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IMPACT OF ICT AND MOBILE TECHNOLOGY IN AGRICULTURE IN MAHARASHTRA

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Abstract*: Many initiatives in the recent past portrayed the significant role that the Information Communication Technology (ICT) plays in the realm of rural development. Several projects have reduced the costs, and it also has increased transparency. It is noted many scientists are using these ICT for information retrieval or data updating, data analysis, for finding references, for searching details related to their research for farming communities.. In developing countries ICT has played very important role in the development of education, health, rural development as well as in agriculture development. This technology has brought a significant change in agriculture development in Maharashtra and India in particular where farmers directly connected with research centres, universities, government, market, buyers, customers and meteorological department to get information regarding inputs, practices, weather forecast and prices. ICT has also increased the income of farmers in Maharashtra. Now, there is need to provide facilities to farmers and introduce technology in rural areas where farmers are unaware and they do not have knowledge and skills regarding this technology. It was also indicated by different research that this technology has increased the product of agriculture by adopting ICT tools in agriculture and farming. However, farmers are facing major problems and challenges including poor agricultural practices, inadequacies in information delivery, reconciliation of records among farmers, government and traders. Similarly, lack of information on best practices to farmers.*

Keywords*: Agriculture, Maharashtra, Information Communication Technology, ICT, Mobile, E-governance*

I. INTRODUCTION

Information Communication Technologies (ICTs) are those technologies that are used to interlink information technology devices such as personal computers and mobiles with communication technologies such as telephones and their telecommunication networks. PC, laptop, netbook and mobile phone with e-mail and Internet provides the best example. ICTs are range of electronic technologies which when converged in new configurations are flexible, adaptable, enabling and capable of transforming organisations and redefining social relations. The range of technologies is increasing all the time and there is a convergence between the new technologies and conventional media. This rapid and ongoing convergence means that devices such as web camera, digital cameras, digital video cameras and players, personal digital assistants, slide projectors and mobile telephones are also compatible with more traditional media such as radio (digital, satellite), television (cable, digital, satellite). Thus most devices can now be linked to others to share and exchange information and allow it to be used in such a way that they can also be categorised as ICTs. Even books are being incorporated into ICTs either through the potential for informal web publishing or more formal digital book publishing with designated readers or e-books, e-journals, e-magazines, e-newspapers, e-library, etc. ICTs, therefore, are an expanding assembly of technologies that can be used to collect, store and share information between people using multiple devices and multiple media.

II. INFORMATION AND COMMUNICATION TECHNOLOGY

The term ICT used to include a radio, television, mobile phone, internet, telephone, ipad, ipod, video, voice information system, fax and computer. ICT is main source of information for all people and has reduced the gap among people and places. But logically, ICT is the tool for development of rural areas to empower the voiceless, reduce exploitation. One of the major driving forces for rural development is communication. In recent times, ICT is playing a role of catalyst in rural development. It is used in every aspect of information, management and governance for development. ICT means application of innovative way to facilitate information and communication technologies in the rural domain. Farmers of rural areas can be educated with modern means of cultivation through ICT. These include hardware, software, media for collection, storage, processing, transmission and presentation of information in any format (i.e., video, voice, data, text, photo and image) on internet, intranet, email, cloud computing, CD-ROMs, DVD-ROMs, telephone, radio, television, etc. The advent of personal computers, laptops, netbooks, i-pad, i-phone, smart phone, internet and email during the last two decades has provided a much wider choice in collection, storage, processing, transmission and presentation of information in multiple formats to meet the diverse requirement and skills of people. Almost every single activity in the modern world is becoming more dependent on the application of ICTs for one use or

another. The benefits of ICTs reach even those who do not themselves have first-hand access to them. Through ICTs, for example, a farmer in a rural village can get up-to-date information regarding certain practices and can use that information to advice and cultivation; an agricultural extension worker can learn new technologies, rainfall forecasts, commodity prices, etc and use that information to advice farmers in rural villages; etc. The action lines address issues related to, among others, ICT infrastructure, capacity building, cyber security, an enabling policy environment and ICT applications in agriculture, education, government, business or the environment. The rise of mobile telephony in particular and its associated applications are the most striking examples.

Agriculture plays an important role in the economy of Maharashtra state. Agriculture faces many problems hindrances and challenges such as poor agricultural practices, inefficiencies in information delivery, records maintenances between farmers and traders and lack of information on best practices to farmers. Agriculture is vital economic activity in state where most population of the state live in the rural areas and derive their livelihoods, directly or indirectly, from agriculture. ICT provide new approaches and ways of communicating, transferring and enhancing the knowledge and information among different communities. ICT could use to facilitate, strengthen, replace and existing information systems and networks. It uses internet, email, Microsoft Word, Excel, PowerPoint, Access, Acrobat Reader, Windows Media Player, Internet Explorer, Mozila Firefox, Google Chrome, gmail, yahoo mail, hotmail and other webpages for agricultural information. ICTs such as e-mail, mobile phones, and Internet among others are required for effective extension information among farmers. Social Networking websites like Facebook, Twitter, Google+, Whatsapp, Linkedin, Flickr, etc. are also used for dissemination of agricultural research and innovative information to the extension workers and farmers.

III. MAHARASHTRA AT A GLANCE

Maharashtra is the second largest state in India both in terms of population and geographical area is 308 thousand sq. km. Maharashtra has a population of 112.4 million (Census 2011) which is 9.3 per cent of the total population 1028.73 million of India (Census 2011). The State is highly urbanised with 45.2 per cent people residing in urban areas and 54.8 per cent in rural areas. The State has 35 districts which are divided into six revenue divisions viz. Konkan, Pune, Nashik, Aurangabad, Amravati and Nagpur for administrative purposes. For local self-governance in rural areas, there are 33 *Zilla Parishads*, 351 *Panchayat Samitis* and 27,906 *Gram Panchayats*. The urban areas are governed through 26 Municipal Corporations, 219 Municipal Councils, 7 Nagar Panchayats and 7 Cantonment Boards. Mumbai, the capital of Maharashtra is the financial capital of India. The gross state domestic product (GSDP) at current prices for 2011-12 is estimated at 11.99 crores and contributes about 14.4 per cent of the GDP. Presently industrial and services sector both together contribute about 87.1 per cent of the State's income. The agriculture & allied activities sector contributes 12.9 per cent to the State's income. The State has 23175 thousands hectares of land under cultivation and area under forest is 52.1 lakh hectares. Average total foodgrains production in Maharashtra is 1,12,29,000 quintals during 2001-2010 period. It has become a leading Information Technology hub and ICT major growth centre. Maharashtra has the largest Internet subscribers at 38.78 million in country on 19 Feb 2014. There are 67.73 million mobile users in Maharashtra in Feb., 2013 (TRAI). Maharashtra state government have successfully implemented e-governance in 36 ministries and all departments of the ministries of government of Maharashtra. Its portal is https://www.maharashtra.gov.in/. Home page of this site have separate link for each departments of government. Similarly, each ministry and departments have separate address for their web portal as egovernance.

IV. INFORMATION TECHNOLOGY IN MAHARASHTRA

Maharashtra government have developed 37 public Information Technology (IT) parks. For getting private participation in creating world-class infrastructure for IT industry, 479 private IT parks have been approved, out of which 122 have started functioning with an investment of ` 2,712 crore, thereby creating employment of about 3.2 lakh. The remaining 357 IT parks with proposed investment of ` 11,994 crore have been given LoI and are expected to generate 16.0 lakh employment opportunities. The private IT parks are mainly concentrated in Greater Mumbai (176) followed by Pune (168), Thane (125) and Nagpur. During 2011-12, total 31 private IT

parks were approved. The proportion of households in the State having TV was 56.8 per cent. The proportion of households having computer/laptop with and without internet was 5.8 per cent and 7.5 per cent respectively. Around 69.1 per cent households had telephone/mobile phone.

V. WEB PORTALS FOR AGRICULTURE EGOVERNANCE IN MAHARASHTRA

Web Portals of Department of Agriculture, Ministry of Agriculture, Government of Maharashtra is http://www.mahaagri.gov.in. This portal has many facilities for researcher, educators, extension worker and farmers. It contains the link for Agriculture Inputs, Agri. Facilities, Marketing and Export, Agriculture Technology, Soil and Water Conservation, Schemes, Projects and Plans, Agri. Statistics and Crop Weather: Basic Information, Agriculture Advisory Service, Agrometeorogical Forecast, Contigency Planning, Satellite Image, Rainfall, Technologies, Dryland Agriculture Mission, Kisan (farmer) SMS Services. Maharashtra State Agriculture Marketing Board http://www.msamb.com/ displays two days market prices of agricultural produce in 300 APMCs in Maharashtra. Micro Irrigation Scheme Implementation System, Dept. of Agriculture, Govt. of Maharashtra has website http://mahaethibak.gov.in/mahdrip/ethibak/index.php. Maharashtra State Portal for Farmers http://farmer.gov.in/advs/login.aspx. Website for eParwana, GIS, SMS, Etaal is https://mahaonline.gov.in/Site /Home/Index.

VI. ICT TOOL FOR KNOWLEDGE DISSEMINATION

ICT helps farmers with value based information to improve their productivity and provide timely information to farmers and traders. Disseminating knowledge through broadcasting and multimedia services at doorsteps in rural areas. Relevant news at one's door-step is possible through ICT and mobile technology. ICT is one of the important driving forces behind globalization. ICT is powerful tools for handling and spreading information and knowledge to the needy person in Maharashtra. It has impact on all aspects of life by reducing time, distance and the information gap. ICT is increasing day by day for greater and faster interaction within different groups of people from different societies especially among farmers. However, ICT is an influential and a powerful tool for growing productivity, generating economic growth and facilitating trade, transport and financial issues, creating jobs and improving the quality of life of different society's people in developing countries. Furthermore, ICT could help to reduce poverty by creating employment opportunities and increasing productivity. ICT could play an important role to reach people living in far flung and remote areas. It could say that ICTs can bring awareness and adoption of ICTs technology and different kind of information on modern agricultural system in rural communities. It can also enhance agricultural production, processing and marketing which will increase farm income, improved nutritional status as well as diversified consumption, processing and marketing of agro-based products in developing countries. ICT tools such as mobile phones have provided new approach to farmers to make tentative decisions much more easily than before. Use of mobile phone leads to greater social cohesion and improved social relationships. However, short message service SMS and voice record MMS have given improvements in social relations. Mobile phone based social-networking in the developing countries goes to show the growing importance of this aspect

VII. ICT AND MOBILE FOR MODERN AGRICULTURE

The uses of ICT and mobile phones for getting modern agricultural information and knowledge about market prices of crops at various markets, receiving information regarding seed variety and contact veterinary doctors has played a significant role for the development of different countries. In the context of the Maharashtra mobile phones have played an important role in farmer daily use for providing needed agricultural information related to modern farming techniques and market prices. The mobile based agricultural services are also obtaining enthusiastic response from the farming community. Where mobile phones help farmers about feed their fields agricultural extension programme, information about market price and deliver fertilizer advice by text message by mobile phones and other tools of communication technologies in different farmers communities. In India today farmers were closely attached with media and they get market information from different sources such as mobile phones, radio and television, agril. information centre, kisan call centre. Farmers indicated that ICT has played an important role by use of these technology, the access to agricultural information is improved. This could show that farmers use mobile phones in rural areas to access knowledge. By use such kind of technology farmers could improve the quality of their lives. ICT help farmers to make their own decision for sell their produce in different markets. It is a powerful tool for directing and expressing our creativity. The role of ICT is important for the development of economy in enhancing the effectiveness of market, productivity and competitiveness

VIII. AGRICULTURAL KNOWLEDGE MANAGEMENT AND DISSEMINATION: INITIATIVES BY INFORMATION AND COMMUNICATION TECHNOLOGY

Almost 54.8% people or more depend on agriculture in Maharashtra. One of the major constraints affecting agricultural productivity in the state is the problem of availability of timely and relevant agricultural information

to the farmers. The existing ways of transfer of agri-technologies do not reach the majority of the farmers across the state due to a large gap in the ratio of extension workers and farmers. Various innovative ICT applications by both government and private initiatives have been developed for better communication and rapidly changing demand of the consumers in rural areas like SMS, e-Choupal, RML project, etc. to comprehend their role in technology dissemination to the agricultural community and examining the changes in agricultural productivity due to their usage. As ICT access continues to increase among farming communities and information services continue to adapt and flourish, the scope exists for a much better rural productivity impact in the future. The contribution of information and knowledge in bringing about social and economic development has been well recognized globally. Farmers now work with various information sources to tap markets and provide consumers with good-quality. Farmers get advice and information from input and technology providers about new technologies importance, it usage and benefits. Agro buyers and input suppliers have a vested interest in providing advice. Similarly farmers obtain information regarding market for sell their product in good price. The development and use of ICTs are playing a critical role in this regard. In Maharashtra APMC, MSAMB, AGMARKNET, ITC's e-Choupal are providing the market information through their websites.

Figure 1: ICT for Agri. Knowledge Dissemination
Source: Self at Agrovision-2013, Nagpur, Maharashtra

IX. USE OF MOBILE TECHNOLOGIES FOR EMPOWERING FARMERS IN MAHARASHTRA

There have been experiments in technology dissemination using ICT but the mobile applications recently started can revolutionalize the information reach to the resource farmers on real time basis. The content development for different clientele groups in different languages is a challenge but voice messages give an easy option for delivery and its understanding by users. Text messages in different languages is very important to understand the technology. The cost of voice messages are higher which may be brought down with technology development. The development of appropriate software, content development and its authentication and farmer friendliness, reducing cost of message delivery and involvement of different players may bring an environment of efficient use of mobile services. Timely and actionable information from trusted sources, locally relevant, storable and reference able and access of experts may enhance the effectiveness of mobile services. Video calling facility may further enhance the quality of communication.

Farming is not so linear but requires constant inputs at every stage where new technological inputs provide better crop outputs. It means, crop production depends on weather, agricultural practices and management of pests and diseases at right time to save crops and gain better results. The final produce should provide better marketable price to farmers, where the market intelligence is the key, which provides regular information about nearby markets in local language. The mobile phone technology provides the electronic capabilities (battery, processing power, memory), reach to customer, provides privacy, anytime and anywhere, contact-less services and most preferred user carry personal item. Keeping these factors and the needs of Maharashtra farmers in mind, various applications and services have been deployed by different projects. The projects are providing farmer needs" based Reuters Market Light (RML) of Reuter-MSAMB-India Post (on GSM, CDMA). The mobile based projects for farmers had objectives which benefit farmers, based on development agenda. These objectives have orientation for markets (input, output) prices, availability status, agricultural extension, social connectivity and finally financial support systems. The applications used in the services are of short message service (SMS), multi-media service (MMS) and voice stream options. These are customised based on 4 subjectivity such as literacy, usage pattern, social acceptance, domain specific and life-style of rural farmers in state.

X. CHALLENGES OF ICT IN AGRICULTURE

There is no doubt that ICT is challenge and an opportunity for developing countries. In agriculture the main problem is of poverty, illiteracy, nuclear family culture, poor financial condition. Sharing information among developing countries is poor communication technology, slow connectivity, less bandwidth, lack of infrastructures, poor electricity and limited access in developing world. The shortages of information were also a factor in restricting economic advancement for developing countries. Especially agriculture sector is facing many problems to obtain new information about market price, weather updates and other related issues. Furthermore, ICT infrastructure could develop by taking the advantage of existing infrastructures by which farmers not only increases the acceptability of the new technology similarly it minimizes the costs of the

technology and makes it affordable by the farmer communities. It is found that ICT initiatives were scattered and uncoordinated and summarized the main challenges and factors that influence the use of ICTs as: high cost of available technologies, inadequate infrastructure and low ICT skills, poor and expensive connectivity, inappropriate ICT policies, language barriers, slow speed, low bandwidth, inadequate and/or inappropriate credit facilities and systems. Moreover, it is also identified poor involvement of women and other disadvantaged groups, inappropriate local content, weak institutions and inadequate collaboration and awareness of existing ICT facilities and resources, a poor information sharing culture and low awareness of the role of ICTs in development at all levels. ICT come with a range of challenges including: technological dependence; lack of accessible telecommunication infrastructure in many rural and remote areas; capital cost of technologies, high cost of on-going access and support; inherent need for capacity building; often difficulty in integrating with existing media, and local communication methods and traditions; and, often lack of involvement of all stakeholders in planning, especially youth.

XI. DEMAND AND SUPPLY FACTOR OF THE WORLD

The world is going through some changes that are triggered by demand and supply factors. The demand drivers of the changes include population, income growth, and urbanization, all of which demand increasing availability of food and fiber. The supply drivers encompass climate change, water and land scarcity, science, technology and innovation policy, investment in research, policy and governance reform. Innovations are needed to tackle these changes. Innovation involves the extraction of economic, ecosystem and social value from knowledge. It involves putting ideas, knowledge and technology to work in a manner that brings about a significant improvement in performance. Increased mobility of knowledge has made re-cycling of knowledge easier. Maharashtra is also going through these changes of demand and supply drivers.

XII. CONCLUSION

In rural Maharashtra, various successful e-governance initiatives, the improvement of ICT infrastructure and many ICT projects have empowered the rural people. The role of ICT is important for the development of economy in enhancing the effectiveness of market, productivity and competitiveness. Rural information systems have focused on supplying the information to the rural people about modern agriculture. ICT and Mobile are becoming more open, more participatory and more demand driven, involving interactivity, negotiation and two-way information exchanges. There is a new emphasis on the acquisition of information and enabling the rural to request information specific to their particular livelihood needs in their local languages. ICT has reduced the gap among communities and increased the knowledge among farmers of developing countries but still there is gap among farmers, buyers and extension services. Most of the farmers need ICT trainings, facilities and skills to enhance their product in future. Rural people facing lack of infrastructure, service delivery from government. Therefore, it is need to increase ICT and Mobile based advanced models to expand in Maharashtra for information delivery to farming communities with proper structural arrangements and connections at different levels of the agricultural supply chain in rural areas.

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