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Institutional innovations in technology transfer- Mobile agro advisory services and its impact in adopting improved cultivation practices

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ABSTRACT

The rising spread of mobile phone shows it's potential as a source of information for providing farmers the timely and right information which enable him to respond to different types of risk, market incentives and competition more efficiently. The hypothesis of this study is that providing information about improved cultivation practices through mobile phones may accelerate the process of adoption of new technologies by the farmers. In order to provide agro advisory services through mobile phones, fifty five farmers from two villages under the project "Cyber Extension Model for Agricultural Development: An Action Research" i.e. Sidhauli and Kasmanda blocks of Sitapur district of Uttar Pradesh was selected purposively. In selecting the sample for this research, mobile phone ownership was kept in mind. To strengthen the information base of the farmers, Short Message Service (SMS) regarding improved cultivation practices of wheat and mustard crops were sent to the farmers. This study shows that majority of the farmers agreed that mobile phone is the best instrument to get timely information (87.0%); to increase the access of information (87.0%); to overcome physical barriers (82.0%). Although, mobile phones play an important role in accessing the information about improved cultivation practices, the farm resources such as inputs, labour, machinery, seeds, fertilisers, pesticides, energy, storage facilities, irrigation and affordability by the farmers may become a serious constraint in adopting any particular technology. This study also reveals that permanency of the information and overcoming the illiteracy by SMS and voice calls respectively is equally preferred by the farmers. Both technologies has to be used depending upon the nature of information and literacy level of the farmers.

Keywords: Mobile phone, SMS, mustard, wheat cultivation practices

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Institutional innovations play a critical role in technology transfer. As technology develops over the period of time, the process of technology transfer also takes different dimensions. The 1980s saw most of the states embracing the World Bank funded Training and Visit (T&V) system of extension. With external support drying up, the states began to dilute the rigour of T & V system and the 90's

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saw many states experimenting with new extension approaches (Rasheed Sulaiman V, 2003). For example, integrated technology transfer models such as Integrated Whole Village Development Approach (1985), Effective Utilization of Mass Media in Agricultural Development (1985), Single Window System (1986), Farmer-to-farmer Quality Seed Production Programme (1988), Entrepreneurship Development (1995), Rural Social Centre Concept (2003), Gender Empowerment with Self Help-Groups (1998), IT-based Expert System of Extension (2003), Gender Empowerment Development Strategy (2003), Indigenous Knowledge System (2003), Farming System Research and Extension (2002), etc. were operated in different parts of the country (K. Vijayaragavan, 2014).

But sill, extension service is relapsing mainly due to poor access to agriculture-related information by small and marginal farmers, who form the bulk of the farming population, living in remote areas. This problem is aggravated by lack of extension personnel to deliver the information at the doorstep of the farmers. In India, the ratio between extension worker and farmer is very wide, which is 1:2000. In the last decade, the Information and Communication Technology (ICT) revolution has taken place with the major role from mobile phones, led to unprecedented capacity for dissemination of knowledge and information to the rural population. Due to the well organized National Agricultural Research System (NARS), the availability of information is plenty. Like the yield gap (which exists at the final stage of the crop production), there is information gap (which exists in every stage of the crop and to sales) too. The first and foremost thing needed to bridge the yield gap is bridging the information asymmetry that exists between lab and land. The recent introduction of Information and Communication Technology (ICT) enabled information services provide a means to overcome existing information asymmetry.

Access to ICT can have a tremendous positive impact on sustainable development and poverty reduction (Torero and Braun, 2006). The increasing penetration of mobile networks and handsets in rural areas provides an opportunity to make useful information more widely available. Mobile phones can act as a catalyst to rejuvenate the collapsing extension services by bringing better interaction among the stakeholders in the country.

Table 1: Perceptions of respondents about SMS

N = 55

Sl. No.	Statements	Percentage	Rank
1	Feeling proud to get SMS from IARI	100.00	I
2	There is a need for expanding the information range	92.00	II
3	Mobile phone is the best instrument to get timely information	87.00	III
4	Mobile phone is the best instrument to improve access to information and services	87.00	IV
5	Mobile phone is the best instrument to overcome physical barriers	82.00	V
6	Mobile phone is the best instrument to disseminate information	80.00	VI
7	Feeling proud to get information faster than neighbors	75.00	VII
8	Better information lead to better yield	75.00	VIII
9	Satisfied with the range of information provided	60.00	IX
10	Receive SMS from other than IARI	42.00	X

In India, lots of studies are conducted on adoption of improved technologies by farmers and they say that only a meager percentage of farmers adopt such technologies. The major reason behind this scene is that poor access to information, which impedes the transfer of technology at the farm level. Information is a prerequisite to adopt such improved technologies. According to Anderson *et al*. (2007), information is one of the key inputs to productivity growth. The results of the situation assessment survey of farmers conducted by the National Sample Survey organization (NSSO, 2005), GoI reveal that only 40 per cent of the farmer households have access to information about the new farming technology. The traditional knowledge and experience is of no help to farmers of today, as the technology is changing rapidly at every moment.

The dynamics of the agriculture sector demands that conventional wisdom and extension systems need to be restructured and modernized. The access to consistent,

reliable and quality information by a farmer has an extensive and multifaceted role in agriculture and is of utmost important before taking any technology to his field. Providing farmers the timely and right information through mobile phones enable him to respond to different types of risk, market incentives and competition more efficiently. The rising spread of mobile phone with its additional integrated functions such as SMS, Voice messages, MMS, GPRS *etc.*, shows its potential as a source of information for farming which makes it more resourceful.

As more and more farmers gain access to mobile phones, input companies, government agencies and non-governmental organizations are looking as an opportunity to deliver agro advisory services through mobile phones. It not only saves time and travelling cost of the farmers but for the extension workers too. Actually, it complements the traditional extension. So it is like win-win situation for both of them. But how best it is going to work depends on how mobile networks are able to link the farmers to required information in a timely and accurate manner.

Methodology

In order to provide agro advisory services through mobile phones, the operational area under the project "Cyber Extension Model for Agricultural Development: An Action Research" i.e. Sidhauli and Kasmanda block of Sitapur district of Uttar Pradesh was selected purposively. From the above mentioned two blocks, two villages were selected purposively in Sitapur district of U.P. In selecting the sample for this research, mobile phone ownership and SMS agro advisory were kept in mind. Hence, the sample consisted of fifty five farmers from two villages. To strengthen the information base of the farmers and to bridge the information gap among the farmers, it was decided to send Short Message Service about the improved cultivation practices of wheat and mustard crops. This study adopted an exploratory approach to find out the impact of SMS among the farmers. Data was collected by using a structured interview schedule with a focus group discussion. This study was mainly focussed on providing advisory services on cultivation practices of wheat and mustard crop. The hypothesis of this study is that providing information about improved cultivation practices through mobile phones may accelerate the process of adoption of new technologies by the farmers. The main focus of this study is assessment of impact/adoption of improved cultivation practices by the respondents.

Results and Discussion

To start the SMS service, first, content related to wheat and mustard cultivation practices was collected from various sources, and then this content was screened and formatted to fit into SMS capsule. Then, it was translated into local language 'hindi', and then with the help of SMS service provider, it was sent to farmers from project location. The entire process is systematically presented in the following fig. 1.

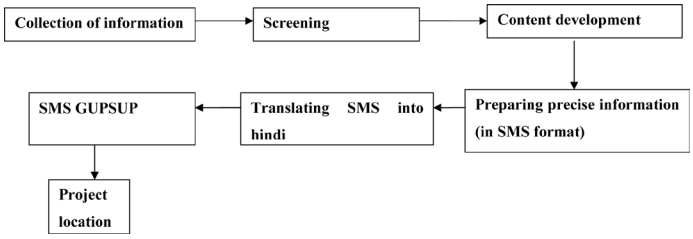

Fig. 1: Preparation and delivery of information

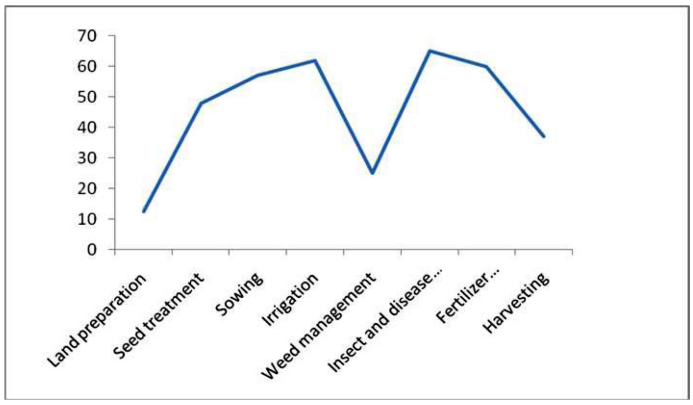

Fig. 2: Adoption of information/mobile agro advisories on wheat

All the respondents (100.0%) were having the proud feeling of getting SMS from Indian Agricultural Research Institute (IARI). About 92 per cent of the respondents told that to start the SMS service in other crops with a variety of information (not just the information from sowing to harvesting). And the farmers agreed that mobile phone is the best instrument to get timely information

(87.0%); to increase the access of information (87.0%); to overcome physical barriers (82.0%). Because farmers believe that information is crucial for attaining high yield (75.0 %), and 42 per cent of the farmers received SMS other than IARI from Ambarpur KVK and KVK Bhatia, Manpur block, Sitapur district, and they told that some farmers from their area even getting SMS from reliance company. One crucial information sent by reliance company was that future price of mentha may go down; the farmers who followed the advice and did not cultivate mentha were avoided loss. The study by Jensen (2007) on impact of mobile phone use by Kerala fishermen found that the introduction of mobile phones decreased price dispersion and wastage by facilitating the spread of information, which made markets more efficient and enhanced both consumer and producer welfare.

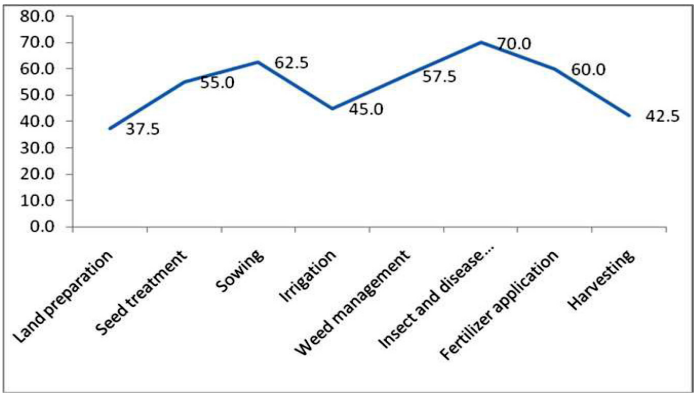

Fig. 3: Adoption of information/mobile agro advisories on mustard

Before studying the impact of SMS on adoption of improved wheat and mustard cultivation practices, The SMS content was validated among the 25 extension personnel from KVK, Ambarpur, Sitapur district and farmers on seven parameters on a response pattern comprised of disagree, neutral and agree categories with the score value of 1, 2 and 3 respectively.

As far as mean scores were concerned, highest mean score (2.60) was given to SMS content was related to needs of the farmers, followed by SMS bridges the information gap (2.44), SMS content was easily understood (2.32) *etc*.

From the above table 3, it is clear that almost all the respondents got the SMS on wheat cultivation practices. But only 82.00 percent of them reported that SMS was compatible and among them only 63.0 per cent of them could read SMS. All the respondents (100.0%) reported that SMS was regular and on time. Aker, 2011 in her study reported that mobile phones have the potential not only to reduce costs, but also allow for more regular and timely access to information. According to Bertolini (2004), knowledge and information are important factors for accelerating agricultural development through increased production and improved marketing and distribution.

Table 2: Validation of SMS content among the respondents

N=25

Sl. No.	Items	Response (%)			Mean score
		DA	N	A	
		(1)	(2)	(3)	(out of 3)
1	SMS was comprehensive	32.0	20.0	48.0	2.16
2	Content was easily understood	28.0	12.0	60.0	2.32
3	Content was related to needs of the farmers	20.0	0.0	80.0	2.6
4	SMS was delivered systematically	48.0	0.0	52.0	2.04
5	Text is easy to read	36.0	12.0	52.0	2.16
6	Font type and size is readable	8.0	60.0	32.0	2.28
7	SMS bridges the information gap of rural people	28.0	0.0	64.0	2.44

DA= Disagree; N = Neutral; A = Agree

And the usefulness of SMS varied from practice to practice. About 72.00 per cent of the respondents reported that the SMS regarding fertilizer application was most useful followed by insect and disease management (70.0%).

Adopting the practice i.e. information, which was sent through mobile phone to the respondents also varied from practice to practice. The advisory regarding insect management practice was mostly adopted by the respondents (65.0%) followed by fertilizer application (60.0%). This may be due to the reason that fertilizer dose, pest & disease management are the crucial information which help the farmers in saving inputs, labour and money. The fig. 2 shows the adoption/

Table 3: Wheat cultivation practices

N=55

Wheat Package of Practices	Did you get SMS		Did the SMS was compatible		Was the SMS on time		Was the SMS regular		Did you read SMS		Was the SMS useful		Did you follow the advisory	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*F*	%
Land preparation	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	13	25.0	7	12.5
Seed treatment	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	35	65.0	31	57.0
Sowing	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	29	54.0	26	48.0
Irrigation	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	37	68.0	34	62.0
Weed management	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	24	44.0	13	25.0
Insect and disease management	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	38	70.0	35	65.0
Fertilizer application	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	39	72.0	33	60.0
Harvesting	55	100.0	45	82.0	55	100.0	55	100.0	35	63.0	22	41.0	20	37.0

Table 4: Mustard cultivation practices

N = 55

Mustard cultivation practices	Did you get SMS		Did the SMS was compatible		Did you read SMS		SMS was regular		Was the SMS on time		Was the SMS useful		Did you follow the advisory sent through SMS	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Land preparation	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	15	37.5	15	37.5
Seed treatment	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	23	57.5	22	55.0
Sowing	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	18	45.0	25	62.5
Irrigation	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	30	75.0	18	45.0
Weed management	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	32	80.0	23	57.5
Insect and disease management	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	35	87.5	28	70.0
Frost management	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	28	70.0	0	0.0
Fertilizer application	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	35	87.5	24	60.0
Harvesting	55	100.0	45	82.0	35	63.0	55	100.0	55	100.0	22	55.0	17	42.5

following of practices on wheat by the farmers based on mobile agro advisories.

From the above table 4, it is clear that almost all the respondents got the SMS on mustard cultivation practices. But only 82.00 percent of them reported that SMS was compatible and among them only 63.0 per cent of them could read SMS. All the respondents (100.0%) reported that SMS was regular and on time. And the usefulness of SMS varied from practice to practice. About 82.50 per cent of the respondents reported that the SMS regarding fertilizer application and insect & disease management was most useful followed by (87.5%). Adopting the practice i.e. information, which was sent through mobile phone to the respondents also varied from practice to practice. The advisory regarding insect & disease management practice was mostly adopted by the respondents (70.0%) (a recent study by the World

Bank identified disease information as one area where mobile applications can promote agricultural and rural development) followed by fertilizer application (60.0%). It depends on many factors including availability of inputs, labour machinery, seeds, fertilisers, pesticides, energy, storage facilities and irrigation and affordability by the farmers. These farm resources may become a serious constraint in adopting any particular technology.

And more over, agriculture is one such profession where traditional knowledge predominates generation to generation and one simple message may not sparkle the mind of the farmers who are doing agriculture for many years. Study by Abadi Ghadim & Pannell 1999; Foster & Rosenzweig 1995 reveal that imperfect knowledge of the technology as a barrier to adoption decreases with experience. The following fig. 3 shows the adoption/ following of practices on mustard crop by the farmers based on mobile agro advisories

The information, which received through mobile in the form of SMS by the farmers led to an increase of yield of wheat and mustard crops. This may be due to increased knowledge of the respondents about the improved cultivation practices. This is in line with the findings of S. R. Verma *et al.*, who in their study found that mobile phone users possessed more knowledge about improved cultivation techniques than non-users of mobile phone. The economic efficacy of sending one SMS per farmer was calculated. The cost of sending one message to one farmer was 14 paise. In total, a farmer received 120 messages regarding wheat and mustard cultivation practices in a year. Hence, the cost of sending Sms to one farmer was ₹ 16.80 (Table 5).

There was a yield difference of 68.75 kg/ha in case of wheat and 52.3 kg/ha in mustard was noticed between the farmers who received seeds as well as mobile agro advisory services from the institute. This additional yield incurred an additional income of ₹ 921.25 and ₹ 1725.9 for wheat and mustard crops respectively. The de Silva and Ratnadiwakara (2008) study also found that gherkin farmers in Sri Lanka were able to improve their incomes through simple mobile phone applications. The study found that up to 40 per cent of crop loss could be prevented with quick interventions facilitated by information received via SMS. According to Bhatnagar *et al*. (2008), the contribution of ICT can be felt at all stages of the agricultural cycle; the impact may be in quantifiable gains such as increase in income and improved yield.

The focus group discussions with the farmers of Sitapur district, Uttar Pradesh, yielded interesting findings that SMS and voice message are equally important. IN SMS, the major lacunas are many of the handsets are not supporting local language; limits of characters to send large information; and majorly illiteracy among the farmers. But still, SMS has its own merit that permanency of the information, which is not possible in voice calls even though it overcomes language barriers, character limitation and illiteracy. But still some farmers who are literate prefer text message because there is clarity of information in case of complex message; quantity specific message (fertilizer dose, pesticide dose *etc*.). The farmers requested to fix a day or two in a week to send SMS on any time so that they will be conscious to read the message otherwise they may ignore it. It is due to the reason that farmers were getting so many calls and messages from commercial SMS service provider in a day. These types of spurious messages irritate and distract the farmers from reading the agricultural SMS, which facilitate interaction, sharing of experiences on farming practices and learning among farmers. The spurious messages create a very casual attitude among

Table 5: Economic efficacy of SMS based agro-advisory in wheat and mustard

Sl. No.	Crop	Increased Yield * (Kg/ha)	Total increased income (₹/ha)	Cost of sending SMS (₹/farmer)
1	Wheat	68.75	921.25 (@ ₹ 1340/q (market price)	16.80
2	Mustard	52.3	1725.9 (@ ₹ 3300/q (market price)	

* Yield difference of farmers received IARI Seed and SMS and farmers using IARI seed but not received SMS

* 120 SMSs per farmer@ 14 paise per SMS

the farmers that it may be some commercial unwanted message. And the farmers suggested that a specific ring tone may be assigned for all agricultural messages from the service provider side if possible, which may alert the farmers about the importance of the message. The farmers wanted SMS service for potato, bengal gram, sugarcane, paddy, and mentha.

Other than cultivation practices, the farmers wanted market and weather information such as probability of rainfall, frost and temperature. Such information can play a central role in the assessment of suitability and risk of going for a particular crop in a particular season. Qiang *et al.* 2011, in their study mentioned that one of the main challenges of scaling up m-applications in developing countries was providing highly targeted and granular services.

One farmer maintained a SMS record to keep an entry of messages received from IARI. Whenever he gets SMS, he used to write it down in register and showed it to his fellow farmers. He shared his knowledge/information with other fellow farmers. This is an unique example of farmers' own network and a clear evidence of farmers get the information through their own social networks. de Silva & Ratnadiwakara 2008 in their study found that farmers get the information through their own social networks.

Conclusion

This study shows that, although, mobile phones play an important role in accessing the information about improved cultivation practices, the adoption of such practices depend on many factors including availability of inputs, labour, machinery, seeds, fertilisers, pesticides, energy, storage facilities, irrigation and affordability by the farmers. Mobile phones cannot substitute for face-to-face interaction and their use to deliver information has to be complemented with other information sources. It has to be culmination of voice and written SMS depending upon the type of information. The findings of present investigation will be useful to researchers & policy makers to formulate effective strategies in mobile agro advisory services to reach the unreached.

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