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Transforming India through ICT Enabled Agriculture

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Abstract: ***Agriculture is most important sector with the majority of the rural population in developing countries depending on it. In Indian scenario, it said that the country lives in villages which mean that farming and agriculture sector contributes n GDP of the country to great extent. The traditional approaches of agriculture being adopted since long back in the history, has numerous challenges in terms of production, marketing, profit etc. The management of agricultural products, choice of suitable seeds and the suitable amount of fertilizers are some of other issues that need attention in order to enhance the production and sustainable development. 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 significantly by using information and communication technologies (ICT) hat play an important role in uplifting the livelihoods of the rural poor. This paper explores the role of ICT in agricultural sector in India and transforming the country through increased growth and sustainable production of agricultural products.***

Keywords: Climate change, ICT

1. Introduction

Current literatures suggest that the agriculture is a source of livelihoods for 86% of rural people in India and it provides 1.3 million jobs for small-scale farmers and landless workers. Moreover, the contribution of agriculture in growth of GDP in much more as compared to other sectors. In recent years, with the advent of ICT tools, potential contribution of ICT can be seen in achieving agricultural development objectives and contributing to broader economic, social and institutional development. ICT helps in growing demand for new approaches, business models, good practices and design guidance in agriculture and rural development projects. Lot assistance is available for the farmers with the use of ICT. The proper awareness and understanding about crops, seeds, fertilizers, marketing and other related information, are achieved through several media using ICT tools. ICT also helps in empowering the poor and rural people by providing better access to natural resources, improved agricultural technologies, effective production strategies, markets, banking and financial services; local and national policies related to agriculture etc.

1.1 Objectives

ICT 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 ICT enabled agriculture:

1) To ensure ownership and develop entrepreneurship in farmers of Indian villages.
2) To develop local content and create awareness.
3) To spread knowledge of technologies, crop cycle, suitable use of fertilizers etc.
4) To ensure language and cultural pertinence and active participation of farmers.
5) To help the villagers augment the growth of agriculture and contribute in GDP growth.
6) To implement a framework for agricultural development strategies, investments and programs.
7) To provide concrete guidance on agriculture through several motivational real time examples; telling them the success stories of farmers who have been successful using ICT.
8) To increase public investment in agriculture.
9) To provide local as well as global markets.
10) To improve access to financial and banking services.
11) To improve performance of producer organizations.
12) To use innovative practices through science and technology, and many more.

2. Review of Literature

(1) A study conducted by **Reddy (2003)**[23] to identify the opportunities and advantages of ICTs for governments. ICT offers huge possibilities to the government to increase its efficiency and meet the challenges and goals in all aspects of its activity. Authors also mentioned the advantages of IT applications in governance which includes access, storage, processing, organization and transfer of information and data to various levels of administration and increase Transparency and to provide cost effective and speedy discussions and meetings, quick and speedy action based on timely reliable information etc to the peoples.

(2) **Kumaresan and Chitra (2003)**[9] made a study to assess the need of rural information centers in the villages of Tamil Nadu. According to the authors the villagers who are dependent on different professions other than agriculture for livelihood have no such facility that fulfils their information requirements from information center. Authors studied twenty villages in the state of Tamil Nadu to access the need for rural information centers.

(3) **Simone and Scott (2003)**[3] made a study to identify whether the information and communications technology applications contribute to poverty reduction from Indian perspective. According to the authors ICT can reduce poverty by improving poor people's access to education, health, government and financial services. In this study authors discussed some ICT projects for poverty reduction in

rural India and concluded that ICT can empower the poor by expanding the use of government services and to reaching the poor and realizing the potential of ICT in the area of opportunity, empowerment and security is a difficult endeavor.

(4) **Prasad K. N. (2004)**[21] in his article entitled as "digital divide in India narrowing the gap; an appraisal" stated that the Modern ICTs can contribute to resolving the problems of a rural society of India and the major obstacle which has prevented rural areas from benefiting fully from the great potential of ICT is the low penetration of telecommunication services. Author also made observation that the rural community and individuals need to be empowered by enhancing their capacity to access, select and use information for development efforts, whether they relate to literacy, food, health and family welfare, population growth, environment, trade employment, etc.

(5) **Jangid (2004)**[7] the paper entitled as "Information technology: boon or bane" concluded that information technology is not the panacea for every problem in society however it is only a tool and do not provide solution to all the problems. Information Technology has huge potential to make information rich societies and has some positive and negative or harmful effects. In this paper author made observation in Indian context on Internet, it is urgent need to customize the internet's content and providing meaningful information which will benefit the rural and tribal areas and suggested that the government should apply a two pronged strategy providing easy and cheap access to the internet to the common man and carrying out the necessary infrastructural reforms to support the information revolution to bridge digital divide.

(6) **Midda and Mukhopadyay (2006)**[15] conducted a study on "Information and communication technology in e-education". In this study the authors were discussed the significance of computer and internet in education. And stated that ICTs provide a new and innovative way to education, the invention of new technologies such as computer, the internet and www can be used in education electronically known as e- education which improving the quality of education and provides lifelong education for all.

(7) **Ogunsola (2007)**[19] made a study to examine the implications and opportunities opened to Africa in the current information age- especially as they relate to the acquisition of technology for increasing productivity as well as enhancing live hood . Author stated that ICT cannot offer instant cure for the challenges and concerns of any society, but the ICT can be a tremendous enabler for the development process of society and can boost the productivity, innovation, access to knowledge and information and in the promotion of transparency. The paper finally recommends that the economy should be totally de-regularized to allow full private sector participation with a view to enabling them invest in infrastructural sectors which is important part of the economy.

(8) **Asheeta Bhavnani et al. (2008)**[1] conducted a study to examined the role of mobile telephones in sustainable poverty reduction among the rural poor and concluded that economic and social benefit of mobile telephony will be highest in rural areas, which currently have limited or less telephony services. The induction of mobile phones does have a positive impact on sustainable poverty alleviation. The multiple benefits to the mobile phone: from reducing negative aspects such as corruption, crime, high prices, etc. and to increasing positive aspects such as levels of education, efficiency, health.

(9) **Shukla and Gautam (2008)**[25] made a study to examine digital divide in rural areas of Uttar Pradesh. According to the authors, ICTs can play an important role in sustainable rural development, and by establishing tele centres in the rural area which facilitate socio-economic empowerment. The authors also noted that the presence of newer ICTs such as e-mail or the Internet was less compared to older ICTs like radio, television and landline phone and suggested that if properly deployment of ICTs in CICs, Panchayat Offices then these offices will become information hubs or kiosks and it can be interpreted that wider coverage, enhancement and upgradation of ICT initiatives required, especially for those who cannot afford it and do not have access to the information that is likely to improve their health, education, livelihood, and can protect them against vulnerable situations.

(10) **Surabhi Mittal et al. (2010)**[26] conducted a study to look at the impact of mobile phones on the crop sector in India with a focus on small farmers. The result was based on information collected through group discussions and interviews with farmers of Uttar Pradesh, Rajasthan, Maharashtra and New Delhi and with fishermen in Pondicherry. According to authors the rapid growth of mobile telephony and introduction of mobile-enabled information services provide solution to overcome existing information issues in agriculture which limit the agricultural productivity such as physical infrastructure, problems with availability of agricultural inputs and poor access to agriculture-related information, etc and also bridging the gap between the availability and delivery of agricultural inputs and agriculture infrastructure. The study found evidence that mobiles are being used by the farmers to increase productivity in agriculture.

(11) **Leisa Armstrong and N. Gandhi, (2012)**[10] made a study to investigate the factors influencing the use of Information and Communication Technology (ICT) Tools by the farmers of rural villages of Ratnagiri district of Maharashtra state, India. Authors were selected 100 respondents from one Tehsil Ratnagiri district and key stakeholders government officials and agricultural industry workers. Two different questionnaires were provided to farmers and key stakeholders. The study was revealed that, rural farmers of Ratnagiri district still not been adopted ICT fully and there is a massive opportunity to enhance the broadcasting of agricultural related information that farmers receives from government officers, fellow farmers and relatives. Most of the farmers were used TV and mobile phone to collect agricultural related information and also noted that number of factors constraining the dissemination of ICT in Ratnagiri District such as the gap between the currently used technology and the technology preference as well as the factors such as gender and land ownership did

not significantly affect the use of ICT tools and also effective use of technology is a necessary prerequisite for the successful use of ICT by the farmers. Strengthening and motivating farmer groups to use the technologies such as internet, home phone is important to facilitate access for ICT facilities. Moreover the authors opined that establishing IT based information centres in rural areas could boost access to market information.

(12) **Balwant Singh Mehta, (2013)**[2] conducted a study by using field Survey method to explores the socioeconomic impact of mobile phone usage in rural areas of the two Indian States such as Punjab and Bihar and the survey revealed that, mobile phones have reduced the cost of accessing information and helped users to make communication with their relatives and migrant family members and to gather timely information related with agricultural and non-agricultural purposes and also Mobile users get benefit by obtaining timely information on a variety of subjects, including on employment opportunities and higher education for their children, funds transfer, etc. The author also noted that in Punjab state, peoples were early adopted new technologies and hence there is high usage of mobile value-added services (MVAS) and innovative uses like transfer of funds and agricultural related information. Finally the author made conclusion, With the spread of mobile use, it is very likely that it could be an arena of innovative activity, reducing costs and thus increasing incomes at the 'bottom of the pyramid'.

(13) **Jayade, K. G et al. (2014)**[8] published an article entitled as "Study of Information Communication Technology in Agriculture in Vidarbha Region of Maharashtra State of India." and concluded that ICT has improved the economical condition of the farmers in Vidarbha Region of Maharashtra state; ICT is advanced tools to disseminate the modern agricultural knowledge to the farmers and it plays an important role for the development of economy by enhancing the effectiveness of agricultural market, productivity and competitiveness in Vidarbha region of Maharashtra state. ICT and Mobile technology not only improved the package of practices but also improved the agriculture through knowledge dissemination by eagriculture but also reduced the gap among agricultural scientists, extension worker and farmers.

3. Scope of ICT

It has been acknowledged by various reports of government that application of ICTs 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 significant role in achieving competitiveness. ICTs provide transparency in implementation mechanisms that could be seen in paddy procurement systems of government of Maharashtra state, and several other purchase schemes of various crops all across the country. 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 predicts about rain and weather in general, helps the farmers in planning managing of various stages of agriculture. ICT 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 ICT 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 towards ICT based approaches etc.

Land Management and Planning

Lot of time is wasted in completing the formalities related to updating of land records that are required in order to avail government benefits and schemes. So, the difficulty of land management and planning; and getting their documents ready for availing benefit of several schemes; ICT 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 ICT solutions for land planning and management. GIS helps cater multiple layers of information, drawn from different sources, into one spatial representation. 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 f their crops.

Green and Environmental Friendly Growth

Agricultural progress and subsequent increased production are very important advantages of ICT enabled agriculture. However, environmental issues need to be taken care of so that the harmful effect of augmented crop production and marketing could not affect the society and mankind. Climate Change and green growth are always to be at top agricultural development agenda. Agricultural productivity should not be achieved at the cost of environmental adverse effects. Actually, limited resources, population growth and environmental concerns are some of the challenges in augmenting the agricultural productivity; and this could further be affected if there is adverse effect. Therefore, ICT usage should take care of these issues. In many developing countries including India, farmers determine fertilizer usage and its amount with the help of retailers, but its automated and calculated implementation is required to improve the productivity that is made possible using ICT tools. Use of ICT is requires for innovation in assessment and management of agriculture's impact on the environment, water and other natural resources.

Outcome

ICT has helped agriculture sector to great extent that further making livelihood of rural people better; finally the services are of big importance for the nation since GDP of the country is controlled by agriculture. Following are some major outcomes of ICT enabled agriculture:

1) Increased productivity due to growth and penetration of mobile ICTs in rural areas.
2) Innovations in agriculture through electronic media that supports education and training.
3) Creation of new opportunities increasing the development of human and social capital.
4) Achieving improved process control, transparency in market information.
5) Reduction of transaction costs in tracking of consumer needs.
6) Enhanced food security and support rural to livelihoods.
7) Poverty alleviation through modern agriculture.
8) Expansion of perspective of local communities in terms of national or global developments.
9) Creation of new business opportunities.

The above outcome can be seen in various ICT based agricultural implementations by several government agencies. Few of them are 'e-krishi', 'kheti' project, 'e-NAM' etc.

4. Challenges

The use of ICTs in most of agricultural implementations is gaining importance but there are some challenges in implementation of ICT based services that need attention and requires a lot of research. Following are major challenges:

1) Lack of access to ICT tools.
2) Lack of understanding and awareness of the needs and challenges of small scale farmers
3) Lack of standardized approaches of ICT usage in national poverty reduction schemes.
4) Need of appropriate socio cultural issues to achieve the desired objectives.
5) Poor connectivity, low bandwidth, limited electricity, user driven information.

References

[1] Asheeta Bhavnani ,Rowena Won-Wai Chiu , Subramaniam Janakiram Peter Silarszky, The Role of Mobile Phones in Sustainable Rural Poverty Reduction available at http://siteresources.worldbank.org / EXTINFORMATION ANDCOMMUNICATION AND TECHNOLOGIES /Resources/The_Role_of_Mobile_Phones_in_Sustainable_Rural_Poverty_Reduction_June_2008.pdf accessed on 11 March 2017.
[2] [Balwant Singh Mehta, "Capabilities, costs, networks and innovations: impact of mobile phones in rural India" working Paper available at http://www.capturingthegains.org/pdf/ctg-wp-2013-29.pdf accessed on 15 March 2017.
[3] Cecchini Simone and Christopher Scott. (2003). Can information and communications technology applications contribute to poverty reduction? Lessons from rural India. , Information Technology for Development, Vol. 10, Issue 2 (2003): 73 – 84.
[4] David J. Grimshaw and Shalini Kala (2011) – Strengthening Rural Livelihoods: The impact of information and communication technologies in Asia - Practical Action Publishing Ltd., UK and the International Development Research Centre, Canada.
[5] Gulati Archana (2008) - "Dialing in rural prosperity through universal cellular connectivity" - Kurukshetra – A Journal of Rural Development, Ministry of Rural Development, Government of India, Vol. 57, No. 1, ISSN-0021-5660.
[6] Indiresan, P.V. (1989). Technology planning for rural development. IASSI quarterly, 8 (1), 52-63.
[7] Jangid, Umesh Arya. (2004). Information technology: boon or bane. Ed by Kiran Prasad. Information and communication technologies; recasting development, New Delhi: BR, 67-80.
[8] Jayade, K. G., Khot, P. G., Ambani, G. - Study of Information Communication Technology in Agriculture in Vidarbha Region of Maharashtra State of India. International Journal of Software and Web Sciences (IJSWS), 9(2), June-August, 2014, pp. 115-119. Available at www.iasir.net accessed on 15 March 2017.
[9] Kumaresan, S.C. and Chitra, Alosia. (2003). A study on the need for rural information centers in the villages of Tamil Nadu. Annals of library and information studies, 50,137-145.
[10] Leisa Armstrong N. Gandhi, 2012, "Factors influencing the use of information and communication technology (ICT) tools by the rural famers in Ratnagiri District of Maharashtra, India", ECU Publications 2012, available at http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1104 &context=ecuworks 2012 accessed on 12 March 2017.
[11] Malik, Netrapal and Bharadwaj, Neelam. (2001). Village information centers: a strategy of using information technology for rural development". IASSI quarterly, 19(3), 103-113.
[12] Manish Kumar, Chitra Pathak and Singh, A.K. (2001). Information sources of rural poor: a study in US Nagar district of Uttaranchal. IASSI Quarterly, 19 (3), 123-133.
[13] Mathur, Akshay and Ambani, Dhirubhai. (2005). ICT and rural societies: Opportunities for growth. The international information & library review, 37 (4), 345-351.
[14] Mehtha, Sanjeev and Kalra, Manmeet (2006). Information and Communication Technologies: A bridge for social equity andsustainable development in India. The international information & library review, 38(3), 147-160. Available at http://www.sciencedirect.com/science?_ob=Article.
[15] Midda, Abdul Momin. And Mukhopadhyay, Sripati. (2006). Information and communication technology in e-education. Journal of library and information technology, 2(1), 42-48.
[16] Mr. Atul D. Newase; Dr. Jitendra Sheetlani; Dr. Ranjit D. Patil; ICT: A Super Highway to Reaching the Unreached Rural Communities of India, IOSR Journal of Computer Engineering (IOSR-JCE), Volume 18, Issue 6, Ver. VI (Nov.-Dec. 2016), PP 08-11.
[17] Neelameghan, A. (1998). Information technology and rural development. Information studies, 4 (1), 55-61.
[18] Nikhil Sabharwal, Gaganpreet K Sidhu, ICT IMPLEMENTATION IN RURAL INDIA available at http://citeseerx.ist.psu.edu/viewdoc/ download? doi= 10.1.1.613.5951 &rep=rep1&type=pdf accessed on 16 March 2017.

[19] Ogunsola, L.A. (2007). Africa in the global village: the challenges of co-operation and linkages in the 21st century. Library progress (international), 27 (2), 165-179.
[20] P. Syama Thrimurthy (2009) "Information communication technology for rural areas" – Edited by P Adinarayan Reddy – Science and Technology for Rural development – The Associated Publishers, New Delhi.
[21] Prasad K.N. (2004). Digital divide in India narrowing the gap; an appraisal. Information studies, 10(3), 523-558.
[22] Rasheed Sulaiman V, N J Kalaivani, Nimisha Mittal, P Ramasundaram, CRISP Working Paper 2011-001 "ICTs and Empowerment of Indian Rural Women. What can we learn from on-going initiatives?" available at http://www.crispindia.org/docs/4%20crisp%20working%20papericts%20and%20empowerment%20of%20women.pdf accessed on 12 March 2017.
[23] Reddy, Naresh. (2003). I T for governance: opportunities. Information technology for participatory development. New Delhi: Centre for information research and development, 135-142.
[24] Sharma, Aravind Kumar, (2007) Information needs and sharing pattern among rural women; a study. IASLIC Bulletin, 52 (3), 159-167.
[25] Shukla, Saurabh and Gautam, J. N. - Impact of information communication technology in rural areas of Uttar Pradesh: bridging the mdivide. Ministry of Rural Development, New Delhi.
[26] Surabhi Mittal, Sanjay Gandhi, Gaurav Tripathi, "Socio-Economic Impact of Mobile Phones on Indian Agriculture", working paper no.246, Indian Council for Research on International Economics Relations, New Delhi. Available at http://www.icrier.org/pdf/WorkingPaper246.pdf accessed on 12 March 2017.
[27] Upadhya, Padma V. (1996) Information Technology and Community Development. Role of libraries in national development. New Delhi: ILA, 323-328.
[28] Warner M. F., Adoption of ICT in agricultural management in the United Kingdom: the intra rural digital divide. Agriculture Economics, 48(1), 2002, 1-http://www.agriculturejournals.cz/publicFiles/59184.pdf accessed on 03/12/2016.
[29] World Bank Group (2002), URL:http://web.worldbank.org/WBSITE/EXIERNAL/TOPICS/EXTGENDER/EX11CTTOOLKIT/0"contentMDK: 20273967-menu PK: 54 2826 -pagePK: 64168445 -p iPK64168309-theSitePK: 542820, OO.html.Atul D. Newase et al. / Indian Journal of Computer Science and Engineering (IJCSE)ISSN