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SUBJECT IV
ROLE OF ICT IN DISSEMINATION OF KNOWLEDGE IN AGRICULTURE SECTOR - ITS EFFICACY AND SCOPE

ICT Initiatives in Indian Agriculture - An Overview

Shalendra*, K.C. Gummagolmath and Purushottam Sharma****

Agriculture is an important sector of the Indian economy as it contributes about 17 per cent to the total gross domestic product (GDP) and provides employment to over 60 per cent of the population. Indian agriculture has registered impressive growth over the last few decades. The foodgrain production has increased from 51 million tonnes (MT) in 1950-51 to 234 MT from 122 million hectares in 2008-09. The production of oilseeds (nine major oilseeds) has also increased from 5 MT to 28 MT during the same period. The rapid growth has helped Indian agriculture mark its presence at the global level. India stands among top three in terms of production of various agricultural commodities like paddy, wheat, pulses, groundnut, rapeseeds, fruits, vegetables, sugarcane, tea, jute, cotton, tobacco leaves, etc (Government of India, 2008-09). In spite of this formidable growth, the huge challenges facing Indian agriculture are to further increase the production to keep pace with the ever increasing demand from growing population. The productivity is hampered due to non-availability of modern inputs, poor physical infrastructure and more so information on various issues in agriculture. Indian agrarian economy is characterised by low degree of market integration and connectivity, accessibility of reliable and timely information by the farmers on prices of commodities. To fulfill the expectations of the conscious buyers, price and quality, globalisation and liberalisation and maintain the viability of small and marginal farm to retain them in the farming, application of technology in agriculture has become inevitable.

The development and application of better customised technologies specific to agro-climatic conditions, farm size and level of agricultural development is the real challenge ahead for the policy makers. The bane of Indian agriculture is not lack of technologies and R&D efforts but inadequate and inefficient dissemination of relevant information to the farming sector (Bahl, 2008). In most of the developing countries, much of the agricultural information has been found out of date and irrelevant that is not applicable to small farmers' needs, leaving such farmers with very little information or resources to improve their productivity (Meera *et al.*, 2004). The timely availability of right information and its proper utilisation is as critical as

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the availability of major inputs required for farming until the produce reaches the consumer.

The application of Information and Communication Technology (ICT) can play a pivotal role in efficient dissemination of information. The ICT can deliver fast, reliable and accurate information in a user-friendly manner for practical utilisation by the end user. The information disseminated facilitates the farmers to decide what and when to plan, how to cultivate, when and how to harvest, what post-harvest management practices to follow, when and where to market the produce etc. (USAID, 2010).

In order to get the desired results from the use of ICT for dissemination of information in a country where majority of the farmers are illiterate, land holdings are small or marginal, the level of infrastructure development is very poor in the rural areas, there is need to assess the information requirement of the farmers. Further, how effectively ICT may be used to deliver the required information to the satisfaction of the user and identifying the suitable model for Indian farmers is required. Against this background, the present paper makes an attempt to: (i) to assess the information requirement of the farming community, (ii) review some of the ICT initiatives made under the Government, co-operative and private sector, (iii) to suggest the requirements for different models for efficient and effective delivery mechanism, and (iv) to recommend policy measures to use ICT for efficient and effective dissemination of information.

Assessment of Information Needs

The needs of information in agriculture are many and varied based on the agro-climatic regions, size of holding, crops cultivated, technology followed, market orientation, family needs, weather condition, etc. The success of any market information dissemination initiatives depends heavily on the assessment of appropriate information needs of the end user. As revealed by the study conducted by Meera *et al.,* 2004 majority of the farmers perceive the facility of 'question and answer service' as the most appropriate as it provide them the opportunity to get customised answers to their specific problems (Table 1).

This is crucial role of information under the present trade environment as reflected by the perception of the farmers. As per the findings of the study, the market information has been perceived as the most appropriate by about two-third of the farmers. Information on rural development programme of the Government including subsidy scheme, best packages of practices and plant protection has also been high on the priority by 50 per cent of the sample farmers. Other issues perceived by farmers as most appropriate are weather forecasting, post-harvest technology and information on agri-inputs.

TABLE 1. FARMERS' PERCEPTION OF THEIR INFORMATION NEEDS

Information Needs (N = 120)	Most appropriate		Appropriate		Less appropriate	
	Freq.	Per cent	Freq.	Per cent	Freq.	Per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Question and answer service	86	71.7	34	28.3	0	0.0
Market information	70	58.3	41	34.2	9	7.5
Best packages of practices	53	44.2	58	48.3	9	7.5
Warning system on disease/pest and their management	45	37.5	46	38.3	29	24.2
Input prices and availability	20	16.7	50	41.7	50	41.7
Weather forecasting	37	30.8	57	47.5	26	21.7
Information on RD programmes/ subsidies	55	45.8	44	36.7	21	17.5
Directory and information on crop insurance	19	15.8	45	37.5	56	46.7
General agricultural news	8	6.7	69	57.5	43	35.8
Farm business and management	13	10.8	35	29.2	72	60.0
Dairy, animal husbandry related information	16	13.3	41	34.2	63	52.5
Post-harvest technology	25	20.8	66	55.0	29	24.2
Facilitation of access to land records/online registration	69	57.5	33	27.5	18	15.0

Source: Calculated from Meera *et al.,* (2004).

Sources of Information for Farmers

The survey conducted by NSSO found that the main source of information for the farmers was 'other progressive farmers' followed by input dealers, radio and television. A study by ICRIER also found that the farmers have access to a wide range of information source like television, radio, newspaper, other farmers, government extension services, traders, input dealer, seed companies and relatives (Table 2).

TABLE 2. SOURCE OF INFORMATION FOR INDIAN FARMERS*

Sr. No	Source of Information	Total (N=183)	Per cent
(1)	(2)	(3)	(4)
1.	Mobile phone	183	100
2.	Mobile -phone-enabled service	138	75.4
3.	Television	118	64.5
4.	Newspaper	98	53.6
5.	Kiosk	51	27.9
6.	Other farmers	43	23.5
7.	Radio	37	20.2
8.	Input dealers	42	23.0
9.	Extension workers	121	66.1

Source: Calculated from Mittal *et al.*, (2010).

*The locations covered are Allahabad, Agra, Mathura, Alwar, Dausa, Bhilwara, Baran, Jaipur, Satara and Puducherry.

Application of ICT for Dissemination of Information in India

There are different players like Government, co-operative sector, private entities, NGOs, etc. operating in the agricultural sector with different objectives like productivity enhancement, well being of the farming community and agri-business opportunities. The availability of timely, reliable and accurate information helps to increase productivity and ensure well being of the farming community. The availability and physical delivery of information also help expansion of market for agri-inputs and developing business relations. The information itself has a business value for the role played by it in the entire production process. The importance of information in agricultural development and agri-business has encouraged various players to disseminate market information using ICT on different components. Some of the initiatives taken to disseminate information on agricultural and related aspects in the country are depicted in the Table 3.

TABLE 3. DIFFERENT ICT INITIATIVES IN INDIAN AGRICULTURE

Initiative (1)	Description (2)
AGRISNET	An infrastructure network existing at block level facilitating agricultural offices, agricultural extension services and agribusiness activities to enhance rural development.
Digital green	The agri. information of local relevance is disseminated through digital video. The system consists of a digital video database prepared for farmers by farmers with the help of experts. The recordings are shown to individuals or small groups using laptops, DVD player, television and to communities through village cable network.
eSagu	eSagu provides personalised expert advice in a timely manner from sowing stage to harvest for small and marginal farmers at their door-step. The farm situation is brought to the expert in the form of digital photographs and text information. The expert advice after analysing the situation is prepared and is delivered to the concerned farmer on the same day or subsequent day.
Warana	The project provides access to a wide range of information including agriculture to the member of the cooperative in local language. It provides information on crops, market prices, employment schemes, educational opportunities, etc. The information is provided through the village information kiosks. The operators of these kiosks are the main linkage between the farmers and the information centre.
IKSL	The relevant information is delivered to the farmers on mobile phones through five voice message in local language. Customized solutions are provided to the farmers through helpline. The farmers can also speak to the experts on specific subject through special 'phone-in' programmes.
Agmarknet	This initiative provides daily market price and arrival information in respect of 300 commodities and 2000 varieties in eight local languages. The wide range of information on prices, arrival and other related aspects like grades, standards, packaging, etc. is collected and disseminated by networking major agricultural produce markets operating in the country.
Pravara	The project aims to connect a hundred villages in Ahmednagar to empower rural population and improve quality of life. The information on government scheme, agricultural marketing, healthcare, education, agro-processing and economic development are disseminated through IT centres established under the project.
iKisan	iKisan is a one-stop solution for farmers in providing information on crops, crop management techniques, fertilizers, pesticides and other related information like market updates and weather forecasts.
Earik	Single window to improve the access to agricultural information and technology in north-eastern India. It provides expert consultation on production, plant protection and marketing.

(Contd.)

TABLE 3. CONCLD.

Initiative (1)	Description (2)
Digital Mandi	Digital Mandi is an electronic trading platform for agri-commodities to bring the benefit of ICT to farmers and traders by eliminating geographical barriers and temporal limitation and removing cash crunch through active participation of various financial institutions. Digital Mandi is inspired by the vision of Media Labs Asia sustainable village through culturally appropriate use of new technologies.
Akashganga	The initiative facilitates timely collection of milk, proper payments and generates higher income for dairy farmers. The system includes weighment of milk electronically, fat testing, capturing unique ID by the software and printing of pay slip and payment settlement.
aAQUA	aAQUA is a multilingual online problem solving system that facilitate farmers getting their queries answered by experts. The reply to the queries raised by the farmers is sent in one to three days depending on the nature of the problem.
eKrishi	The communication network established under eKrishi is utilised to educate farmers, provide real time information on prices, arrivals and issue disaster warning and weather forecast. The aim is to enable farmers to take informed decisions on sale of their produce and bring transparency in the working of the Madhya Pradesh State Agricultural Marketing Board
Mahindara Kisan Mitra	The initiate provide information on daily market prices, weather updates, crop advisories, agri-related news, etc. The information is also available on other sections such as loans, insurance, Mandi database, cold storage and warehouses, etc. The farmers can also get motivated and take benefits from the success stories of other fellow farmers reported on the website.
Haryali Kisan Bazar	HKB has set up centre across different states to provide solutions to wide range of problems of farmers under one roof including agri-inputs, financial services, farm-output services and round the clock expert advice. The centres provide information on crops, latest technologies, weather forecast, market prices, customised services based on the farmer database maintained under the initiatives.
Fisher Friend Mobile Advisory	The information relevant for fishermen is provided in local language through mobile phones. The information covered are wave height, wind speed and director, potential fishing zones, relevant news, government schemes and market price.
KCC	The Kisan Call Centre utilises telecom infrastructure to provide customised information on various aspects of agriculture in local language using toll free number 1800-180-1551.
Reuters Market Light	Reuters Market Light provides mobile phone based customised information according to the individual farmer's preferences on crops, markets, and location. The information in local language in respect of over 440 crops and varieties, more than 1400 markets and 2800 weather locations are available across 13 states through SMS.
e-choupal	An initiative by ITC provides alternative marketing channel, information on weather, agricultural practices, input sales, etc. It is a kiosk located in a village and equipped with computer with internet access managed by trained *sanchalak.*
e-agri kiosk	An initiative by NABARD and Central Agricultural University. Touch screen kiosk for technology transfer among tribal farmers of Arunachal Pradesh.
MSSRF FFMA	*Fisher Friend* is a BREW-based application offered on a low cost CDMA handset with a graphic interface, an icon-based menu and programmable shortcut keys. In addition to safety and weather information, fishermen can receive the locations of fishing areas and real time market prices with one-click in their local language.

The table reveals that a number of approaches have been followed by the service providers ranging from text to voice SMS, digital videos, tele-infrastructure, internet, etc. to get the information delivered to the end users effectively. Sanchalak is a key link to facilitate efficient delivery of information for some of the initiatives. The initiatives discussed above have been categorised on the basis of ownership and delivery mechanism in Table 4. The table reveals that majority of the initiatives made under private and co-operatives, generally working on self-sustained or revenue model, have relied heavily on *Sanchalak,* i.e., the facilitator or the linkage between

the user and service provider and also mobile phones for effective delivery of the service.

TABLE 4. CATEGORISATION OF ICT INITIATIVES IN INDIAN AGRICULTURE

Ownership/ Delivery mechanism (1)	Government (2)	Non-Government (3)	Cooperative/Private/ Consortium (4)
Web-based	AGRISNET, eKrishi, AGMARKNET	-	Pravara, Akashganga, iKisan, aAQUA, Mahindara Kisan Mitra, Haryali Kisan Bazar
Sanchalak (Facilitator between the user and service provider)	-	-	Warana, eSagu, iKisan, e-Choupal
Mobile/ Mixed Approach	KCC, Earik, Digital Mandi, e-Agri Kiosk	Fisher Friend Mobile Advisory, Digital green, MSSRF FFMA	IKSL, Reuters Market Light

The approach with the most effective delivery mechanism will have the highest impact in the Indian condition where majority of the farmers are illiterate or semi-literate. Due to the paucity of research and the relatively shorter period of implementation of such initiatives (USAID, 2010), it is difficult to identify the approach with maximum impact. Under Indian conditions, the mobile phones being used by a handsome number of rural population and local linkage in the form of *Sanchalaks*, this seems to be an effective approach. The same has been reflected by private players and co-operatives generally running on revenue models.

The ICT based Model for Information Dissemination

The information is vital for development of agriculture and well being of the rural masses. The fact has been well recognised in the form of a number of initiatives taken to disseminate information on agriculture and related aspects by government, non-government, private and co-operatives. However, the optimum utilisation of the system and the information disseminated will depend on a number of factors like literacy level, understanding of ICT, extent of telecommunication infrastructure, level of awareness of the farmers, information need of the farmers, etc. Any approach incorporating these factors will have maximum impact. Since few research findings are available to support any particular approach, an attempt has been made to identify the important factors for an ideal ICT model for information dissemination considering the above given factors.

(i) *Delivery Mechanism*: The rural India characterised by poor literacy and poor infrastructure poses the biggest challenge in finding the correct and effective mechanism for delivery of information to the end user. Under such conditions, mobile phones which are used by sizeable rural population can

provide an efficient and effective platform for delivering of information. The penetration of mobile in rural areas has increased in the recent past. The tele-density in rural India was reported to have reached 31.18 per cent by the end of year 2010. A study on fisheries sector in Kerala suggests that mobile phone coverage alone led to significant market efficiencies with reduction in waste and the difference in prices across markets. The study also reported an increase of 9 per cent in fishermen's profits and decline of 4 per cent in consumer prices (Jensen, 2007). Another innovation that has been utilised successfully in some of the approaches to deliver information is introduction of *Sanchalak* - the facilitator. Mostly the *Sanchalak* is an educated and progressive farmer from the community itself. This linkage already having the faith of the locals can effectively compensate for the low level of literacy and lack of IT exposure of the farmers.

(ii) *Two-way Process*: Single directional flow of information has been the problem with many of the government extension programmes. An efficient information system should be a two-way process. The content of information to be delivered by the system should be developed after thorough assessment of the information needs of the farmers.

(iii) *Integration of Various Departments*: There are a number of departments operating in isolation to serve the varying and different needs of the farmers. The integration of all these departments will help in economic utilisation of resources and help rapid dissemination of information for its optimum utilisation.

(iv) *Window for Queries*: Agriculture is a kind of profession where practically farmers come across a new problem every day. The information dissemination system should have provision for interaction with subject matter experts to resolve farmers' specific queries.

(v) *Customised Information*: Different farmers cultivate different crops with different technology and thus, the system should be in a position to serve the specific requirement of the farming community.

(vi) *Integrated approach*: An integrated approach using different mediums like phone, films, digital photos, internet, television, radio, local facilitators, etc. according to the needs and level of understanding of the end user would yield better results.

(vii) *User friendly information*: The information should be provided in an easily understandable format preferably in local language.

(viii) *Viability of dissemination model*: An ideal model should have financial viability so as to sustain itself over a longer period of time.

CONCLUSION AND RECOMMENDATIONS

There is great transformation in Indian agriculture owing to changes in the economic and trade environment. To cope up with these changes timely, relevant and accurate information to the farmers and other stakeholders will help them take optimum decisions. ICT should play a vital role in the efficient delivery of this information. Several ICT based initiatives have been tried by different players and the same are analysed in the present paper. Based on the analysis review of the different initiatives, an attempt has been made to recommend measures to harness the full potential of ICT as given below:

(i) Assessment of information needs of the farmers and appropriate mode of reaching them as per local conditions is crucial before developing an ICT Model

(ii) The information dissemination model should be viable and user-friendly so that the initiatives may be sustained in long-run. A string backward and forward linkage should be in place for accurate information collection and its dissemination.

(iii) Integration of various agencies under one roof for providing vital information on various components of agriculture so that it will act as a one stop solution for the needs of the farmers.

(iv) Introduction of delivery mechanism of information in the case of government initiatives like agmarknet.nic.in is need of the hour so that the information reaches the end user.

(v) It is essential to create the requisite ICT infrastructure in rural areas for effective dissemination of information.

(vi) Creating awareness among farmers and other stakeholders on the importance of information and its optimum utilisation will help in the development of agriculture and overall well being of the farming community.

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