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Importance of mobile in dissemination of Agriculture Information among Indian Farmers

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Abstract: Mobile is the next big revolution after internet adoption. Mobile has changed the way the information is shared among the communities. The m-Agriculture service uses technology such as mobile phones to offer an alternative delivery channel for dissemination of information on agriculture to farmers. There is greater need to understand the evolution of mobile based agriculture services in Indian farming communities since agriculture is still the backbone on India. It is also important to note that adoption of m-Agriculture service will lead to support other areas of social upliftment like health and education to rural sector.

Keywords: Indian Farmers, m-Agriculture, technology adoption, agriculture, Information Communication Technology, mobile, agriculture information.

I. Introduction

Mobile communications technology has quickly become the world's most common way of transmitting voice, data, and services in the developing world. Given this dramatic change, mobile applications (m-apps) in general and mobile applications for agricultural and rural development (m-ARD apps) in particular hold significant potential for advancing development. They could provide the most affordable ways for millions of farmers to access information, markets, finance, and governance systems previously unavailable to them.

Mobile phones have many key advantages: affordability, wide ownership, location based services, voice communications, and instant and convenient service delivery. As a result, there has been a global explosion in the number of m-apps, facilitated by the rapid evolution of mobile networks and by the increasing functions and falling prices of mobile handsets.

Though there have been many studies on the mobile revolution, there is a lack of systematic trend analyses and assessments of m-Agriculture services in developing countries. Thus this paper examines the evolution of m-Agriculture service in India, the availability and access of these service to India Farmers to meet their agriculture information requirement. This study also analyse how the information asymmetry can be bridged using m-Agriculture services in Agriculture sector.

II. Methodology

The information required to prepare this research paper has principally come from various reports, documents and web site resources. The information has been analyzed to illustrate the need of the mobile based agriculture services and the available m-Agriculture service providers in India. It is important for our agriculture industry to remove the information asymmetry and farmer should be able to get agriculture information at right time.

III. Background

Agriculture continues to be the most important sector of Indian economy. The total demand for food grains is projected to touch 280 million tonnes by 2020-21. Meeting this demand will necessitate a growth rate of nearly two per cent per annum in food grain production (Singh, 2011) and the agriculture sector needs to grow at a targeted four per cent per annum.

The recommendation of the Planning Commission's working group on agricultural extension for the 11th five-year plan (2007-2011) states that the agricultural growth is stagnating. Hence, there is an immediate need for vibrant, dynamic and innovative approach to be adopted for agricultural extension in order to achieve a targeted growth rate and serve the farmers better. Further, land and water resources are depleting fast; hence achieving food security requires "Knowledge Resource". Estimates indicate that 60 per cent of the farmers do not get access to any source of information for advanced agricultural technologies, resulting in huge adoption gap (NSSO, 2005).

In India, there are about 120 million farm holdings and the number is growing every year. In order to provide a minimum of one field-level extension personnel for a village of 800-1000 farm families, the requirement for such personnel comes to around 13 to 15 lakh. The current availability is about one lakh (PC, GoI, 2007). In this scenario, it is expected that integration of ICTs in agricultural extension will provide the much-needed impetus

to the sector and ICTs can complement the traditional extension system for “Knowledge Resource” delivery to millions of farmers (Saravanan, 2010).

IV. Agriculture Extension

The traditional extension model, “Training and Visit” extension, has been promoted by the World Bank throughout the developing world and is generally characterised by government-employed extension agents visiting farmers individually or in groups to demonstrate agricultural best practices (Anderson and Birner, 2007). As in many developing countries, India too has a system of local agricultural research universities and district-level extension centres, producing a wealth of specific knowledge. In 2010, the Government of India spent \$300 million on agricultural research, and a further \$60 million on public-extension programmes (RBI, 2010.)

Yet, traditional extension faces several challenges that limit its effectiveness. Limited transportation in rural areas and high cost of delivering information in person hinder the reach of extension programmes. The problem is particularly severe in interior villages of India, where farmers often live in houses adjacent to their plots during the agricultural cycle, creating a difficulty to both the delivery and receipt of information.

As agricultural extension is rarely provided to farmers on a recurring basis, the lack of ability of farmers to follow-up on information delivered may limit their eagerness to adopt new technologies. Infrequent and irregular meetings limit the ability to provide timely information, such as ways to counter inclement weather or unfamiliar pest infestations.

In developing country like India, government-service providers often face institutional difficulties. The reliance on extension agents to deliver in-person information is subject to general monitoring problems in a principal-agent framework (Anderson and Feder (2007). For example, monthly performance quotas lead agents to approach the easiest-to-reach farmers, and rarely exceed targets. 'Political capture' may also lead agents to focus on groups affiliated to the local government, rather than to marginalised groups for whom the incremental benefit may be higher. Even when an extension agent reaches the farmers, the information delivered must be locally relevant, and delivered in a manner that is accessible to them with low levels of literacy.

A recent survey shows that only 5.7 per cent farmers report receiving information about modern agricultural technologies from public-extension agents in India (Glendenning, Babu, and Asenso-Okyere, 2010.) This failure is partly attributable to the misaligned incentives of agricultural-extension workers. Basically, it is attributable to the high cost of reaching farmers in interior rural areas. Last but not the least, the top-down approach is adopted for providing information to farmers. This may result in inadequate diagnosis of the difficulties facing the farmers, as well as information that is often too technical for semi-literate farming populations. This problem may affect adoption of new technologies as well as optimal use of latest technologies.

In the absence of expert advice, farmers seek out information through word of mouth, generic broadcast programming, or from agricultural extension worker , who may be poorly informed or get incentives to recommend the inferior-quality products (Anderson and Birner (2007.)

These difficulties hinder the reliable flow of information from the agricultural research universities to farmers, and may narrow their awareness of and willingness to adapt to latest agricultural technologies. Overcoming these “informational inefficiencies” may, therefore, enhance agricultural productivity and farmer welfare. The emergence of mobile phone networks and rapid growth of mobile phone users across South Asia and Sub-Saharan Africa has opened up new vistas for employing newer techniques to deliver agricultural-extension services.

V. ICT (Information Communication Technology) Interventions in Agriculture – India Presepective

Right information at the right time plays a vital role in the agriculture sector. In India, the task of providing agricultural information to farmers is primarily vested with government agencies or the Public Extension System. A network of the Indian Council of Agricultural Research (ICAR) Institutes, State Agricultural Universities (SAU) and KrishiVigyanKendras (Farm Science Centres) spread across the country, is responsible for developing, refining and disseminating the latest technologies to farmers. The extension activities are also carried out by state agricultural departments, private agri-business companies and Non-Government Organisations (NGOs). The public-extension system has adopted a two-pronged strategy to address the information needs of the farming community

The mass-mediated broadcasts supported by trained agricultural-extension personnel at the field level form the backbone of the agricultural extension system in India. All India Radio (AIR), the state-controlled radio network, introduced special programs for farmers in the late 1950s. These programs, designed to bridge the information gap, provide day-to-day seasonal needs of the farming community besides giving relevant information pertaining to the latest agricultural technologies. Since 2004, AIR has also started broadcasting daily market prices of agricultural commodities and weather reports for farmers through its 94 stations. The AIR also broadcasts non-formal educational programs such as “Farm School on Air” to meet the objective. In 1966, Doordarshan, the

state-controlled television network, started telecasting programs such as (Krishi Darshan) in order to disseminate agricultural information to farmers. This program continues till date. The mass-mediated messages are, however, too general to be of much use and usually serve only as a reminder for regular field operations.

The National Commission on Farmers has noted that knowledge deficits constrain agricultural productivity in India. The commission also observed that the Information and Communication Technologies (ICTs) for agricultural extension could effectively be employed to address the information needs of the farming community. The Working Group on Agricultural Extension constituted by the Planning Commission (11th Five-year Plan), Government of India has also recommended that there is an urgent need to respond to the emerging challenges to the sector by strengthening information dissemination to farmers through use of ICTs. With the help of ICTs, agricultural extension is expected to become more diversified, knowledge-intensive, and demand-driven, and thus more effective in meeting farmers' information needs (Zijp, 1994.)

In a comprehensive review of Information and Communication Technologies for Development (ICT4D) projects in India and the use of ICTs in the agriculture sector, Chattopadhyay (undated) estimates that there are over 200 ICT-enabled development interventions in various stages of implementation across the country. Most of these include some component related to agriculture. These projects provide broadly four categories of services. The first category of ICT projects (e.g.; Bhoomi, Drishte, etc.) provides information regarding government schemes and programmes to rural people and they provide access points for retail products and services in rural India (Bhatnagar et al., 2007; Hasson et al., 2003). In case of the agriculture sector, these projects provide the latest data on land records, etc. The second group of projects is largely concerned with e-commerce and trading issues (e.g.; e-Choupal, Warana, etc.). In such cases, agricultural markets have been computerized and networked to provide commodity prices to farmers. The idea is to leverage ICTs to reduce transaction costs, thereby making agriculture more attractive to small growers (Bowonder et al., undated.)

The third category of projects (e.g.: Krishi Vigyan Kendras/Farm Science Centres at Baramati, Ahmednagar, etc.) provide offline static content on a package of practices, recommendations, locally-relevant technologies, weather information, etc. through strong inter-institutional linkages (Dhawan, 2004). Lastly, projects such as Shiksha, SEWA and so on, address capacity-building issues of farmers, rural artisans, women and extension personnel (Chattopadhyay, undated). The ICT tools used in these initiatives present an impressive list and include video conferencing, voice-activated call-centre facility, Internet-enabled PC-based networking, voice and text messaging via mobile phones, Internet-based crop-specific digital video, and interactive community radio (Rajendran et al., 2004; Mittal, 2010.)

Initially, the ICT-enabled development projects in India kicked-off with a telecentre or community-information kiosk model (Village Knowledge Centres, e-Choupal). In all such cases, the farmers had access to the agricultural information using a PC with Internet connection (Chattopadhyay, undated). For example, telecentres (e-Choupal) set up by the Indian Tobacco Company (ITC) have more than four million users across the country. The farmers visit these centres to check the price of the agricultural commodities at the local and global markets to gain information on latest farming techniques and to place orders for agricultural inputs such as seeds and fertilizers at prices less than the local market. During the procurement season, ITC purchases the crop directly from the farmers at a competitive price. On an average, farmers receive nearly 2.5 per cent higher price as compared to the government market. The key reason behind the success of the e-Choupal initiative are, customization to suit local conditions and the agriculture sector, the leadership role played by e-Choupal operators, and the trust, transparency, equitable and tangible benefits that can be traced to the use of e-Choupal (and technology) covering all aspects of the agriculture supply chain (Bowonder et al., undated; Annamalai & Rao, 2003.)

In a comparative study on the availability and usefulness of agricultural information provided by public extension system vis-à-vis Rural Knowledge Centres (Soochna Kutir), Barala (2006) found that only three per cent of farmers in the study area had visited these centres. A study, conducted in the Nainital district of Uttarakhand, India, revealed that time lag, high cost, low technological literacy and infrastructural problems were the major impediments to the use of Rural Knowledge Centres by farmers. Furthermore, the absence of linkages with other input agencies (seeds, fertilizers and pesticides) resulted in low applicability of the suggestions given by the Subject Matter Experts (SMEs). Other significant factors such as using English language as a medium of instruction, non-availability of hardware, poor network, absence of a legal environment, and socio-cultural norms governing use of technology and public space, were also responsible for lesser use of telecentres. In some cases, it was also found that accessing information through an intermediary (usually the kiosk operator or owner) posed limitations. The telecentre owners usually provide other revenue-generating services to augment their income and in such cases, there was very little initiative and encouragement by the intermediary to use the centres for development applications (Barala, 2006.)

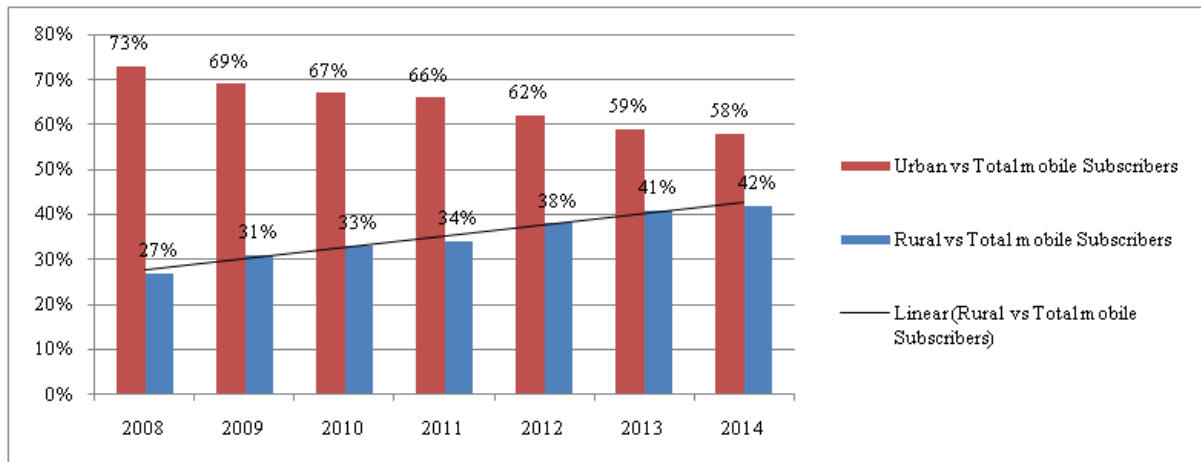
Studies on usage and impact of telecentres have led to a search for alternative models and tools. The expansion of mobile telephone markets and increasing number of mobile phone users in rural areas has opened doors to mobile-based initiatives (IFFCO Kisan Sanchar Limited, m-krishi, etc.). Faced with the sustainability issues, some of the PC-based initiatives were redesigned into mobile phone-based systems (Warana project). In the state of Kerala, India, adoption of mobile phones by fishermen translated into direct economic benefits. Mobile phones

helped in reducing price dispersion, elimination of waste, and adherence to one price, thereby benefitting both fishermen and traders (Jensen, 2007)..

VI. Mobile Penetration in India

Strategic reforms in the telecommunications sector since 1990s, facilitates strong ICT infrastructure in India. In 2012, India and China accounted for nearly 40 per cent of the total new mobile connections across the world. Evidently, the Indian market plays a key role in the ever-expanding mobile network globally. The Indian mobile subscriber base stood at 970 million in March 2015 and is expected to cross one billion by 2016. The Indian mobile subscriber base contributes to around 15 per cent of the world mobile subscriptions of 6.5 billion. (COAI, 2015)

Figure 1 : Mobile Penetration in Urban and Rural Segment (Source : COAI Annual Reports 2015)



Rural mobile subscriber base has been increasing steadily over last 7 years . It was 27% in the 2008 and by 2015, the rural subscriber base has reached till 42% of the total subscriber base . It is estimated by the Mobile industry that the mobile growth will now happen from rural segment. TRAI report states that 93% of the internet users are using mobile devices to access the internet application . It means that mobile devices are fast replacing Personal computers to access content available on internet .This clearly indicates that the Internet revolution via mobile telephony is taking place from the rural areas. (COAI, 2015)

VII. m-Agriculture Projects in India

There are around 44 projects which are providing farmer needs-based m-Services (mobile services) through their technological innovative applications (Sarvanana.)These projects are not only run by Government but by Private enterprise also. There are 15 projects by Public sector, 24 projects by Private sector and 6 projects are run by public and private sector jointly. It demonstrates that private sector is investing more in the area of m-agriculture. This may be due to the increase in the demand of agriculture based information services.

The mobile-based information services for farmers were made available in the year 2000 . However, only 8 projects became operational till 2008. The demand for mobile based services was boosted after 2008 when many such projects which were kicked-off. It appears that with the penetration of mobile in rural segment, the demand for these services also increased. This may also be due to the slash in the prices of smart phones that has enabled the rural population to afford such devices.

All the m-Agriculture projects in India provide the information using SMS (Short Message Service.) Around 16 projects provide information using IVRS (Interactive Voice Response System) technology. Recently more and more projects are offering images and video as medium for information sharing ..Apart from the English, m-Agriculture projects are offering the services in the local languages. Localization of the services along with language is making these services more popular. There are some service providers who are focusing on providing weather, soil, crop information, some are focusing on market information and some are providing both.

Apart from the m-Agriculture projects initiated by Private and Public sector, there is rising trend on native mobile applications on agriculture services. Google Play store has 100 mobile applications on the agriculture information (accessed on 25th October 2015 with key word “agriculture apps in India”) for Indian farmers. These mobile apps are related to weather information, soil information, agriculture regulations, market prices. There are some specific applications on the specific crops like coffee, tea etc. This demonstrates that with the increase in smartphone ownership with in rural community there is increase in the native mobile apps in google store. This will help in bridging the information asymmetry within the farming community.

Figure 2 :m-Agriculture projects in India (Source : Sarvanan , 2010 , Web search)

Hello Uttam	Kisan Mobile Advisory Service (KMAS)	ISAP-QRS	aAqua mini (redesigned for mobile browser)
Via SMS	Market Price on Mobile	Kissan Kerala	AvaajOtao (Voikiosk/ Spokenweb)
Kisan Call Centre	SMS Weather Alert	mKRISHI	Awaaz De (Give your voice)
Lifelines of India	Mandi on Mobile/ Digital Mandi	MandiBhav	Mobile based Crop Nutrient Management Decision Support System
Warana Unwired	mKisan	MAHAAGRI SMS	KRIBHCO Reliance Kisan Limited
Fisher Friend	SMS Service	Life Tools	Soil Based Plant Nutrient Management Information System
v-KVK	Annapurna KrishiPrasaarSeva	CERES	Mobile Multimedia Agriculture Advisory System (MAAS)
Reuters Market Light	BehtarZindagi (Better life)	VedioKheti	DMI (Dynamic Market Information)
Handygo	Kisan Help Line	Kisan Sanchar	IFFCO Kisan Sanchar Limited (IKSL)
Fasal	m4agriNEI	Nano Ganesh	Intelligent Advisory System for Farmers (IASF)
KHETI	mFMS	Mrittika	Kissan SMS Portal

A study on the website of Iffco Kisan Sanchar Limited (IKSL) gives information that there are around 15 million customers which are regularly using mobile based agriculture services . IKSL covers 18 states providing 5 free voice messages in regional languages to rural subscribers. mKisan service is the Government of India initiatives to provide information to Indian Farmers through SMS . mKisan SMS Portal was inaugurated by the Hon'ble President of India on July 16, 2013 and since its inception nearly 327 crore messages or more than 1044 crore SMSs have been sent to farmers throughout the length and breadth of the country. These figures are rising ever since.

The subscriber base and the usage of the m-Agriculture services are increasing. This demonstrates that mobile is able to provide the bridge the information asymmetry among India Farmers. It also shows that mobile can help in reaching the farmers who are not covered by either by agriculture extension worker or other ICT medium like TV, Radio and computers.

VIII. Conclusion

Applications such as SMS, Multimedia Messaging Service (MMS) and Voice Stream, are used to disseminate information to the farming community. These applications are customised based on subjectivity such as literacy, usage pattern, social acceptance, domain specific and lifestyle of rural farmers in various states. These practices are nothing but innovative business models, which are adopted based on user per capita. Most of the initiatives are push-based methods providing opportunity to fill the knowledge transfer to fulfil the users' basic needs.

Development occurs when people are increasingly able to take control of their lives, which means the decision power for the development-challenged citizens has a chance to come out of the bottom of the pyramid (Danielson A, 2001). Jensen (2007) mentions in his paper that that the introduction of mobile technology in fishing activities in Kerala, India, has led to the reduction of fish prices dispersion and a decline in waste. Jensen (2007) noted that the fishermen's profits rose by eight per cent, consumer surplus increased by six per cent and consumer prices declined by six per cent. The mobile-based projects for farmers had objectives, which benefit farmers and such projects were based on development agenda. These objectives suit market (input, output) prices, availability status, agricultural extension, social connectivity and financial-support systems.

ICT initiatives have come a long way in the last two decades in India in the Agriculture domain. The penetration of mobile phone in the rural sector has opened up vast possibilities. Initially mobile was used as the communication medium by rural sector but now it has been used as information dissemination tool. This tool can also be used in the area of agriculture information, rural health and rural education sector. There is a greater need to identify the underlying factors that supports the adoption of mobile-based services in the rural sector so that a more focused approach can be taken by the government agencies as well Private sector .

Refernece

- [1] Abraham, R. (2007) Mobile phones and economic development: evidence from the fishing industry in India, Information Technologies and International Development, 4(1):5-17.
- [2] Anderson, J., and R. Birner (2007): "How to Make Agricultural Extension Demand- Driven? : The Case of India's Agricultural Extension Policy," IFPRI Discussion Paper 00729. 2.1
- [3] Anderson, K., and G. Feder (2007): "Chapter 44: Agricultural Extension," Handbook of Agricultural Economics. 2.1
- [4] Annamalai, K. & Rao, S. (2003) ITC's E-Choupal and Profitable Rural Transformation, World Resources Institute, Washington, D.C, [4] Bandura, Albert. Social Foundations of Thought and Action: A Social Cognitive Theory, NJ: Prentice Hall, 1986.
- [5] Barala, P. (2006) A Study of Rural Knowledge Centres in Nainital District of Uttaranchal, Unpublished M.Sc. Thesis, Department of Agricultural Communication, GBPUAT, Pantnagar.

- [6] Birkhaeuser, D., R. Evenson, and G. Feder (1991): "The Economic Impact of Agricultural Extension: A Review," *Economic Development and Cultural Change*. 1, 2.1
 - [7] Bhatnagar, S., Rama Rao, T.P., Singh, N., Vaidya, R. and Mandal, M. (2007) Impact Assessment Study of Computerized Services Delivery Projects from India and Chile, IT@WB Staff Working Papers No 2, [http://www.iimahd.ernet.in/egov/documents/ impact-assessment-study-wbr.pdf](http://www.iimahd.ernet.in/egov/documents/impact-assessment-study-wbr.pdf).
 - [8] Bowonder, B., Gupta, V. and Singh, A. (undated) Developing a Rural Market e-Hub: The Case Study of e-Choupal Experience of ITC, http://planningcommission.gov.in/ reports/sereport/ser/stdy_ict/4_e-choupal%20.pdf.
 - [9] Chattopadhyay, B.N. (undated) Information and Communication Technologies for Sustainable Development, <http://agropedia.iitk.ac.in/openaccess/sites/default/files/WS%205.pdf>.
 - [10] Dhawan, V (2004) Critical Success Factors for Rural ICT Projects in India: A Study of n-Logue Kiosk Projects at Pabal and Baramati, Indian Institute of Technology, Bombay. <http://www.dil.iitb.ac.in/docs/kiosk-success-factors.pdf>.
 - [11] Feder, G., Birner, R. & Anderson, J.R. (2011) The private sector's role in agricultural extension systems: potential and limitations, *Journal of Agribusiness in Developing and Emerging Economies*, 1(1): 31 – 54
 - [12] Fu, X. & Akter, S. (2011) The impact of ICT on agricultural extension services delivery: evidence from the rural e-services project in India, TMD Working Paper Series No.046, University of Oxford Department of International Development.
 - [13] Gandhi, S., Mittal, S. & Tripathi, G., 2009. The impact of mobiles on agricultural productivity. In India: The Impact of Mobile Phones. The Policy Paper Series No.9. Vodafone Group, pp. 21–33.
 - [14] Glendenning, C., S. Babu, and K. Asenso-Okyere (2010): "Review of Agricultural Extension in India: Are Farmer' Information Needs Being Met?," IFPRI Discussion Paper 01048. 2.1
 - [15] Jensen, R. (2007) The Digital Divide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector, *The Quarterly Journal of Economics*, 122, 3, 879-924.
 - [16] Kameswari, V.L.V., Kishore, D. & Gupta, V., 2011. ICTs for Agricultural Extension: A Study in the Indian Himalayan Region. *The Electronic Journal on Information Systems in Developing Countries*, 48(3), pp.1–12.
 - [17] Mittal, S, Gandhi, S., & Tripathi, G. (2010) Socio-economic impact of mobile phones on Indian agriculture, ICRIER Working Paper No.246, International Council for Research on International Economic Relations, New Delhi
 - [18] Parikh, T.S., Patel, N. & Schwartzman, Y. (2007) A Survey of information Systems Reaching Small Producers in Global Agricultural Value Chains, School of Information, UC Berkeley.
 - [19] Rajendran, R., Balasubramanian, V., Rohini, A., Uma, P., Natarajan, K., Stalin, P., Samiyyan,
 - [20] K., Selvan, S., Jayaraj, T., Ramanathan, S., Chandrasekaran, B., Palaniappan, V., Walker, D and Alluri, K. (2004) Farmers' Interaction with Researchers through Ham Radio Network in Tamil Nadu, India - An Analysis, http://www.col.org/pcf3/papers/PDFs/Rajendran_etal_Alluri.pdf.
 - [21] Saito, K., and C. Weidemann (1990): "Agricultural Extension for Women Farmers in Africa," World Bank. 2.1
 - [22] Saravanan, R., (2010), Country Chapter No.: 4, In: Saravanan, R., (Ed.) ICTs for Agricultural Extension: Global Experiments, Innovations and Experiences, New India Publishing Agency, New Delhi.
 - [23] Veeraraghavan, R., Yasodhar, N. & Toyama, K. (2009) Warana unwired: replacing PCs with mobile phones in a rural sugarcane cooperative, *Information Technologies and International Development*, 5(1):81-95.
 - [24] www.iksl.in accessed on 28 February 2016 .
 - [25] www.mkisan.gov.in accessed on 28 February 2016
- Zijp, W. (1994) Improving the Transfer and Use of Agricultural Information – A Guide to Information Technology. Washington DC: World Bank.