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E-*kapas* advisory system of ICT : Impact analysis for the cotton growers of Haryana

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ABSTRACT

Cotton Cultivation involved expensive inputs and is highly risky. Its production and productivity depends on the weather and climatic factors. In India cotton crop productivity is low as compared to other countries which mainly due to lack of irrigation facilities at critical stages, poor plant stand, injudicious input use, outbreak of insect pests, lack of good quality seeds, non availability of superior hybrids/varieties, adverse weather conditions and most important, lack of real time information about latest technologies. In past decades, technologies of cotton cultivation were disseminated manually. Thus, there is a vital necessity to device some innovative technology model using ICT to transfer new technologies to the end users to enhance the production and productivity of cotton crop.

"e-*kapas* network" with the joint efforts of CICR, Nagpur and CCS HAU, Hisar was developed for effective transfer of knowledge to the farmers. The overall success rate of the delivered voice message was 76 per cent during the project period. Hundred per cent respondents were in favour that mobile is the necessity of today's life. The majority (87%) of the farmers considered that information received on mobile phones increase their income and saved their time, labour and energy.

Key words: Advisory, cotton, e-*kapas*, ICT, weather

In India, agriculture is the main occupation of farming community. Cotton represents the most leading fibre crop of the world and generally known as "White Gold". There are four cultivated species of cotton *viz.*, *Gossypium arboreum, G. herbaceum, G. hirsutum* and *G. barbadense. Gossypium arboreum* and *G. herbaceum*, species are diploid (2n=26) and commonly known as old world cotton and *G. hirsutum* and *G. barbadense* are tetraploid species which are commnly known as new world cotton (Sangwan *et. al*, 2019). Cultivation of this crop involved expensive inputs and is highly risky. The low productivity of cotton in our country is mainly due to marginal land, lack of good quality seeds, selection of hybrids/ varieties, poor irrigation facilities, adverse weather conditions and lack of real time information about latest technologies related to package and practices. Weather plays a major role on crop production and productivity. In Haryana during recent years, cotton growers are facing severe challenges due to limited availability of extension personnel's and dependency on the conventional methods of information transformation and communication. Among various reasons for low productivity of cotton in India, wide gap in technology dissemination found to be most significant. Cotton crop plays a vital role in the economic growth of country by providing employment to the people and making significant contributions to export earnings. India occupies 37.56 per cent of world cotton area and produces 24.26 per cent of world cotton and stands tall, however, productivity is lower than the world average (AICCIP, 2020).

Dissemination of cotton technologies

In India, cotton crop productivity is highly influenced by adverse climate conditions and lack of real time information to the end users. Due to this results of research carried out by researchers did not reach to the farmers. In our country cotton growers depends on the

conventional methods of information transformation and communication. In recent times, extension personnel have primarily transferred developed technologies manually. ICTs method was not adopted anywhere in the country. Due to the country's great geographic diversity, internet access in rural areas was regarded as an extremely complex and challenging process (Sangita, 2016).

Due to the shifting global environment in the cotton sector, India is experiencing a significant challenge in maintaining its top position in area and production at the world scenario. Suitable cotton production technologies have been developed. Information and communication technology (ICT) can be used as the simplest, most cost effective, and successful way to let scientists communicate with thousands of farmers more easily and widely (Singh *et. al*, 2019).

Use of icts in agriculture

Information and Communication Technology abbreviated as ICT consist of Information technology, enterprise software, audio-visual system and middleware using which user can access, store, transmit and modify information as required (Pramanik *et al.*, 2017). In India's past, radio and television were the two main electronic broadcasting media used to reach rural areas, but in the last two decades, internet and mobile based channels have rapidly gained popularity (Sangwan *et al.*, 2018).

The recent advances in ICT have changed the way knowledge is produced, processed, stored, retrieved and disseminated to different stakeholders in agriculture (Ansari *et al.*, 2013). Mobile phones have been emerged as the most adopted technology over the last two decades. Most of the Indian carries a mobile phone. Thus, the use of mobile devices in the agricultural extension system will enable a greater distribution of innovations created in laboratories for use in the field (Singh *et al*, 2019). Information and communication technologies (ICT) can be used to reach cotton growers in the state of Haryana with needed information and new technology in the local language. Agricultural extension that functions through a participatory approach can play a major role in facilitating a national, long range agricultural developmental plan (Singh, *et al.*, 2016). However, many of the initiatives in agriculture face common problems, such as issues with sustainability, affordability, ease of use, accessibility, scalability, and the availability of relevant and localised content in a suitable language, despite the rapid spread and potential of ICTs to facilitate farmers' access to information (Wasnik and Kranthi, 2014). Quality information about cotton production and protection technologies and weather is timely send and it is totally relevant (to specific season) as per the status of the crop in particular environmental condition. Besides, farmers are also made aware about the university extension activities like *Kisan Mela* and *Kisan Diwas*. Farmers need not pay any money for receiving these SMS. Thus it is a very effective and useful system for disseminating knowledge to different stakeholders in agriculture and creating awareness for timely interventions to increase productivity (Isha *et al.*, 2016).

In spite of the huge prospective of ICT for agricultural growth, only a few isolated projects have been initiated in our country due to various grass root level challenges. In many Indian villages, there are no communications services available. For teaching and meeting the information needs of farmers in the villages in our nation, significant financial investment is needed. The main obstacles to implementing ICT based advisories include a lack of localization, inadequate advisory services, bad ICT infrastructure, poor ICT literacy, a lack of timely advise, relevant content, and non-integration of services. In order to connect the research, extension, and farming communities in the nation and boost cotton crop productivity,

information and communication technologies (ICT) are becoming increasingly significant.

Mobile phone – An useful ICT tool for technology dissemination

Smart phones are quickly replacing other ICT tools as a necessity for all types of users in our nation, regardless of age. The ownership of mobile phones is higher among farming communities than that of other ICT instruments. The quick transfer of agrotechnologies from a research facility to farmers is made possible by mobile-based ICT interventions, which are cost-effective and friendly to farmers. In this regard, the e-kapas network project is a highly helpful tool for farmers, as the cotton advisory's voice message option makes it easy for farmers without literacy to obtain information.

MATERIALS AND METHODS

'e-kapas' network system- Mobile phone based conceptual framework

Keeping in the view of the advantages of modern advancements in ICT and in mobile phone technology, the Central Institute for Cotton Research, Nagpur has been executed a extension mechanism project "e-*kapas* network" at 17 centres' in ten cotton growing states. In Haryana state, voice messages related to cotton advisory and weather based information in simple Hindi language were recorded and transferred to the registered cotton growers. The most obvious benefit of 'e *kapas*' project was to improve the effectiveness of the current system so that it can save money and time in comparison to manual systems. Warnings and alert services were issued to the registered end users for taking proactive measures. The conceptual framework for this study states that the information chain begins with the content itself and moves through the ICT platform to the end user (Fig. 1). To determine the success of the project, an impact analysis was done on randomly selected 85 registered cotton growing farmers. Data were gathered through personal interviews with the registered, randomly chosen cotton growers according to an interview plan.

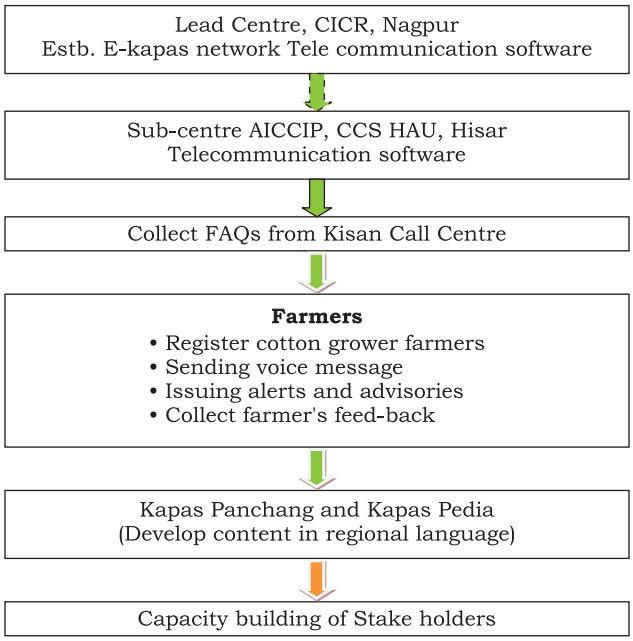

Fig. 1. Flow chart

RESULTS AND DISCUSSION

Data base of 'e- kapas' network project beneficiaries

By enrolling farmers with their information, including names, residences, mobile numbers, villages, and districts, a database of cotton growing farmers in Haryana state's cotton growing districts was created. For the purpose of distributing the cotton advice *via* voice messages, 34,000 farmers who grow cotton in major cotton-growing regions were enrolled. The details of the registered beneficiary cotton growers are being entered into a database called e-kapas farmers' database.

Collection and solution of FAQs (Frequently Asked Questions) on cotton

Frequently asked questions (FAQs) on cotton from the state agriculture department and Kisan Call Centers (KCC) were gathered during

kisan melas, were collected, studied, and replies were prepared in straightforward Hindi as a dissemination tool for the farmers in the form of voice messages. Farmers' questions and answers were analysed, and a "*Kapas Panchang*" was created to send voice SMS at the right times for field operations like weed and nutrient management, new technologies, pest and disease management, market information, weather forecasts, farm machinery and tools, price, government schemes, and farm credit information. Recording of Voice Messages related to FAQs and advisories.

Advisory related to agriculture is extremely time sensitive. Answers to all frequently asked questions (FAQs) for voice messages, including all package of practices of cotton from sowing to picking, pest and disease control, IPM, weather, *etc.*, have been produced in Hindi. For proper transmission to registered cotton producing farmers, all FAQs' meaningful voice messages were recorded in a noise-free setting at the CCS HAU, Hisar Radio community centre (Table 1).

Table 1. Subject areas of messages and advisories delivered on cotton in Haryana state

Sr. No.	Subject area of cotton advisories/messages
1	Land preparation and ploughing
2	Seed treatment
3	Varieties/hybrids recommended
4	Sowing and Planting distance
5	Fertilizer basal application
6	Thinning and Gap filling
7	Intercultural operations
8	Top dressing of fertilizers
9	Irrigations scheduling
10	Weather parameters
11	*Kisan mela* information
12	Control of root rot and wilting
13	Control of blight disease
14	Control of cotton leaf curl virus disease
15	Malformation remedy
16	Control of termites
17	Control of sucking pests like white fly
18	Control measures of bollworms and other pests
19	Time of pickings and drying
20	Storing, marketing

Effectiveness of e-Kapas network- An Impact Analysis

An analysis was conducted to know the effectiveness of the e-*kapas* network among the registered cotton growers of the Haryana state. For this purpose an evaluation was conducted with prepared performa among randomly selected 85 registered regular attendees of e-*kapas* alerts through personal interviews with different age group, land holding, literacy and marital status (Table-2).

Table 2. Distribution of respondents according to personal variables

S. No.	Variables	Categories	Frequency
1.	Age	Young (up to 30)	12(14.12)
		Middle (31-50)	51(60.00)
		Old (>51)	22(25.88)
2.	Land holding	Small (Less than 2 hac.)	18(21.18)
		Medium (2-4 hac.)	48(56.47)
		Large (More than 4 hac.)	19(22.35)
3.	Land under	Small (Less than 2 hac.)	16(18.82)
	cotton	Medium (2-4 hac.)	52(61.18)
	cultivation	Large (More than 4 hac.)	17(20.00)
4.	Education	Illiterate	18(21.18)
		Primary	41(48.23)
		Metric	14(16.47)
		Bachelor	12(14.12)
5.	Marital status	Single	29(34.12)
		Married	56(65.88)

Through in person interviews, an investigation of farmers' awareness of mobile phones was carried out (Table 3). Hundred percent of them agreed that a cell phone is a beneficial tool, essential in modern life, and that receiving messages *via* toll free numbers is necessary. The majority of them (81.18%) were not aware about the usefulness of mobile for finding information about agriculture. 90.59 percent of registered farmers reported not accessing the internet to find information.

Table 3. Awareness of farmers towards mobile phone

S.No.	Statements	Frequency	Percentage
1.	Mobile phone is necessary in today's life	Yes	85(100.00)
		No	0
2.	Mobile is good Instrument	Yes	85(100.00)
		No	0
3.	Are you Smart phone users	Yes	17(20.00)
		No	68(80.00)
4.	Mobile phone is used for receiving message	Yes	85(100.00)
		No	0
5.	Mobile is used for agriculture information	Yes	16(18.82)
		No	69(81.18)
6.	Which type of message use	Text	48(56.47)
		Voice	16 (18.82)
		Both	21(24.71)
7.	Received message from any department / Agency / Institute	Yes	51(60.00)
		No	34(40.00)
8.	Information received though SMS/Calls is useful	Yes	85(100.00)
		No	0
9.	Toll Free Message facility is required	Yes	85(100.00)
		No	0
10.	Which type of SMS service better	Text	46(54.12)
		Voice	15(17.65)
		Both	24(28.23)
11.	Do you use internet for getting information	Yes	8(9.41)77
		No	(90.59)

In case of assessment of mobile phone in technology transfer in agriculture (Table 4), majority (87.06%) of farmers said that mobile phone has saved your money, energy and time. About 72 per cent farmers did not contact agricultural scientists/ officials by mobile for any scientific advisory before registering themselves under e-*kapas* network project. Nearly 39 per cent farmers had listened all messages broadcasted through project, whereas 43.53 per cent listened 20-29 messages while remaining listened more than 10-19 messages (Table 5). Majority of them (87.06%) agreed that they had listened and taking notes of the messages. More than 67.06 per cent endorsed that they had listened the messages and also shared with friends.

Table 4. Assessment of mobile phone in technology transfer in agriculture

S. No.	Statement	Frequency	Percentage
1.	Do you have your own mobile phone	Yes	85(100.00)
		No	0
2.	Are your mobile phone for agriculture purpose	Yes	16(18.82)
		No	69(81.18)
3.	Do you consider that mobile phone gives benefits	Yes	85(100.00)
		No	0
4.	Do you contact Agricultural Scientists/ Officials by mobile	Yes	23(27.06)
		No	62(72.94)
5.	Do you consider that mobile phone have increased your income	Yes	51(60.00)
		No	34(40.00)
6.	Mobile phone has saved your money, energy and time	Yes	74(87.06)
		No	11(12.94)
7.	Do you search weather information by mobile	Yes	8(9.41)
		No	77(90.59)

Table 5. Listing behavior of farmers

S.No.	Statement	Frequency	Percentage
1	Listened to message		
	i. All 30 messages	33	38.82
	ii. Listened to all 20-29 messages	37	43.53
	iii. Listened to all 10 to 19 messages	15	17.65
	iv. Listened to fewer than 10 messages	0	0.00
2.	Listening and also doing the work		
	i. Only listening	8	9.41
	ii. Listening and taking notes	74	87.06
	iii. Recording	3	3.53
3.	i. Listening and sharing with friends	57	67.06
	ii. Discussing with family members	19	22.35
	iii. Seeking additional information with CICR/State dept.	9	10.59

Regarding opinion of the farmers to delivery of messages, 83.53 per cent said that it was at early crop growth time while in case of relevance of voice messages, 74.12 per cent endorsed the high relevancy (Table 6). Majority of them believed that audio quality was good (87.06%), message moderately technical (84.71%), very useful (92.94%) and need some more details (90.59%).

Table 6. Opinion of the farmers on mobile based voice messages

S.No.	Statement	Frequency	Percentage
1.	Timely during crop growth		
	i. Early	71	83.53
	ii. Late	14	16.47
2.	i. Highly relevant	63	74.12
	ii. Somewhat relevant	22	25.88
	iii. Irrelevant	0	0.00
3.	Audio quality		
	i. Good	74	87.06
	ii. Fair	11	12.94
	iii. Bad	0	0.00
4.	Messages		
	i. Less technical	0	0.00
	ii. Moderately technical	72	84.71
	iii. Highly technical	13	15.29
5.	Content		
	i. Adequate	8	9.41
	ii. Needs more details	77	90.59
	iii. Not at all adequate	0	0.00
6.	Content		
	i. Very useful	79	92.9
	ii. Little useful	6	47.06
	iii. Not useful	0	0.00

Out of the total 12, 59,346 voice messages, 9, 47,646 voice messages were successfully sent to the registered users. The overall success rate of the delivered voice message was 76 percent during the project period.

Constraints in implementation of the network

The major Constraints faced when sending voice SMS were dropped calls as a result of DND (Do Not Disturb), network issues, and registered farmers' failure to respond. The main constraints to transmitting e-*kapas* alerts to the registered cotton producers were frequently "ring timeout and network congestion".

CONCLUSION

Information Communication Technologies (ICT) is widely found as important resources for socio- economic development. Farmers are more social united as a result of using cell phones. Presently, the methods used by the department of agriculture and extension personnel to provide technology and information relating to the cotton crop to end users are not effective and adequate. Through e-*kapas* mobile based network system, appropriate, quickly and relevant information on cotton cultivation in local language can be disseminated to facilitate the cotton growers to take timely crop management decisions. By providing advice and alerts related to weather forecasting to the farmers in advance help them in taking protective measures which ultimately help in bringing a change in the perspectives of cotton farmers. It also help in monitoring severe pest; solving problems of insect pest epidemic situation such as white fly infestation in North India through advisory services issued directly to the farmers in advance. Timely advisory services regarding cotton crop to the growers help in bringing a change in the perspectives of farmer about cotton cultivation.

Feedback from the registered farmers was that the advisory received was highly relevant, good audio quality, and very useful. Farmers were benefitted by this technology as they were getting voice message on their mobiles in simple Hindi language which was easily understandable regarding cotton production technology. This technology will be of great use to the cotton growers who are not using any internet or not equipped with any modern technology.

Most of the registered farmers appreciated timely broadcasting of alerts related to cotton cultivation and weather forecasting for better application of techniques. Farmers were also enthusiastic to pay for such services in future if they can be demanded. Thus using such modern ICTs technology like 'e-*kapas*' system and establishing a strong linkage between researchers and farmers can play a crucial role in creating and sustaining significant changes in the productivity and profitability of cotton crop in Haryana state.

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