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RESEARCH PAPER

Impact of information and communication technology (ICT) based extension system on technology adoption

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Abstract: Information and communication technology (ICT) is playing vital role in providing agriculture services and there are more opportunities for its utilization in development of agriculture. There exists wide gap between extension worker and farmers to the extent of 1:1200 in India (Sulaiman 2015). ICT based extension service can overcome the existing problem of low ccess to extension services by farmers. One such attempt was made through the project on comprehensive Agriculture Extension Services (CABES) which was designed to deliver information to farmers based on the needs of the farmers and field condition on real time bases. An impact assessment of such ICT based extension services was carried out in project villages. Project was implemented in 20 *GramPanchayats (GP)* with registration of 200 farmers in each GP. Information was delivered to registered farmers through programme called e-SAP loaded on TAB. *RaithMitra* a grass root level worker was in charge for one GP and conducted field surveys regularly in farmers' field. In addition to crop pest diagnosis, best management practices, market information, input etc. were added to the programme. The messages are in text, pictorial and video farms. Thus farmers' access to real time information was very high. The study observed that fifty per cent of the farmers were big farmers and main crop cultivated were cotton, bengal gram, sorghum and wheat. Farm advisory services through ICT enable services was able to deliver prescriptions to the field problems of farmers as high as 3081to 1181 farmers of bengal gram (2.59 per farmer), while in case of cotton it was 1041 to 201 farmers (5.08 per farmer). Further it was observed that acceptance and adoption of farm advisory services was high. It has resulted in incremental yield of 25 per cent in bengal gram and sorghum, while in case of cotton it was 12.10 per cent.

Key words: Acceptance, Agricultural messages, Farm advisory service, Technology

Introduction

India is on the cusp of a major digital revolution with a mounting urban base, growing internet penetration and expanding millennial population. The overall internet penetration is 35 per cent of total population with urban India witnessed a growth of 9.66 per cent from previous year and is presently estimated to have around 295 million internet users. On the other hand, rural India witnessed an annual growth of 14.11 percent and is presently estimated to have around 186 million internet users. The number of internet users stood at 481 million as on December 2017, an increase of 11.34 per cent over the last year. The country recorded 456 million mobile internet users with an increase of 17.22 per cent from the previous year as on December 2017. The urban mobile internet users reached 291 million whereas in rural area the number of mobile internet users is estimated as 187 million (Anonymous, 2018).

Information and Communication Technologies can have a significant impact in area of agricultural extension, which depends to a large extent on exchange of information between and among farmers on one hand, and a broad range of other actors *viz.* researchers, extension workers, input dealers, market functionaries etc. on the other. There is growing recognition that farmers and members of rural communities have needs for information and appropriate learning methods that are not being met (Greenridge, 2003; Lightfoot, 2003).

ICTs can help overcome various bottlenecks present in Agriculture. Firstly, there is a lack of extension facilities available, secondly, issue of illiteracy amongst farmers, thirdly, capability of farmers to compete with large farmers is limited and fourthly, the gap existing between the modern and traditional technologies is widening. Lastly, farmers are disconnected with the latest information available and willing to pay a cost of the expenditure of the project. Sahota and Kameshwari (2014) conducted a study in northern region of India to know the usefulness of the IT based farm advisory service IFFCO *Kisan Sanchar Nigam* Limited and found that messages about likely pest/insect infestation helped them to take precautionary measures and save their crop from potential loss.

ICT based extension service project by name Comprehensive Agri Business Extension Services (CABES) was implemented by University of Agricultural Dharwad, in Navalgunda Taluk of Dharwad District. The impact of ICT Based Extension Services was studied and discussed in this paper.

Materials and methods

The study was conducted in Navalagund taluk of Dharwad district, Karnataka as the project Comprehensive Agribusiness Extension Service (CABES) was implemented in Navalagund taluk under University of Agricultural Sciences Dharwad during 2015-16.The project was implemented in 20 Gram Pachayats of Navalagund taluk. In each Gram Panchayat a diploma holder was placed to work as *Raithmitra* and he/she is provided with Tab that was uploaded with the programme e-SAP. e-Sap is pest surveillance app that assist in diagnosing the field problem especially insect pests, disease and weeds and provide possible solutions. Additional information was uploaded in the app to provide information on variety, seed rate, nutrients etc *Raithmitra* after registering the interested farmers visited fields

regularly to provide farm advisory services. In each Gram Panchayat around 200 farmers were encouraged to register to enable them to use ICT based extension services.The app was uploaded with crop management practices of all crops in Navalagund taluk. Major cultivated land in the taluka was rainfed and important crops of the taluk included cotton, onion, green gram and maize in kahrif season while in rabi season sorghum and bengal gram were major crops. A check list was prepared to record the observation and data was collected from available reports and personnel interview method.

Results and discussions

Distribution of farmers based upon the land holding

Among the registered farmers of ICT enabled Extension Services (CABES), 50 per cent of the farmers were belonged to large size holding followed by medium size (34%) and small size (16%) as indicated in the table 1 and Fig. 1. As the major area cultivated by farmers in Navalgund Taluk is rainfed and traditionally more land holdings are processed by the farmers, majority of the farmers had a large holding i.e., more than 2 hectares.

Table 1. Distribution of farmers based upon the land holding

SN	Category	Freq.	Percent
1	Small	439	16
2	Medium	898	34
3	Large	1315	50
	Total	2652	

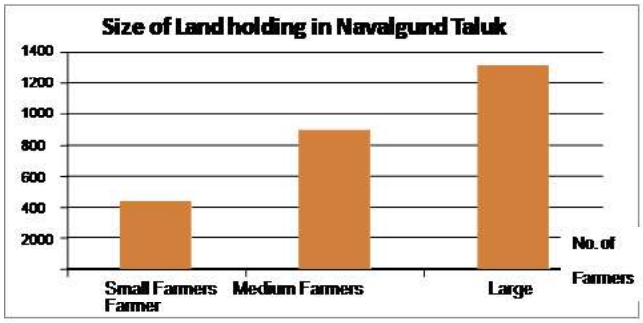

Figure 1. Size of Land holding in Navalgund Taluk

Vandana (2016) conducted a study to know the effectiveness of information communication technology in promotion of SRI method of paddy cultivation among paddy cultivators from Dharwad district of Karnataka state. The study was conducted in an experimental mode for knowledge retention and symbolic adoption by exposing farmers to a combination of extension methods. The analysis of the research revealed that video screening once resulted in 59.55 per cent of symbolic adoption followed by video screening once + mobile advisory + expert mediated group discussion (57.78%), video screening at defined stages (52.89 per cent) and mobile advisory (31.55%) when exposed to different teaching methods.

Major Crops cultivated by farmers

Navalgund taluk of Dharwad district comes under zone 8 (Transitional Zone) of Karnataka. The major crops of the Navalgund taluk are bengal gram, sorghum, wheat and cotton. Among the sample, farmers cultivating major crops of Navalgund Taluk is presented in the Table 2 Figure 2 which indicates that majority of the farmers cultivate bengal gram during Rabi season. Other important crops cultivated by farmers includes sorghum (454), wheat (303) and cotton (201). The area receives both South east and North west monsoon and farmers normally take up green gram, cotton and maize in Kharif while in rabi season major area is sown with bengal gram, sorghum, and wheat.

Table 2. No. of farmers cultivating major crops in Navalgund Taluk

n= 2139

Sl.No.	Crops	Frequency	Percentage*
1	Bengal Gram	1181	55
2	Sorghum	454	21
3	Wheat	303	14
4	Cotton	201	10
	Total	2139	

*Rounded to next nearest number

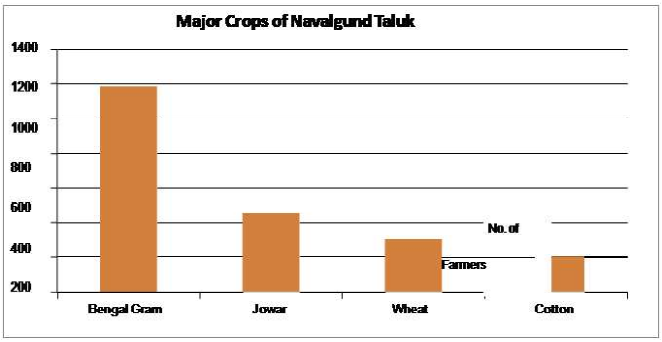

Figure 2. No. of Farmers growing major crops of Navalgund Taluk

Reach of ICT based Extension advisory to farmers

It is interesting to note that farmers growing different crops had received the advisory frequently through ICT enabled service (Table 3 and Fig 3). In case of cotton farmers were able to receive higher frequency of five per farmer, while in sorghum and wheat it was 3.98 per farmer. The lower frequency was observed in case of Bengal gram (2.59 per farmer).It may be noted that farmers access to information has significantly increased in case of ICT based farm advisory services. The advisory received by farmers cultivating cotton was high as the number of insects' pests and disease as well deficiency symptoms are more in cotton. In case of sorghum and wheat advisories are relatively higher due to long duration of crops and farmers might have sought information on nutrient management and other practices. It is clear that farmers make use of the information of improved methods if they are available in time and applicable to field conditions. The results in table 4 reveals that on an average farmers had received 264 to 524 messages per Gram panchayat (GP). As indicated earlier, in each GP minimum 200 farmers had registered, which means on an average they had received two messages per crop or farmer depending upon the crop and cultivated by them. The number

Table 3. Reach of ICT based Extension Advisory in Navalgund Taluk for Major Cropsn= 2139

Crop Name	No .of Farmers	Total number of advisory	Advisory per farmer
Bengal Gram	1181	3061	2.59
Sorghum	454	1968	4.33
Wheat	303	1206	3.98
Cotton	201	1022	5.08

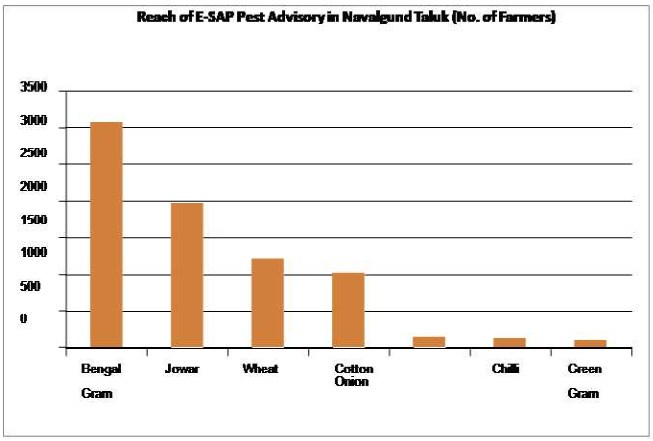

Figure 3. Reach of E-SAP advisory in Navalgund Taluk for Major Crops

of messages delivered in case of Bengal gram is higher as more number of farmers cultivating the crop during rabi season. It can also be noted that all farmers irrespective of the crop had received the farm advisory. It is possible due to digital platform that enable to add information on any crop or specific problem.

ICT services provide critical access to the knowledge, information and technology that farmers require to improve the productivity and thus improve the quality of their lives and livelihoods. (Nandeesha, 2016).

Impact of ICT based advisory services on the yield of important crops

The data in table 4 presents the impact of ICT based farm advisory services on the yield of important crops in the project villages. It can observed that there has been significant improvement in the yield levels of bengal gram, cotton and sorghum crops. In case of bengal gram there has been increase in the yield of 1.09 q per acre (5.42-4.33). which means 25.2 percent incremental yield per acre. Similarly in case of cotton and sorghum the incremental yield was 12.4 and 25.1 per cent, respectively. The increase of yield to the extent of 0.62 q/ac and 1.05 q/ac in cotton and sorghum respectively was observed. The increased yield mainly attributed to best management practices such as nutrient and pest management. Normally farmers due to lack of knowledge use the pesticide, either followed during previous season or seek advice from fellow farmer or else visit input dealers to get the advice. Many a times such plant protection measures are technically not correct and may not necessary. Further they may cause damage to crop in addition to adding to the cost. Hence appropriate and timely use plant protection measures given through ICT based advisory significantly contribute to the yield levels.

Rao *et al.* (2012) studied the impact analysis and experience of e-sagu implementation for cotton crop in Andhra Pradesh. The project mainly aimed at giving IT based personalized agro-

Table 4. Gram Panchayat wise and Crop wise number of Farm advisories in Navalgund Taluk

SL.No	Gram Panchayat	Bengal gram	Sorghum	Wheat	Cotton	Chilli	Green Gram	Onion	GPTotal
1	Alagwadi	111	96	67	122	2	10	2	**410**
2	Belehar	140	90	99	31	3	15	0	**378**
3	Bhadrapura	128	70	50	45	17	0	0	**310**
4	Gudisagara	148	115	64	47	20	0	21	**415**
5	Gummagola	280	37	11	72	0	4	2	**406**
6	Halakusugal	178	133	51	64	0	0	2	**428**
7	Hallikeri	134	134	85	36	9	0	2	**400**
8	Hebbal	117	81	75	81	2	0	7	**363**
9	Ibrahimpur	168	92	66	58	3	13	15	**415**
10	Kalwada	208	154	101	29	1	31	0	**524**
11	Morab	192	170	58	50	10	0	16	**496**
12	Navalli	206	34	44	30	16	2	4	**336**
13	Nayaknur	98	125	61	43	9	0	12	**348**
14	Shaswihalli	191	71	52	50	19	4	1	**388**
15	Shalwadi	128	110	56	30	2	0	9	**335**
16	Shirakola	141	81	53	111	7	3	26	**422**
17	Shirur	142	95	51	81	7	3	19	**398**
18	Shiswinahalli	162	106	63	8	1	2	0	**342**
19	Tadahal	106	129	53	37	2	0	3	**330**
20	Yamanur	103	64	66	16	0	15	0	**264**
	Total	**3081**	**1987**	**1226**	**1041**	**130**	**102**	**141**	

Table 5. Changes in the yield levels after intervention in Navalgund Taluk

SL. No.	Crop Name	Mean		Improvement in Yield (%)
		Before	After	
1	Bengal Gram	4.33	5.42	25.2
2	Cotton	5.02	5.64	12.4
3	Sorghum	4.18	5.23	25.1

advisory system. At field level when comparison was made between project and non- project area, the complementation of the project showed positive results. It was observed that farmers in project area had greater knowledge and technology adoption rate in respect of eight components of new technology as compared to farmers in non-project area. The analysis of the census data obtained from all the farmers covered under e sagu in the post operation stage indicate that all farmers had adopted the technology but at different level of the 18 advices provided to each farmer, 18.00 per cent have adopted in the average of 51-75 per cent, 57.00 per cent have adopted 25 to 50 per cent of advices. About one fourth concentrates in the lower level of adoption. As far as the utility of the project is concerned 78.00 per cent farmers have responded that it is 'more useful ', the remaining as 'useful '.

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