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Effect of communication based extension services on adoption behaviour of farmers

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Abstract
Agriculture prolong to be the most essential sector of the Indian economy and agriculture is a more or less a obligation for livelihood of millions of farmers. Extension plays an imperative role by bridging the gap between research stations and farmers field. The present study was conducted to explore the effect of mobile phone based extension services on adoption behaviour of farmer. The descriptive research design has been used by the researcher. Data were collected through personal interview schedule. Two hundred respondents were selected through the purposive sampling from Bihta and Bikram block of Patna region of Bihar. For the dissemination of information through mobile phones, mobile apps and through social media. It was observed that maximum number of respondents (youth) use mobile phones to get real time assistance from kisan call centre and Kisan Subhidha app and others for the current and update information of agriculture.

Keywords: Communication networking, social influence, mobile apps and social media

Introduction
One of the most important developments has occurred in the last two decade, is the rapid growth of the mobile phone use around the world. Mobile phones have empowered developing countries to spread information networking coverage in the remote areas and rural areas and are getting great benefit out of it. Different studies showed that general application of mobile phones has improved the living standard of poor farmers in developed nations (Duncombe, 2011) [4]. Mobile communications technology has quickly become the world's most common way of transmitting voice, data, and services in the developing countries (Chhachhar *et al*., 2016) [1]. Due to this spectacular change, mobile applications in general and mobile applications for agricultural and allied sector in particular hold significant potential for advancing development. There are various mobile apps has also been developed like M-Kisan, Kisan Suvidha, Nano Ganesh and KRIBCHO Reliance. These apps were easily downloaded from Google Play Store. The apps provides information, markets, finance, and governance systems on affordable ways to millions of people which were previously unavailable.

There are other systems which enhance the capacity of farmers in remote areas such as remote sensing, satellite system and geographical information system (GIS). Information and communication technologies also played a vital role for agriculture and allied sector related services. These technologies provides weather condition and many more infrmation whhich are required to farmers by internet from any place of the world. The Indian government also facilitating farmers and providing easy access to information of market from mobile networking services in remote areas (Shimamoto *et al*., 2015) [9]. In modern information and communication technologies such as 3G and 4G internet, email, Facebook, Twitter and many other social media can also have provided numerous information about the agriculture. There are many online programs are available by which farmers can collect information and also apply such information and methods in their own land for better production of crops. YouTube is also one of the best sources of getting latest information about agriculture development. Because, of the farmers were not well skilled and trained for the use of all these information and services and fortunately and unfortunatly unable to apply all the knowledge in their own working places.

Mobile phones are one of the finest tool of information communication technology (ICT) and every person of the society can take benefit from it. In developing countries mobile phones played an important role in the terms of economics and significantly reduces the gap among communities. Diffusion of information communication technologies in remote areas of developing countries is playing an important role in the agriculture development. Nowadays, it is seen that mobile phone is not so expensive in developing countries and every person can buy it (Anjum, 2015) [3].

Although it is seen that in India low income farmers also have mobile phones and communicate to market and getting good price from customers. Similarly, use of ICTs in agricultural extension services especially mobile phone services in the agricultural sector has provided information on market, weather, transport and agricultural techniques to contact with concern agencies and department (Aker, 2011) [2].

Information and communication technologies especially mobile phones are playing a role of game changer in agriculture development and brought a positive impact on marginal farmers in developing countries (Slavoljub, 2014) [8]. Context-specific information could have higher impacts on the adoption of technologies and increase farm productivity for marginal and small agricultural landholders (Samaddar, 2006) [6]. In different places of rural areas farmers directly communicate with customers and sell their produce and get good benefit from it. Mobile phone accomplish as a connecting links between farmers and buyers. With this farmers also helping each other to reduce the risk of wastage of their good and reached it on time. The importance of mobile phone and their social influence in adoption works in two modes: one that exerts pressure on individuals to adopt, and another that helps to generate benefits via social networks that are tied in with economic and business networks (Silva *et al*., 2011) [7]. The information communication technologies applications have provided many opportunities to solve the problems and issues of rural communities and same time have enhanced the capacity of agriculture production and related information. It is very important to empower the farmers and provided latest information about their agriculture produce timely where farmers can earn good money and reduce the poverty by using communication technology tools (Nagini *et al*., 2016) [5].

Research Methodology

The study has been conducted in Patna district corresponding their outskirts villages in Bihar. In Patna region there were twenty three blocks out of that only two blocks Bihta and Bikram. The rationale of selecting these two area is that large number of mobile users, electricity supply is good and large population is educated. (According to Census 2011 literacy rate is 70.67%). Ten villages (five villages from each block) were selected randomly thus a total of two hundred respondents were selected for the present study.

Results

Mobile based Applications / Services

The study has been done and it is observed that 18.17% respondents use WhatsApp, 12.26% uses Facebook, 13.00% respondents know about kissan suvidha application. Whereas, 11.26% respondents knows about M-kisaan, 11.26% known about Nano Ganesh and 09.27% respondents know about KRIBCHO Reliance, 08.21% respondents also aware about YouTube and 07.23% respondents had knowledge about E-Caupal. Remaining 02.11% uses Twitter. The above data show that many of the people are aware of the application and services provided by governmentforagricultural improvement. The analysis table is shown underneath Table 1.

Table 1: Mobile based Applications / Services used by the respondents

S. No.	Type of mobile phone App/ Services	Frequency	Percentage (%)
1	M-kisaan	23	11.26
2	Kisaan suvidha	26	13.00
3	Nano Ganesh	23	11.26
4	KRIBCHO Reliance	19	09.27
5	E-Caupal	14	07.23
6	E-mails	14	07.23
7	WhatsApp	36	18.17
8	Facebook	25	12.26
9	Twitter	4	02.11
10	YouTube	16	08.21
Total		200	100.00

Responses of usefulness of mobile phones

The study shows that majority (94.50%) of respondents found the mobile phones helpful in chatting with people or connecting with people, where 64.44% found the mobile phones helpful in getting latest information regarding agriculture and allied sectors. Whereas, 49.50% respondents found mobile helpful for using internet facility, 52.00% for connecting with markets, 49.46% respondents found mobile helpful for generating revenue, 43.50% respondents use mobile phones for mobile apps, 49.50% to adopt better agriculture practices, 32.00% for influencing their cropping pattern decisions and remaining, 37.50% found mobile phones to reduce wastage. The above data revealed that people found mobile phones as very useful tool to get various types of information to improve their knowledge in different areas. The analysis table is shown underneath Table 2.

Table 2: Responses of the respondents regarding usefulness of mobile phones

Sr. No	Usefulness of mobile phones	Frequency	Percentage
1	Latest information regarding agriculture and allied	128	64.00
2	To adopt better agriculture practices	99	49.50
3	Influencing of cropping pattern decision	64	32.00
4	Latest market information	104	52.00
5	Reduced wastage	75	37.50
6	Generate revenue	82	41.00
7	Chatting with people	189	94.50
8	For internet	99	49.50
9	For mobile apps	87	43.50

Utilization of mobile phones for farm practices

The study showed that the extent of mobile phones utilization in which 113 respondents were seldomly utilizing, whereas 66 respondents were frequently utilizing, and remaining 21 respondents were never utilized. Through e-mails: 72 respondents were seldomly utilizing, whereas 16 respondents were frequently utilizing and remaining 112 respondents were never utilized**.** Through WhatsApp: 104 respondents were seldomly utilizing, whereas 25 respondents were frequently utilizing and remaining 71 respondents were never utilized. Through Twitter: 90 respondents were seldomly utilizing, whereas 07 respondents were frequently utilizing and remaining 21 respondents were never utilized. Through YouTube: 88 respondents were seldomly utilizing, whereas 21 respondents were frequently utilizing and remaining 91 respondents were never utilized. Through M kisan: 127 respondents were seldomly utilizing, whereas 27 respondents were frequently utilizing and remaining 46 respondents were never utilized. Through Kisan suvidha app: 120 respondents were seldomly utilizing, whereas 17 respondents were frequently utilizing and remaining 63 respondents were never utilized. Through Kisan call center: 106 respondents were seldomly utilizing, whereas 77 respondents were frequently utilizing and remaining 17 respondents were never utilized. The analysis table is shown underneath Table 3.

Table 3: Extent of utilization of mobile phones services in adoption for improved farm practices

S. No	Communication networks	Extent of Utilization		
		Frequently	Seldom	Never
1	Mobile phones	66	113	21
2	E-mails	16	72	112
3	WhatsApp	59	107	34
4	Facebook	25	104	71
5	Twitter	07	90	103
6	YouTube	21	88	91
7	M kisaan	27	127	46
8	Kisaan Suvidha	17	120	63
9	Kisaan call centre	77	106	17
10	KRIBCHO Reliance	27	81	92
11	Nano Ganesh	27	80	93

Impact of mobile apps/services in adoption of farm Practices

The data compiled in the Table shows the extent of adoption of improved practices of respondents according to adoption level of recommended package of improved Wheat production practices. It is evident from the table that these HD-2733, HP-1761, K-8027, C- 306 recommended varieties were adopted by the majority (61.66%) of the respondents, whereas 33.44% had partially adopted and 05.50% have not adopted the recommended practices. Soil type, soil preparation, sowing time and number of irrigation per cent of respondent agreed and fully adopted the recommendation. Spacing between plant to plant was adopted by the 49.34% of the respondents, whereas 39.24% had partially adopted and 13.52% have not adopted the recommended practices. Sowing depth of wheat majority (63.00%) fully adopted while, 24.36% were adopted and 11.24% was not adopted as per the recommended practices. Seed rate the majority (62.24%) of the respondents fully adopted, whereas 20.21% had partially adopted and 17.38% have not adopted the recommended practices. Seed treatment the majority (55.54%) of the respondents fully adopted, whereas 29.33% had partially adopted and 15.13% have not adopted the recommended practices. Cropping system the majority (57.14%) of the respondents fully adopted, whereas 33.34% had partially and 09.52% have not adopted recommended practices. Mixed cropping the majority (60.34%) of the respondents fully adopted, whereas 23.44% had partially adopted and 16.22% have not adopted the recommended practices. Time of sowing the majority (69.54%) of the respondents fully adopted, whereas 22.24% had partially adopted and 07.22% have not adopted the recommended practices. Fertilizer application the majority (61.14%) of the respondents fully adopted, whereas 33.34% had partially adopted and 05.52% have not adopted the recommended practices. Farmed yard Manure (FYM) application the 44.34% of the respondents had partially adopted, whereas 39.12% respondent was fully adopted and 16.54% have not adopted the recommended varieties. Irrigation management (51.30%) of respondents were fully adopted the recommendation while 35.41% were partially adopted and 13.29% respondents did not adopt the recommended practices. Disease protection the majority (57.00%) of respondents fully adopted the recommendation while 30.54% were partially adopted and 12.46% respondents did not adopted the recommended practices. Control measures for pest and insects the majority (51.34%) of respondents fully adopted the recommendation while 35.48% were partially adopted and 13.18% respondents did not adopt the recommended practices. Time of harvesting the majority (54.44%) of the respondents had fully adopted, whereas 44.24% respondent was partially adopted and 05.32% did not adopted the recommended practices. Yield the majority (55.54%) of the respondents had fully adopted, whereas 33. 22% respondent was partially and 11.26% did not adopted the recommended practices that's why yield per cent is low. The analysis table is shown underneath Table 4. Overall level of adoption of improved farm practices of the respondents (Wheat) Table 5.

Table 4: Impact of mobile phone and mobile apps/services in adoption improved farm Practices by the respondents (wheat).

S. No	Practices	Recommendations of improved farm practices	Users					
			Fully adopted		Partially adopted		Non adopted	
			P	F	P	F	P	F
1	Land preparation	Deep plough / 3 harrowing	93	46.44	81	41.33	26	13.33
2	Soil type	Clay loam / Loam texture	200	100	00	00	00	00
3	FYM application	10-15 t/h	102	51.00	71	35.54	27	13.46
4	Variety	HD 2733, HP 1761, K 8027, C 306	123	61.66	66	33.44	11	5.50
5	Seed treatment		111	55.54	59	29.33	30	15.13
6	Seed rate	Normal (100kg/h) / Late (125 kg/h)	124	62.24	41	20.21	35	17.38
7	Time of showing	Irrigated Nov	89	44.34	96	28.00	15	07.57
8	Soil testing	Yes / No	78	39.00	111	55.54	11	05.46
9	Spacing between plant to plant	Normal 20-22.5cm / Late 15-18cm	99	49.34	78	39.24	27	13.52

10	Cropping system	Rice –wheat / Maize – wheat	114	57.14	67	33.34	19	09.52
11	Depth of showing	5 cm	126	63.00	49	24.36	22	11.24
12	Method of showing	Broadcasting / Drilling /Zero tillage	131	65.63	60	30.13	09	04.24
13	Mixed cropping	With mustard, chick pea, linseed	121	60.34	46	23.44	33	16.22
14	Time of showing	October to November	140	69.54	44	22.24	16	07.22
15	Recommended dose of fertilizer (N:P:K)	Timely (120:60:40) / Late(80:40:20)	123	61.14	67	33.34	10	05.52
16	Number of Irrigation	1 to 2 time /1 to 4 time	109	54.34	71	31.11	20	10.55
17	Control of weeds	2,4-D, Isoproturon, Tribunil	99	49.24	79	40.22	22	11.54
18	Disease control measures	Diseases-All rust spraying Mancozeb 75 WP Or Zineb. Loose smut-Vitavex @2.5gm/kg.	114	57.00	50	25.00	36	18.00
	Insect and pest control measures	Insect-Termites 2% Methylparathion@20-25kg/h. Mite, Aphids, Jassids-Endosulfon 35 EC@1.25 l/h in 1000 l water	103	51.34	71	35.48	26	13.18
19	Harvesting time	After 100-120 days of sowing	108	54.44	81	40.24	11	05.32
20	Yield	45-55 q	111	55.54	66	33.22	23	11.26

F: Frequency; G: Grams; P: Percentage; h: Hectare; cm: Centimeter; Kg: Kilogram

Table 5: Overall level of adoption of improved farm practices of the respondents (Wheat) is presented below in the table.

S. No.	Level (Range)	Frequency	Percentage
1	Low (24-33)	45	22.50
2	Medium (34-43)	106	53.00
3	High (44-55)	49	24.50
Total		200	100

Discussion

The income and education of farmers vastly enhances mobile adoption in developing countries, but gender, age and membership in social networks have little impact. The last finding is interesting from the theoretical construct of earlier analyzed adoption models including Van Biljon and Kotze (2008) [18] where social influence is an important determining factor, which perhaps Chabassou *et al*. (2009) implicitly attempted to measure through membership in various social networks and clubs. Social pressure also influence in mobile phone adoption in a way that provides some useful and comparable quantitative explanations. Instead of the previously used membership in social or community group proxies, we use a new measure: the adoption status of the respondent's closest circle of contacts (friends, family, business contacts etc). We postulate that the more people in one's circle that have adopted, the greater will be the social influence or social pressure towards his or her adopting. Thus the expected sign for "number of top five contacts having a mobile phone" is positive. Chen and Sutano (2007) [14] propose "social coercion, social imitation and social normalization" as key processes by which social pressure is applied. Others have also explained this process (Segrest *et al*., 1998; Chen and Wong, 2003) [17, 15]. In the Harvard Business Review 20 breaking ideas for 2009, Goldstein (2009) [16] explaining how to harness social pressure, shows that people are much more likely to adopt if others who are like them also adopt. In terms of perceived benefits we find non-adopters not very different from adopters in terms of placing value on benefits from mobile phones. While emergency benefits seem to be the same there is a slight drop in perceived social and economic benefits. This is perhaps due to the fact that they anyway have access to phones even though they do not own their own (Silva *et al*., 2011) [7]. Thus, the areas of extension service attracted reasonable levels of disappointment among farmers'. This finding is somewhat steady with the findings of Ganpat *et al*. (2014) [12]. A farmer's emotion that he is not being asked or visited, rather other neighbouring farmers are receiving service, provoke sentiments of neglect and inequality. But the fact is well confirmed by the past researchers such as Kumar *et al*. (2012) [13] and Babu *et al*. (2012a) [11], which indicated that due to imperfect resources and imperfect number of extension personnel, the extension services are not being provided at preferred level of satisfaction of the farmers and it can be possible to improved after the participation of other agencies like media and other private or non-government organizations (NGO's)-following the pluralistic extension approach and public-private partnership (PPP). As stated by Kamini *et al*. (2016) [10], online social network like 'Whatsapp' is the influential means to deal with many areas of agriculture and its development. As such, most of the farmers in villages now have access to mobile phones and internet. And even the Government of India has initiate a new initiative named 'Digital India'.

Conclusion

The result of the study shows that various types of mobile app and services used by farming youth like WhatsApp (18.17%) followed by Kisan suvidh, Facebook etc. Most of the respondent uses mobile phone for latest information regarding Agriculture and allied sector, followed by market information. Mobile phones are very helpful in adoption of improved farm practices. Overall level of adoption of improved farm practices of the respondents were medium level. Respondents are not well educated up to that level and not more aware about importance of apps. Therefore, it is urgent need over there that government should provide technical education and proper information about use of technologies so, that farmers can get benefit and improve their living standard.

Conflict of Interests

The authors declare that there is no conflict of interests.

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