Key of these schemes is the concept of blending traditional and recommended technologies to create a paradigm where technology development results in creation of new or skilled jobs. The purpose of CAEx is to generate and disseminate information relevant for a locality such as development block and village cluster. Here, local specificity is important. The CAEx system centres around a value adding programme which receives information from a variety of sources such as the universities, the relevant State Departments, regional meteorological centres, CAEx can generate and disseminate information relevant for a locality in different areas viz., meteorological information, pest/disease information, marketing price information, weather report (remote sensing data), general and specific scientific information on different enterprises like aquaculture, apiculture, water harvesting, etc.

c) Information and Communication Technologies (Information Communication Technology s): Information Communication Technology s are a generic technology, their application to agriculture and to rural development are very extensive and pervasive. The facilitation of access to information and to knowledge is its main characteristic. They are profoundly transforming extension services through the use of multimedia technology, as well as through the possibility of developing innovative approaches based on interactive knowledge development processes that involve researchers, extension specialists and farmers. The main objective of Information Communication Technology application, from a development perspective, is that of empowering people through knowledge. It increases the effectiveness of their development efforts through informed decision making and through their capacity to harness science and various forms of knowledge to achieve the objectives of poverty eradication, food security and sustainable development. The five key services proposed by Bhatnagar (2000) to analyze Information Communication Technology application and their contribution to agricultural and rural development are:

•Access to information through different types of Agricultural Information Systems (AIS) e.g. village KIOSKS, e-Panchayat, cyber extension.
•Monitoring the situation of natural resources and impact through analysis of environment deterioration, soil erosion, deforestation etc. e.g. Geographical Information System (GIS).
•Education and communication technologies that are playing a very important role in generating new approaches to learning and to knowledge management e.g. e-Library.
•Networking where Information Communication Technology can contribute greatly in relating people or institution among them and facilitating the emergence of "virtual communication of stake holders" that generate and exchange information and knowledge among themselves.
•Decision support system (DSS): Tools and practices through which data and information provide relevant knowledge inputs for informed decision making. E.g. expert system.

d) Potential of Internet: E-Agriculture: The term e-Agriculture refers to the using of IT application such as computers, networking, and database systems to reduce knowledge gaps and increase knowledge sharing for increasing productivity and boosting growth in rural areas. It also helps in empowering farmers with relevant and timely information about different agricultural operations. It supports to locate relevant information on the portal or other farming rural website via the area wise classification. Agriculture extension department should focus on providing agricultural information in e - format over World Wide Web (WWW) via internet. Some important websites are www.kisan.net, www.agriwatch.com, www.agrisurf.com etc.

Regional extension centers can take responsibility for small vertical segments of agricultural information and develop corresponding websites e.g. Rajasthan government has launched a pilot project on ground water information about the ground water availability in the selected locations. E-Agricultural Markets. Farmer's needs vary with season, crop, weather and location. Therefore, most of agribusiness services need to be regional in scope. Many farmers do not have much of time or information access to make and implement informed marketing decisions since commodity prices keep on changing.

3) Other Modern Electronic Media:

Videotext, Tele Text and Interactive Multimedia

a) Video Text: It refers to an information system with which text and graphic information is transmitted and then received either by a video text television or on an ordinary television set with an adapter unit. The concept has been developed to provide a method of low cost information delivery. A video text coupled with a micro computer permits editing as well as retrieval of information on a video text page. The video text that is transmitted via telephone calls, cable data lines or private network is called as interactive video text. Videotext has certain attributes which makes it a potential teaching medium. It can be effectively used in training and distance education.

b) Tele Text: The videotext transmission based on broadcast signals is called teletext. Thus, teletext is a system that links a computer to a television by which text and graphic information can be transmitted on a one way basis to home viewers. Indian television joined the advanced nations when in 1985; it started the teletext, known as "Intex service", to telecast latest news and information, share market, etc.

c) Interactive Multimedia: The combination of computer and video has resulted in a remarkable new educational technology i.e. Interactive Multimedia. A major benefit of this technology is that it permits people to learn interactively using real situations, at a time, pace and location suitable to the learners. It reduces learning time, increases learner retention and reduces training cost.

INFORMATION COMMUNICATION TECHNOLOGY FOR AGRICULTURAL EXTENSION INITIATIVES IN INDIA:

Pilot Project Syndrome: Most of the Information Communication Technology based agricultural extension projects were implemented as “Pilot Projects”; and after the pilot period, most of the projects are never implemented in larger scale. Efforts for continuance of pilot projects are not taken sincerely by the implementing and also funding (Donor) agencies.

Unsustainable Large Investments: Portals like InDG, TNAGRITECH Portal, Rice Knowledge Management Portal (RKMP) was developed investing large amount of money. These portals were developed in project mode for a particular period of time. After the project period, it is difficult to sustain momentum and updating the portal with limited or no financial resource availability.

Users Unwilling to Pay: Most of the Information Communication Technology for agricultural extension projects beneficiaries (generally farmers) are not willing to pay for the services they receive. Similar to most developing countries farmers, in India also most farmers feel that “agricultural advisory services” are welfare activity of the State and National Governments. And hence, they are unwilling to pay for the services.

Small Scale of Operation: The Information Communication Technology for agricultural extension projects were implemented in very limited geographical area (except IKSL) and covering few hundreds or at maximum thousands of farmers. Exceptionally, few projects like farmers call centres and e-Soil Health Card Programme covers entire country and Gujarat State, respectively.

Knowledge Middle Men with Less Permanency: Most published projects are from educational/ research institutions, which generally, ignored traditional extension system and extension personnel, those who are serving over a long period in rural India. Even, if project winds-up the learning took place among extension personnel will be remain for a longer time and more useful to the farmers. In e-Arik case, public extension personnel are unwilling to collaborate with the Information Communication Technology project; because of most of the field level extension personnel never used internet and lack of skill in using other Information Communication Technology’s.

Information alone not for Development: Along with Information Communication Technology based advisory services, input supply and testing need to be integrated for the greater impact (Balaji et al., 2007). In e-Arik project of North-East India, farmers demanded inputs as per recommendations of the project research fellows. Along with information, support services need to be ensured. As indicated by Heeks (2005) e- development projects must be designed around the information chain. They must either provide or draw together an entire "information chain package" of all resources necessary to turn data into effective action. Until this happens, Information Communication Technology’s will not deliver on their developmental potential.

Difficulty in Localisation of Content: Content need to be aggregated from different sources but it needs to be sorted in granular format for rapid adaptation for local use. Localisation and

customizability of content are still are not practiced on a significant scale (Balaji et al., 2007). If sufficient scientific information is not available, content need to be generated, tested, refined and used for further advisory services through Information Communication Technology's. Most of the web portals lack relevant content in local language.

Generic Information: Most of the Information Communication Technology initiatives disseminated generic information on crop cultivation practices of major crops and also weather and market information. Multimedia portals and one stop centres for various operations in agriculture are known as academic exercises (Sideridis et al., 2010)

One-Way Information Flow: Most of the Information Communication Technology initiatives information flow one-way (Sulaiman, 2012). There was a limited scope for interaction. Projects such as Farmers Call Centre, Village Resource Centre, e-Arik, e-Sagu, digital green, Lifelines India and IKSL provide opportunities for interaction among farmers and experts.

Islands of Learning: In almost all the projects, the participation of agricultural education, and research institutions appears to be marginal (Balaji et al., 2007). Most of the projects do not have collaboration with other farm research and extension stakeholders. Practical challenges or constraints in implementing the Information Communication Technology projects are seldom disclosed and shared with others. Learning experience of one project to another project is seldom shared.

Lack of Systematic Evaluation: Most of the projects never revealed actual evaluation results, generally they reported 'positive' results, and most common difficulties such as;inadequate rural Information Communication Technology infrastructure (especially frequent power-cuts) and difficulty in content localisation and customisation were indicated. Systematic and objective evaluation or impact of the projects was seldom done. 12.Lack of Co-ordination: In the absence of collective and coordinated efforts by the public-private agricultural research and extension institutions, Information Communication Technology's have not penetrated satisfactorily in rural India despite time, money and efforts invested so far (Patil et al., 2009).

PROSPECT VIEW:

This shows the apathy of agricultural development departments towards incorporating Information Communication Technology in their day-to-day activities. To formulate a strategy for overall agricultural development, isolated. Information Communication Technology projects need to be studied and the experience gained must be documented in order to draw lessons for the future. On the other hand, the need to market agricultural produce at competitive prices will also change the farmers' attitude towards usage of Information Communication Technology Information Communication Technology will thus help to sustain Indian agriculture. It is necessary to develop Information Communication Technology based agricultural services along with a communication backbone (such as a fiber optic network) in rural areas. Though the use of Information and Communication Technology in agriculture is in a nascent phase in India, Information Communication Technology has immense potential to standardize and regulate agricultural processes and address the needs of farmers. It will therefore definitely serve as an important tool for agricultural development in the near prospect.

Despite the huge potential of harnessing Information Communication Technology for agricultural development, only a few isolated projects have been initiated in India and in other parts of the world. Interestingly, many of these projects were initiated by NGOs, private organizations, cooperative bodies and government organizations rather than by government-established agricultural departments.

PROPERTY ORGANIZATION AND DEVELOPMENT THROUGH INFORMATION COMMUNICATION TECHNOLOGY:

Information Communication Technology plays an important role. With the help of government personnel, the farmers are guided how to get their work done related to land records. They can avail lot of advantages of the schemes through mobile phones since the telephone has also greatly helped in transforming and creating revolutions in villages also.

Geographic Information Systems (GIS) and Remote Sensing (RS) techniques are used as important keys assisting Information Communication Technology solutions for land planning and management. GIS helps cater multiple layers of information, drawn from different sources, into one spatial representation. Lot of time is wasted in completing the formalities related to updating of land records that are required in order to avail government bene?ts and schemes. So, the difficulty of land management and planning; and getting their documents ready for availing bene?t of several schemes; There is great potential of use of mobile phones to push information on climate friendly agriculture to farmers. Large amount of suitable and relevant data can be collected and made available to farmers related to soil information and others. Mobile technology gives opportunity better and efficient mechanism to farmers and purchasers of their crops.

POLICY'S AND IMPLEMENTATIONS:

•**Strengthening Information Communication Technology Infrastructure:** Extension organisations and extension personnel need to be equipped with Information Communication Technology's for facilitating farm information among the agricultural stakeholders.

•**Localisation and Customisation of Content:** Research, educational institutions and extension systems should continuously strive for the appropriate content localisation and customisation as per the demand of the farmers and other stakeholders.

•**Farm Research and Developmental Institutions Collaboration:** Establishing strong working collaboration among the Information Communication Technology initiatives of the research and developmental institutions (IT solution providers) should be initiated. The leading research and educational institutions in agriculture and information technology solution providers should join together to leverage Information Communication Technology penetration for agricultural extension and they should also guide the other Information Communication Technology initiatives for agricultural extension services provision.

•**Human Resource Development:** Creating awareness on Information Communication Technology potentials, Information Communication Technology using skill and capacity development among the extension personnel of the public and private extension systems and also among farmers and other stakeholders in the extension systems will facilitate better usage of Information Communication Technology's.

•**Integration of Information Communication Technology with Public-Private Extension System:** Appropriate Information Communication Technology to be identified and deployed in the extension system to complement ongoing extension efforts of the public and private extension systems.

•**National and State Governments e-Agriculture Policy:** National and state e-Agriculture policy need to be formulated. It should explore and outline the possibilities of leveraging Information Communication Technology for the agricultural extension services provision.

CONCLUSION:

Information Communication Technology for agricultural extension projects need to be compared and evaluated objectively. In India, during the last one and half decade, hundreds of Grassroots Information Communication Technology projects are implemented. Invariably, agriculture becomes one of the indispensable parts of the project service menu. However, we yet to get substantial results in increase of agricultural production because of deployment of Information Communication Technology. (Information Communication Technology) projects are yet to make any breakthrough in agricultural information dissemination.

At the same time, experiences are indicating that Information Communication Technology are going to play greater role in private sector agribusiness, market information and market intelligence. Further, certain type of farm information (e.g. informing government schemes) and online monitoring of the progress of the governmental schemes are proved successful. Most projects are implemented in smaller geographical area and covering few hundred farmers and hence, drawing generalizations may not appropriate. Much hyped Low cost Information Communication Technology tools such as mobile phones having lot of promise for agricultural extension.

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