

How E-Extension Facilitates Effective And Meaningful Technology Dissemination Process In Agricultural Development Programmes?

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Abstract: India's agriculture sector has been transformed from the traditional to modern practice through the effective deployment of Information and Communication Technologies (ICTs). The paper reviews and analyzes the development stages of India's agricultural information dissemination systems and different mechanisms for agricultural information service development and operations. The study uses secondary data of research methodology. The study explains Seven ICT-based information dissemination models are identified and discussed. Information services for farmers at the national and regional level are a promising new field of research and application in the emerging field of e-agriculture. Finally, the agricultural extension requires paradigm shift from top-down, blanket recommendation of technological packages, towards providing producers with the knowledge and understanding with which they solve their own location specific problems.

Key Words: E-extension, Technology, Agriculture Development

1. Introduction: Over the last three decades, India's agriculture sector has been transformed from the traditional to modern practice through the effective deployment of Information and Communication Technologies (ICTs). Information processing and dissemination have played

a critical role in this transformation process. Many studies in relation to agriculture information services have been conducted in India, but few of them have attempted to provide a comprehensive review and analysis of different information dissemination models and their applications. This paper aims to review and identify the ICT based information dissemination models in India and to share the knowledge and experience in applying emerging ICTs in disseminating agriculture information to farmers and farm communities to improve productivity and economic, social and environmental sustainability. The paper reviews and analyzes the development stages of India's agricultural information dissemination systems and different mechanisms for agricultural information service development and operations. Seven ICT-based information dissemination models are identified and discussed. Success cases are presented. The findings provide a useful direction for researchers and practitioners in developing future ICT based information dissemination systems. It is hoped that this paper will also help other developing countries to learn from India's experience and best practice in their endeavor of applying emerging ICTs in agriculture information dissemination and knowledge transfer. (Agricultural information dissemination using ICTs:, 2016)

Agriculture plays a significant role for economic and social development in most undeveloped countries. Information of adequate quality is a necessary condition for improvement of all areas of agriculture. With the rapid development of Information and Communication Technologies (ICTs), data and information can be effectively generated, stored analyzed, disseminated and used to support farmers and farming communities to improve agricultural productivity and sustainability. Information services for farmers at the national and regional level are a promising new field of research and application in the emerging field of e-agriculture. (Agricultural information dissemination using ICTs:, 2016)

The challenges before Indian agriculture are immense. The agricultural growth rate is sluggish and stagnating. The sector needs to grow at a faster rate than the past to allow for higher per capita income and consumption. It is an accepted fact that the sound agricultural development is essential for the overall economic progress of India. Given its range of agro-ecological setting and produces, Indian agriculture is faced with a great diversity of needs, opportunities and prospects. The water scarce-rain fed areas, which account for 63 per cent of the cultivated land, exhibit low and also unstable yield and technology transfer gaps are much

wider as compared to those of irrigated areas. National seminar on agricultural extension 2009 background note states that sustaining growth rate and achieving the required food grain production of 320 million tonnes by 2025 would be a Herculean task considering some of the challenges like nonexpanding land, depleting soil and water resources, adverse impact of climate change, rising cost of production, diminishing agriculture labour availability and farmers reduced interest in agriculture. If India is to respond successfully to these challenges and also to achieve accelerated growth needs, vibrant and innovative technology generation and delivery system are required. Greater attention will have to be paid to technology dissemination. To make farm information and technology transfer more effective, greater use will need to be made of modern information and communication technology among researchers, extension personnel, farmers and other stakeholders. Further, the agricultural extension requires paradigm shift from top-down, blanket recommendation of technological packages, towards providing producers with the knowledge and understanding with which they solve their own location specific problems. (PGDAEMMOOCS, 2018)

2. Objectives Of The Assignment:

- To describe the what is e-extension, need and its importance in agriculture
- To explore the present utilized e-extension services for dissemination process in agricultural sector
- To evaluate how e – extension services facilitates for effective and meaningful technology dissemination in agriculture development.

3. Research Methodology:

The study uses secondary data of research methodology.

4. Details With Subtopics Review Of Literature:

Need For E-Extension: The following points recommend the need of e-extension.

1. To accelerate agricultural growth Recommendation of the Planning commission of India's working among the farmer's agricultural scientists and extension personnel is the most critical missing component of agricultural extension. Hence, there is an immediate need of vibrant, dynamic and innovative approach to be adopted for agricultural extension in order to

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achieve targeted growth rate and serve the farmers better. 2. To expand knowledge resource India feeds 16 per cent of world population with 2.4 per cent of global land. Land and water resources are almost reaching their limits; hence achieving food security heavily relies on “Knowledge Resource”. 3. To facilitate better information access Estimates indicated that 60 per cent of farmers do not access any source of information for advanced agricultural technologies resulting in huge adoption gap (NSSO, 2005). 4. To supplement inadequate technical manpower In India, there are about 120 million farm holdings and the number is growing year by year. It proposes to provide one village extension personnel for 800-1000 farm families than the requirement of field level extension personnel (PC, GoI, 2007). In this scenario, inadequate technical manpower to be for some extent compensate by the extensive use of ICTs. 5. For stronger research-extension – Client system linkage ICTs are required to facilitate stronger linkages with research- extension-client system. The feedback received through ICTs to be more accurate and faster. 6. To develop efficient feedback mechanism Lack of efficient feedback mechanism in the research- extension linkage was identified as one of the weaknesses in the existing extension systems. Hence, it is believed that the media and ICTs will offer strong potential to improve linkage mechanism. 7. For cost-effective extension delivery The ICTs tools such as: Internet and Mobile networks have the potential to provide agro-information services that are; affordable, relevant (timely & customized), up-to date, high accessibility and farmer friendly. 8. To develop knowledge managers the experience of rural centers shows that ICTs can help in enabling rural development workers to gather, store, retrieve, adapt, localized and disseminate a broad range of Information needed by rural families. (PGDAEMMOOCS, 2018)

Village Knowledge Centres:

MSSRF - Village Knowledge Centres (VKCs): The Village Knowledge Centre programme was started in 1998 in the Union Territory of Pondicherry in South India by the M S Swaminathan Research Foundation (MSSRF) in the east coast of South India with the generous support of IDRC and CIDA. In order to ensure access to all, the VKCs are located in public buildings (Panchayats, SHG building, Community Hall, School, Farmers and Fishermen Associations, Women Self-Help Groups, Community Based Organization, etc.). The information content is developed in close interaction with the local people in a bottom-up manner. The VKCs provide information on agriculture, health, employment, weather,

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education, government entitlements, microenterprise s training, etc. This has positively reflected in the increase of the number of women users. (PGDAEMMOOCS, 2018)

ISRO -Village Resource Centres (VRCs): Indian Satellite Research Organization (ISRO) has initiated the VRC concept i.e., setting up of the Village Resource Centres (VRCs) with a view to integrating its capabilities in satellite communications and satellite based earth observations to disseminate a variety of services managing from the space systems and other IT tools to address the changing and critical needs of rural communities (VRC-WP, 2006). Village Resource Centres will become single window delivery mechanism for tele-medicine, tele-education, natural resources data, agriculture advisories, land & water resources advisories, interactive farmers' advisories, e-governance services and weather advisories. The VRCs will provide information on health, education, nutrition, gender issues, legal services and women empowerment. Village Resource Centres (VRCs) was inaugurated in 2004.

Community Information Centres (CICs): The eight North-Eastern (NE) states of India have traditionally been less developed than the other states due to their geographic remoteness and difficult hilly terrain. The

Government of India in 2002, set up 487 Community Information Centres (CICs) at the block level in the eight NE states. The CICs, besides offering basic services like internet browsing, e-mail and training in computer fundamentals, also provide citizen centric or government to-citizen (G2C) services. E-Suvidha is a single-window front end

for such services and is offered by many CICs. The CIC operators teach the villagers how the internet can help them obtain necessary information regarding farming, agriculture, health, education, etc.

Mission 2007: It was way back in 2003 that the idea was seeded to have a Mission targeting the 60th year of Indian Independence named as Mission 2007 which would successfully let the concept of the ICT enabling of all the villages of India evolve into a movement. Today after 15th August of 2007 the Grameen Gyaan Abhiyan proudly holds hands with its 400 odd partners across the country with one intention of creating a Knowledge revolution in rural India (Senthilkumar, 2009). The Grameen Gyaan Abhiyan is Rural

Knowledge Movement in India which has been working with an aim to achieve ICT enabling of 637 000 villages of India has built a multi stake holder partnership with the different ICT4D models present in India. They include the community based models, the

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entrepreneurial models, government models, the business models or corporate models, the cooperative models and the combinations of all these models in pairs or more (<http://www.mission2007.in>).

Common Service Centres (CSCs) Scheme: Common Service Centres (CSCs) Scheme is the nationwide initiative of Government of India to provide support for establishing 100 000 Common Service Centres in 600 000 villages of India. CSCs scheme has been started in 2004 with the vision to develop these centres as a front-end delivery points for Government, private and social sector services to rural citizens of India in an integrated manner.

WEB PORTALS:

AGRISNET: AGRISNET (Agricultural Resources Information System and Networking), a project funded by the Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India. Under this scheme most of the State Governments are established information rich agricultural websites. For example, Sikkim AGRISNET (<http://www.sikkimagrisnet.org>), Andhra Pradesh agri-portal, <http://www.apagrisnet.gov.in>, Uttar Pradesh (UP) Agrisnet Knowledge Portal (<http://agriculture.up.nic.in>), AGRISNET – Himachal Pradesh (<http://203.193.179.168/default.aspx>) - Expert Advisory Services (<http://www.hp.gov.in/expertadvisory/SignUp.aspx>). AGRISNET projects, pilots for 17 states, have been approved to provide following services; market prices, soil information, crop diseases and management, good practices for horticulture, sericulture, etc.

DACNET – An e-Governance Project of Government of India: DACNET (Department of Agriculture and Co-operation Network) is an e-governance project sanctioned by the Department of Agriculture and Cooperation, Ministry of Agriculture, GoI and executed by the National Informatics Centre (NIC) to facilitate Indian agriculture on-line. It is built using the key criteria such as ease of use, speed of delivery, simplicity of procedure, single window access and affordable services, etc., DACNET has four major components: Network together directorates, regional directorates and field units for Internet and intranet access with the central DACNET resources, establish a local-area network throughout Department of Agriculture field locations, empower employees through specialized system training programs, web-based applications at the directorate, regional directorate, and field units. Under the DACNET scheme, 46 web sites and 39 applications are developed (75 were developed and functional), which include web portals on complete information on 9 crop

directorates, extension services, Integrated Nutrient Management, Marketing, Mechanisation and Technology, Economics and statistics ([www.agricoop.nic.in/Kharif2009/JS\(IT\).ppt](http://www.agricoop.nic.in/Kharif2009/JS(IT).ppt)).

InDG- India Development Gateway Portal: India Development Gateway (InDG) is a nationwide initiative of the Department of Information Technology, Government of India and implemented by Centre for Development of Advanced Computing (C-DAC), that targets specific country needs in the domain of rural and social development. InDG aims to provide credible information products and services in local languages that respond to the real and strategic needs of the rural people especially the farming communities. The use of Content Management System (CMS) enables shared ownership of the portal with various stakeholders. Any authenticated user can upload content to a specified topic in the portal. The content includes various forms such as words, audio and video so as to reach out effectively to rural masses and first level service providers. (PGDAEMMOOCS, 2018)

Rice Knowledge Management Portal (RKMP): Rice Knowledge Management Portal developed by the Indian Council of Agricultural Research (ICAR) serve as a information highway to share rice knowledge among the stakeholders. The Extension and Farmers domains provide production know how, package of practices, FAQs etc., in English and local languages. In research domain, various services are provided such as AICRIP Intranet, archives of AICRIP data (27000 datasets!), communities of practice (CoP), bio-informatics suite, approach papers, India Rice Research Repository (i3R), status papers on rice for different states etc. The portal operates two e-learning platforms providing learning opportunity to scientists and extension workers at their time and space. This portal also caters to information needs of exporters and farmers through the trade information system. Another feature of the portal is the indexing of mandi prices of paddy from regulated market yards (from Agmarknet). (www.rkmp.co.in).

TNAU AGRI-TECH PORTAL: Tamil Nadu Agricultural University (India) has explored the power and potential of Information and Communication Technology (ICT) intervention in Transfer of Farm Technology which may accelerate the farm information and knowledge sharing. TNAU AGRI-TECH Portal provides information on agriculture and allied sectors. Further, this portal also has information on special technologies, market and weather. Multimedia resources also hosted in the portal (<http://agritech.tnau.ac.in/>).

iKisan :iKisan is a comprehensive Agricultural Portal initiated by the Nagarjuna Fertilizers and chemicals Ltd., in South India. iKisan is addressing the Information, Knowledge and Business requirements of various players in the Agriculture arena viz., Farmers, Trade channel partners and Agri Input/Output companies. Leveraging Information Technology and extensive field presence, iKisan is positioned as an Information/Knowledge exchange. Agriculture information; Crop Specific, Package of Practices of crops, Animal Husbandry, Aromatic and Medicinal Plants, Agricultural Machinery, Allied Agriculture, Sprayers, Rural Credit, Insurance iKisan crop solutions; farmers have a critical need to get timely solutions for protecting and nurturing their crops to get best yields. (<http://www.ikisan.com>).

e-Krishi: The e-Krishi project, Market driven Agricultural Initiative through IT enabled Agri Business Centres in Kerala, addresses the existing gap in agriculture information flow and transaction management. The project envisages facilitating and enabling farmers and other Stakeholders through Agri Business Centres to interact with Agricultural Service Providers in the Private, Government and Non Government sectors. The project provides a web based solution enabling the small and medium farmers as well as owners of large landholdings. The e-Krishi portal also provides Farm Advisory Services (Crop Information, Fertiliser Recommendation, Planting Material Availability, Fertilizers and Pesticides, Weather Information), Agri- Market Information (Vegetable and Fruit Price, Daily Market Price, Market Analysis Report and Commodity Exchange), Resource Library: e-Krishi Eco-System, e-Krishi information centres, Photo Gallery, Model e- Krishi Project, KISSAN Video Channel. Further, e-Krishi news and online expert advisory, trade login and call centre support are the special features of the e-Krishi web portal (<http://www.e-krishi.org>).

IFFCO- Agri-Portal: The Indian Farmers Fertiliser Cooperative (IFFCO) is one of the World's largest

Manufacturers of fertilizer. The IFFCO's agri-portal'-Sixteen states have been covered with information of relevance to farmers in local languages and can be accessed through IFFCO's website www.iffco.nic.in. User-friendly intuitive graphic based navigation is provided to facilitate viewing in touch screen environment. IFFCO has also installed about 100 Farmers Information Kiosks in 16 states. Training programmes and farmers meetings are conducted to

encourage farmers to use the facilities provided in farmers' information kiosks (Patil et al., 2009).

aAQUA - almost All Questions Answered: The aAQUA is effectively an online, yet archived, discussion forum accessible using a web browser, allowing members to create, view and manage content in their mother-tongue (Hindi, Marathi etc.). It aims to incorporate innovations from the perspective of cross-lingual multimedia information storage and retrieval and intelligent databases. Thus, aAQUA empowers the members in a community to create their own content and provides an easy to use interface. The aAQUA eases the creation of content i.e., text, images, short audio, video and animations, thus helping the users move from being passive consumers to active content creators. The system performs "Meaning Based Search" through the available repository of information. Textual content is stored in a language independent fashion. This is intended to allow users to ask questions in their own language, access content in another language and view it in their own language (Ramamritham et al., 2009).

Digital Green – Participatory Video for Agricultural Extension: Digital Green (DG) is an ICT based research project for the production and dissemination of locally relevant agricultural through participatory video and mediated instruction. The digital Green farm based video has been interactively designed, deployed and evaluated among the small and marginal farmers of the Karnataka State of India. The project was initiated by the Microsoft Research, India in collaboration with Green Foundation, an NGO. Farmer participatory video recordings facilitate the aggregation of scattered information into systematic and comprehensive format with a localized context. The video recordings are made by teachers of agricultural at grassroots level and expert reviewers ensure the accuracy, clarity and completeness of the context and guide the construction of a time and location sensitive video based curriculum. First awareness meetings on DG services were conducted; interested farmers were identified and new content was recorded. Content was provided by local farmers with the guidance of experts. Selected farmers were deployed for field adoption, and content screenings were used to learn, adopt and innovate better agricultural practices.

e-Arik (e-Agriculture): The e-Arik (Arik means agriculture in the Adi tribal dialect of Arunachal Pradesh

State of North-East India) project was implemented in Arunachal Pradesh, one of the most socio-economically backward states of North-East India. After assessing farmers' information needs, the project experimented single window system for the improved agricultural information and technology delivery by using computer, internet, phone, radio and television. Project provides all time expert consultation on agriculture production, protection and marketing aspects through ICTs. The e-Arik research project staff regularly undertakes field visits to observe crop condition, diagnosis the pest, diseases, and nutrient deficiency, physiological problems, and then field crop condition is digitally documented. To solve complex crop pest, diseases, nutrient deficiency and physiological problems, digital photographs are transmitted through e-mail from e- Arik-village knowledge centre to the farm scientists of Central Agricultural University and recommendations passed on to the farmers. Further, farm scientists undertake need-based field visits and provide expert advice to the farmers. (www.earik.in, 2008)

e-Sagu (e-Cultivation): e-Sagu was a ICT based personalized agro- advisory system in which the agricultural scientists deliver the advice by getting the crop status in the form of digital photographs and other information. A co-ordinator who was associated with a group of farmers and who possesses agricultural experience and basic data entry skills, visits each designated farm on a weekly basis. The co-ordinator collects the registration information including soil data, water resources and capital availability from the farm and sends the crop details in the form of text and digital photographs through the communication system to agriculture experts. The agricultural experts gave appropriate recommendation with the help of computerized agricultural information system. The feedback regarding the advice was sent along with photographs during the following weeks. The cycle was repeated every week for each farm (www.esagu.in).

KISSAN- Karshaka Information Systems Services and Networking: KISSAN is an innovative project by the Department of Agriculture, Government of Kerala. The mission of this project is to develop and deploy Information Systems, Network, Processes and Services for Agriculture in ways that lead to (i) amelioration of farmers' distress and enhance their welfare, (ii) increased farm productivity and (iii) better returns for farm produce and derived products. The objective is to provide an effective knowledge management and smart information dissemination system that provides linkage among farmers, public research

institutions, administrative and private entrepreneurs to share the information and knowledge. The KISSAN project is having a dedicated content processing and dissemination system. This involves the collection, analysis, classification, process various information from different sources. The project portal also provides Post Query for Expert Answers, Crop Information, GIS Based Agri Advisory, Farming Practices, Fertilizers & Pesticides, Kerala Agri Directory and Discussion Forum.

Lifelines India- Soochna Se Samadhan (Solutions through Information): SOOCHNA SE SAMADHAN is an initiative to use the power of voice as the primary means of information dissemination. It facilitates the exchange of critical and timely information among marginalised communities so that it helps in improving their quality of life. It aims to provide connectivity, content and capability via a phone-based service. Specifically it will provide grassroots communities with access to a wide information and knowledge pool. The farmers can send pictures along with their questions, and also voice clips to clarify on the issue.(Lall and Sahi, 2009).

Touch Screen Kiosk: The touch screen kiosk with information on cattle health was tried and tested under a United Kingdom Department of International Development (DFID) – Animal Health Programme (AHP) supported project on dissemination of animal health knowledge for development of landless dairy cattle owners in the peri-urban regions of Pondicherry, India (2002- 2004) by the Rajiv Gandhi College of Veterinary and Animal Sciences, Pondicherry, India in collaboration with the University of Reading, UK.

The kiosks were installed in the veterinary centre and veterinary dispensary. The cattle owners bring their animals to the veterinary dispensary for treatment or Artificial Insemination (AI) and register the case. After that they will wait for their turn to come for service delivery. That waiting time is utilized for getting information from the kiosk.

e-Extension (e-Soil Health Card Programme): The Department of Agriculture, Gujarat State, India initiated office automation, networking and e-communication among department staff, digital data bank generation, management, storing and retrieving computerization of farmer centric applications, web site, e-soil health card scheme. The crop estimation survey, online management and monitoring of Government schemes, online farmer accident insurance scheme applications and status. It also provides online monitoring of individual

beneficiary schemes and extension programmes (Krishi mahotsav) and online applications for natural calamity, etc. The e-Soil Health Card Programme, an e-Agricultural extension service programme, is one of the ambitious programmes which aims to analyse the soil of all the villages of the state and proposes to provide online guidance to farmers on their soil health condition, fertilizer usage and alternate cropping pattern (www.agri.gujarat.gov.in; www.shc.gujarat.gov.in).

ICTs FOR MARKET INFORMATION AND AGRI-BUSINESS:

AGMARKNET: The project is about empowering farming community with the knowledge of latest commodity prices and arrivals information through innovative usage of ICT by networking agricultural produce wholesale markets in the country. It was initiated with the objectives of Networking 2800 major agricultural produce wholesale markets; imparting computer awareness and application usage training to about 5000 market personnel; dissemination of daily commodity prices and arrivals information in major Indian languages. In order to bring the farmers in a better bargaining position and to promote a culture of good agricultural marketing practices in the country, Directorate of Marketing and Inspection (DMI), Ministry of Agriculture, Government of India has embarked upon an ICT Project: NICNET based Agricultural Marketing Information System Network (AGMARKNET) as part of the Central Sector Scheme : “Marketing Research and Information Network” . The project, launched during later part of Ninth Plan Period (1997-2002), involves progressively linking all the agricultural produce wholesale markets, State Agricultural Marketing Boards/ Directorates and DMI offices for effective exchange of market information. National Informatics Centre (NIC) is executing the project on turnkey basis. (Source: (www.stockholmchallenge.se, 2019)

EID Parry- Indiagriline: EID Parry- Indiagriline is an attempt to catalyse e-commerce in rural agricultural and non-farm products and provide economic well being to rural areas initiated by EID Parry. Recognizing the significance of information and communication technology (ICT) as a powerful tool for bridging the infrastructure gaps in rural India, EID Parry regarded the Internet as the next logical medium for delivering its farm extension services. Indiagriline is an effort to provide an end-to-end solution addressing the needs of the farming community in South India. EID Parry launched this project in early 2001 by setting up Internet kiosks in 16 villages around its sugar factory in Nellikuppam, Tamilnadu

State. These kiosks were called Parry's Corners, and were intended to be business hubs of their respective villages—a one-stop shop. The strategic goal of the Murugappa Group was to ultimately develop the following capabilities: Distribution infrastructure— Trading infrastructure — this would serve as the foundation to a platform for trading agricultural commodities and rural industry manufactured goods.

ICT INITIATIVES OF NGO: DHAN Foundation: Development of Humane Action (DHAN) Foundation, a professional development organisation, was initiated on October 2, 1997. DHAN Foundation has taken up Information Technology for poor as a new theme with the following objectives: making information technology accessible to poor by developing relevant schemes through research and pilot activities and collaborating with research and academic institutions on e-governance and computer education at schools in rural areas. As part of the programme, internet kiosks in the rural areas as well as urban slums are set up through which services such as computer education, e-mail, ePost, agricultural market intelligence, etc., are rendered (<http://www.dhan.org/themes/itforpoor.php>).

ISAP - Indian Society of Agribusiness Professionals: ISAP- Community Technology Learning Centres (CTLCs) Indian Society of Agribusiness Professionals (ISAP), a non-governmental professional society- with support of Microsoft - Unlimited Potential Programme has established 'Community Technology Learning Centres (CTLCs)' in remote villages of Maharashtra to provide IT training to 450 00 farmers and unemployed youth. Under two-year programme, ISAP would be setting up 250 CTLCs at village level for imparting IT training to rural community and increase their income earning potential. ISAP is working on online weekly price monitoring system of herbal and medicinal plants with the funding support of National Medicinal Plant Board. (ISAP, 2008).

ISAP- Query Redress Services (QRS): Transfer of technical and scientific knowledge to the farmers is one of the primary functions of ISAP. QRS enables ISAP to provide solutions to farmer's queries pertaining to agricultural practices, problems, productivity improvement, scientific farming and improved technology for production to farming community. (ISAP,2008).

ISAP- Community Radio Stations (CRS): Timely availability of reliable information is the key to achieve sustainable food production and mitigate risks. Toward this community radio stations will act as an effective tool of communication and create platform to share

experiences, perspectives and innovations to increase yield and reduce labour. ISAP has been identified as one of seven organizations in the country to establish community radio station (ISAP, 2008)

IFFCO Kisan Sanchar Ltd: - Bharti Airtel Limited, India's leading integrated telecommunications services provider, and Indian Farmers Fertiliser Cooperative limited (IFFCO) launched a joint venture company IFFCO Kisan Sanchar Limited (IKSL), that is set to provide a major boost to Indian agriculture and the rural economy at large during 2008. Innovative telecom products and services, especially created for the farming community, will enhance their productivity and play a bigger role in India's growth story. (<http://www.iffco.nic.in>).

BSNL- Mandi on Mobile Service: Uttar Pradesh State farmers are able to know rates of agriculture commodities in any market in the State on their mobile phones, service was launched by the State-run telecom major Bharat Sanchar Nigam Ltd (BSNL) teamed up with the Uttar Pradesh Agricultural Marketing Board (Mandi Parishad) to launch the 'Mandi on Mobile' service for the farmers (Manoranjan, 2009). The service would be voice-based. To know the rates of over 100 commodities including crops, vegetables and other items, the farmers need to dial specific number from their BSNL cellular phones and follow the voice command subsequently. (IANS, 2008).

Rubber Board, India- Market Price by SMS: The Rubber Board provides the update of both national and international rates of natural rubber through SMS throughout the country by the rubber farmers and dealers

in India (especially Kerala State of South India) are tracking the prices of the commodity real time by SMS. The growers are helped by a service by the Rubber Board which through SMS updates the farmers with rates in the global as well as domestic markets, which is also displayed in the Rubber board's web portal (www.rubberboard.org.in)

6. ANALYSIS SUPPLEMENTED WITH CASE ILLUSTRATIONS/ FIELD EXAMPLES:

For preparation of this paper we directly visited some e-extension centres in AP i.e., Darsi KVK, Garikapadu KVK, Vijayawada, kisan call center and agriculture offices in prakasam dist. The paper directly observed and collected the relevant data related to e-

extension and find e-extension facilitates effective and meaningful technology dissemination process in agricultural development programmes or not with the help of agri scientists and technical experts of department of agriculture. After direct observation and discuss with officials the paper finds the following points. They are;

Farmer Call Centre (Kissan Call Centre): The Department of Agriculture & Cooperation (DoA&C), Ministry of Agriculture, Govt. of India launched Farmer Call Centres on January 21, 2004 across the country to deliver extension services to the farming community. The purpose of these call centres is to respond to issues raised by farmers, instantly, in the local language. There are call centres for every state which are expected to handle traffic from any part of the country. Queries related to agriculture and allied sectors are being addressed through these call centres. The Farmer Call Centre is a synthesis of two hitherto separate technologies namely, the Information and Communication Technology (ICT) and the Agricultural Technology. Both have their specialized domains and work cultures. To optimally utilize the strengths of both these systems, it was proposed to take full advantage of professionally managed Call Centre mechanism and dovetail it with the specialized Subject Matter Specialists knowledge of Agricultural Scientists and Extension Officers, so as to facilitate its reach to the farming community. The Farmer Call Centre consists of three levels – namely Level-I (the basic Call Centre interface, with high quality bandwidth and local language proficient Agriculture Graduate), Level-II (Subject Matter Specialists on concerned important crops and enterprises, connected through good bandwidth telecom and computer connectivity) and Level-III (the Management Group to ensure ultimate answering and resolution of all the farmers' queries which are not resolved at Level-II, connected on off line mode). (KVK, 2019)

SMS Service to Farmers by the Department of Agriculture, AP State: Farmers of Andhra Pradesh (India) are using mobile phones to sort out agricultural related problems. The AP Agriculture Department has introduced short messaging service (SMS) for farmers. The service was available by the agriculture department's Kissan (Farmer) call centre. More than 500 farmers had sent their queries through SMS service and replies had been sent by officials' concerned and agricultural scientists. The free of cost SMS service is available to farmers on mobile number. (KVK, 2019)

Agricultural Extension: Role of Mobile Phones: Agricultural extension is an important means of enabling farmers to benefit from agricultural R&D taking the inventions and innovations to them. It's role becomes still more significant in a developing economy like ours that has low levels of literacy and high incidence of poverty, particularly in rural-areas. Our recent research reveals that the mobile phone is playing a very useful role in fulfilling the informational needs of farmers, particularly among marginal and small ones. These services, through sms or voicemessages provide a variety of agriculture related information on crop-cultivation, fertilizer use, plant-diseases, pesticides, market-prices, weather and important government policy decisions. Mobile has started playing an increasingly useful role in the daily business of Indian farmers by providing them with much needed agricultural information related to modern farming techniques and market prices. The mobile based agricultural services are also getting enthusiastic response from the farming community and are also willingness to pay for these services. They are developing new strategies to make the service more effective, such as including a camera facility that enables transfer of diseased plant's photograph to experts for better communication and efficient solution. This situation underscores the existence of a big gap in our extension services, and the huge potential that mobile phones have in overcoming this gap in agricultural extension services.

SMS Broadcast Service by KVK: The Farm Science Centre (Krishi Viigyan Kendra - KVK), Darsi, Prakasam dist, and Garikapadu, Vijayawada, Krishna Dist, India has pioneered in the IT enabled service aiding instant messaging from Farm Science Centre to individual farmers for extending Agricultural information through SMS alerts. The service comprises sending Short Message Service alerts on cellular phones registered at Farm Science Centres by individual farmers. Weekly SMS alerts are issued on various agricultural developments like weather forecast, disease forecast and market information. The service is also being used as a medium to send information on important trainings and other programmes to the members of the Farmers Clubs and SHG network under the Farm Science Centre. The number of farmers coming to the Farm Science Centre is growing day by day. (KVK, 2019)

ITC-e-Choupal: ITC's Agri Business Division, one of India's largest exporters of agricultural commodities, has conceived e-Choupal as a more efficient supply chain aimed at delivering value to its customers around the world on a sustainable basis. The e- Choupal model has been specifically designed to tackle the challenges posed by the unique features of

Indian agriculture. 'e- Choupal' makes use of the physical transmission capabilities of current intermediaries – aggregation, logistics, counter-party risk and bridge financing -while disintermediating them from the chain of information flow and market signals. Real-time information and customised knowledge provided by 'e-Choupal' enhance the ability of farmers to take decisions and e-Choupal' eliminates wasteful intermediation and multiple handling. Launched in June 2000, "e-Choupal" has already become the largest initiative among all Internet-based interventions in rural India. "e-Choupal" services today reach out to more than 4 million farmers growing a range of crops - soyabean, coffee, wheat, rice, pulses, shrimp - in over 40,000 villages through 6450 kiosks across 8 states (Madhya Pradesh, Karnataka, Andhra Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, Uttaranchal and Tamil Nadu). (www.echoupal.com, 2019)).

7.Summary & Conclusion:

e-extension means electronic extension in the sense to transfer or dissemination of agriculture and allied sector related information from main centres or departments to end of the farmer through using electronic extension channels or disseminate channels i.e., Mobile phones, KVKs, Agrinet, e-Choupals, Kisan Call Centres and other extension channels etc., anyhow among all these e-extension services each have their own importance. However the Mobile phones are take a main importance to bridge the huge gap between e-extension. The existence of a big gap in our extension services, and the huge potential that mobile phones have in overcoming this gap in agricultural extension services

After total direct observation and discuss with all agri experts and scientists the paper finally founds that e-extension facilitates effective and meaningful technology dissemination process in agricultural development programmes.

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