# Mobile Phones for Agricultural Extension in North India

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## ABSTRACT

The Indian economy is largely an agriculture based economy. Majority of Indian farmers fall under small and marginal category. Their farming system is characterized by small and scattered holdings, low production and small market surplus, poor storage and transportation facilities, lack of credit and lack of access to information. Information is one of the inputs that significantly determine their ability to earn a sustained livelihood from agriculture. Traditionally, mass mediated broadcasts supported by trained agricultural extension personnel formed the backbone of agricultural extension system in India. However, actual impact of the public extension system in India is limited by logistics, resources, skills and sheer numbers. In this context, use of ICTs is widely seen as a way of addressing the information needs of farmers. This paper is based on a study carried out to examine the use of mobile phones for disseminating agricultural information in the North Indian state of Uttarakhand. Main objectives of the study were to find out the extent of ownership of mobile phones by the farming community, their use for seeking agricultural information by the farmers and to understand the factors that influence usage of mobile phones by farmers. Ease of use, message comprehension, usefulness of information, trustworthiness of information and cost of the service were studied to understand factors that influence use of mobile phones by the farmers. The study concludes that mobile phones were mostly being used to fulfil social needs and their developmental use was incidental.

**Keywords:** *Mobile phones, agriculture, innovation, IFFCO-Airtel Green Card, India*

## INTRODUCTION

Agriculture is a key sector of the Indian economy. The sector contributes approximately 18% to the national Gross Domestic Product (GDP), besides providing employment to around 58%

of the workforce. Further, the sector contributes significantly towards India's export earnings and is an important source of raw material for many industries. Hence, the continued and sustained growth of agriculture sector is essential to meet the food and nutritional security of a growing population, provide livelihood and income generation opportunities in rural areas and for steady growth of industry sector.

The share of agriculture sector in India's GDP has shown a progressive decline over the years. From 3.5% per year in 1981-82, it has come down to a mere 1% per year in 2004-05. This decline in contribution to GDP has gone hand in hand with a steady decrease in public investment in agriculture. Planning Commission (2008) notes that this problem has been accompanied by an unfortunate trend over the years to cut back on essential staff, particularly in extension departments. As a result, extension wings, across the country, are severely understaffed. Information is one of the key inputs in agriculture. In India, the task of providing agricultural information to the farmers is primarily with the government agencies or the Public Extension System.

According to the National Commission on Farmers, knowledge gap constraints agricultural productivity in India. FAO (1999) asserts that that more than 50% of the difference in productivity between India and developed nations (say the U.S.A) can be attributed to knowledge gap and surpasses differences in yield arising due to size of the holdings (as cited in Jacobson & Asokan 2007: 292). The existing gap in productivity between trial and farm conditions is due to the less than optimal performance of the public extension system especially *Krishi Vigyan Kenrdas* or Farm Science Centres (Planning Commission 2008). It has been noted that individual contacts through field level staff are limited by logistics, resources, skills, sheer numbers and the difficulty faced in building rapport with farmers. On the other hand, mass mediated messages are too general to be of much use and usually serve only as a reminder for regular field operations (Gandhi et al. 2007). Further, government run public extension system has a poor track record of reaching small and marginal farmers (Parikh 2007). All these factors combine to result in an information deficit situation where about 85% of the farmers—usually small and marginal—do not have access to a reliable source of agricultural information (Planning Commission 2008).

Against this backdrop, Information and Communication Technologies (ICTs) are being seen as a viable alternative to overcome the constraints faced by the Public Extension System. Their rapid growth and spread, especially in rural areas, present an opportunity to effectively reach millions of farm families. ICTs can help by enabling extension workers to gather, store, retrieve and disseminate a broad range of information needed by farmers, thus, transforming them from extension workers into knowledge workers (Meera et al. 2004).

## ICTS FOR AGRICULTURE DEVELOPMENT – A REVIEW

At present, there are over 200 ICT enabled development interventions in various stages of implementation across the country. Most of these include some component related to agriculture (Chattopadyay 2005). Initially, ICT enabled development projects in India started off with telecentre or community information kiosk model. Later on, however, it was realized that telecentres are faced with sustainability issues due to low usage of development content (Barala 2006; Veeraraghavan et al. 2006). Studies on usage and impact of telecentres led to search for alternative models and tools. An expanding rural mobile market and increasing

ownership of mobile phones in rural areas led to mobile phone based initiatives. Faced with sustainability issues, some of the PC based initiatives were redesigned into mobile phone based systems (for example; Warana project).

Several researchers have convincingly argued that telephones are more important than PC based systems in developing countries (Duncombe & Heeks 1999; Donner 2006; Rashid & Elder 2009) and a special case has been made out for mobile phones. Mobility, less reliance on infrastructure and basic literary for operation, technological versatility and innovative payment mode have been cited as some of the reasons for their greater suitability to meet the information needs of the less developed nations. Jensen's (2007) study in the state of Kerala, India, showed that adoption of mobile phones by fishermen translated into direct economic benefits. In this case, mobile phones helped in reducing price dispersion, elimination of waste, and adherence to one price, thereby benefiting both fishermen and traders. Aker (2009) reported that the use of mobile phones had a positive impact on the way local consumer goods markets operate in Niger. Mobile phones helped in reducing costs and gave traders access to a wider market. This in turn led to a harmonization and reduction in prices which eventually benefited the consumers.

In a study with small holder vegetable growers in Sri Lanka, de Silva and Ratnadiwakara (2010) concluded that mobile phones can significantly reduce transaction costs and encourage small holders to participate in commercial agriculture. Veerarghavan et al. (2009) indicated that mobile phones have significantly reduced the cost of doing business by a sugarcane cooperative in the state of Maharastra, India. This project (Warana Unwired) "demonstrated a successful pilot in which an existing system of PC kiosks, set up by a sugarcane cooperative, was replaced by one using mobile phone-based kiosks to perform the same function." They point out that, while the tangible short-term gains for individual farmers were not marked, there was a tangible benefit to the cooperative, which ultimately supports the farmers in their profession. In a study conducted with gherkin farmers in Sri Lanka, it was found that mobile phones can be used to reduce wastage through a simple feedback system. In this case, text messages were sent to the farmers on a daily basis giving details of amount of gherkins rejected and the reasons for same, so that they could take immediate remedial measures (Soysa 2007). From a study conducted with farmers across three states and two Union Territories in India, Mittal et al. (2010) concluded that, for many of the farmers mobile phones were the only convenient mode of communication. In this case, mobile phones were being used in agriculture to deliver services that enhanced agricultural productivity. However, "realising the full potential benefits of mobile phones is limited, by a set of constraints that prevent farmers from fully leveraging the information they receive. The barriers apply more to small farmers; large farmers are able to leverage the benefits of information they can access."

Mobile phones have several advantages over telecentres. These advantages include mobility, lower cost, simpler infrastructural requirement, ease of use, wider reach and availability, and low dependency on written word. However, very little is known about the actual usage of mobile based systems by the farmers for accessing agricultural information. Hence, the present study was taken up to find out the extent of ownership of mobile phones by the farming community, their use for seeking agricultural information by the farmers and to understand the factors that influence farmers' usage of mobile phones for seeking agricultural information?

## DIFFUSION THEORY AND ADOPTION OF ICTS

Several other theories have been put forth to explain factors affecting users behaviour regarding adoption of end user technologies like mobile phones. Among these, Technology Acceptance Model (TAM) proposed by Davis (1989) has been widely used, accepted and tested. Davis' model is based on the premise that attitudes affect intentions, which in turn leads to certain kind of behaviour. To explain user acceptance behaviour, Davis proposed two constructs; viz; "perceived usefulness" and "perceived ease of use". Both these independent variables represent the end users' belief in technology and can be used to predict their attitude towards the technology and its ultimate acceptance. Perceived usefulness has been defined as "the degree to which the person believes that using a particular system would enhance his or her job performance". Further, perceived ease of use is "the degree to which a person believes that using a particular system would be free of effort".

A set of external variables influence "perceived usefulness" and the "perceived ease of use". Despite the vastly different fields of application both Davis' model and Rogers' theory have certain commonalities. Diffusion research indicates that "perceived ease of use" interpreted in terms of complexity plays a prominent role in the adoption of an innovation. Similarly, "perceived usefulness" as manifest in the form of relative advantage and compatibility significantly influences adoption of innovations. In fact, studies indicate that compatibility, relative advantage, and complexity have the most significant relationships with adoption across a broad range of innovations. However, socio-personal characteristics of the potential adopters significantly influences "perceived ease of use" and "perceived usefulness".

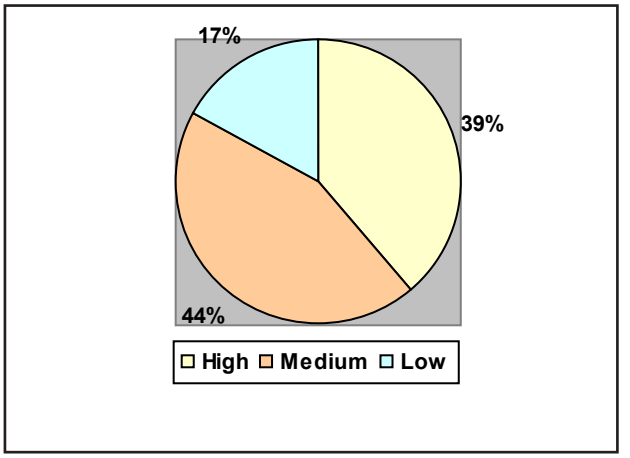
## METHODOLOGY

Indian Farmers Fertilizer Cooperative Limited (IFFCO) is primarily a fertilizer producing unit and has the largest market share in fertilizer production in India. Apart from production and marketing of fertilizers, IFFCO also provides other agricultural services like crop insurance, agricultural extension, soil testing facilities, etc., to the farmers. Realising the importance and benefits of Information and Communication Technologies (ICT) for the overall development of rural India, IFFCO implemented a special project under 'ICT Initiatives for Farmers & Cooperatives' and IFFCO Kisan Sanchar Limited (IKSL) is an outcome of this initiative. IKSL is a joint venture (JV) company between Indian Farmers Fertilizer Cooperative Limited (IFFCO) and Bharti Airtel in which IFFCO has 50% stake and Bharti Airtel and Star Global have 25% equity each. Bharti Airtel Limited is a part of Bharti enterprises and is one of India's leading integrated telecom service provider. Under IKSL, IFFCO leverages its network of distribution centres to provide services and connectivity in rural areas through Bharti Airtel. The joint venture company offers "IFFCO Airtel Green Card" through IFFCO run societies across the country. Under the scheme, affordable mobile handsets have been bundled with Airtel mobile connection. All the farmers having IFFCO Airtel Green Card have access to five free voice messages related to agriculture on a daily basis. In addition, the farmer can call a dedicated helpline (Helpline number- 534351) to seek answers to specific queries.

IKSL services were launched in Uttarakhand state in 2008 where the present study was carried out. All the subscribers were contacted individually by the researcher for data collection. Data collection was done using an in-depth interview schedule. As the respondents

were scattered over a large geographical area, interview schedule was administered through telephonic as well as face to face interviews.

**Figure 1: Socio-economic status of the respondents**




## FINDINGS

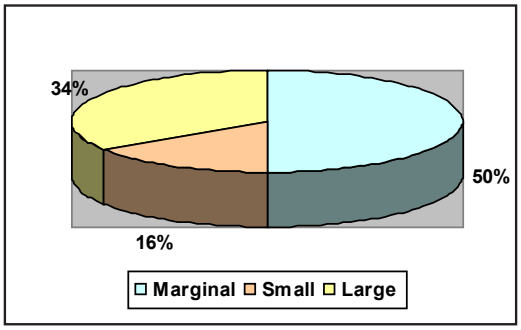
The first objective of the study was to find out the socio-economic characteristics of the users. This was to ascertain whether the services of IFFCO Kisan Sanchar Limited (IKSL) were being availed by all categories of farmers or was confined to a particular section of the farming community, possibly enhancing the digital divide. It was found that a large percentage of respondents belonged to the medium socio-economic category (44%). Out of the total number of farmers who subscribed to IFFCO Airtel Green Card in the study area, 39% respondents belonged to the high socio-economic category and 17% to the low socio-economic category. Subscribers belonging to the low socio-economic category were least in number as IFFCO works through "progressive farmers", who are easy to convince, have necessary resources to adopt innovations and bear consequent risks and fulfil mandatory targets. This "trickle down" strategy hopes to use large-scale farmers, who are in close contact with the extension system, as a role model.

Findings of the study indicate that majority of the farmers (67.14%) were below 35 years in age. This confirms findings from earlier studies which suggest that younger age groups are more likely to adopt innovations faster than older age groups. However, there were also a substantial number of users (17.14%) above 45 years in age. This can be explained by the fact that most of them not only have higher socio-economic status but were also members of the IFFCO *Samiti* and had high extension agency contact. Farmers belonging to the middle age group (15.72%) were mostly from the medium socio-economic category and reported buying IFFCO-Airtel Green card on recommendation of fellow farmers.

An overwhelming majority (94.29%) of the farmers who subscribed to IFFCO-Airtel Green card and used mobile phones for accessing agricultural information were men. Women farmers who were using mobile phones under the scheme were from female headed households and decision making power was vested with them. The low percentage of female adopters can also be attributed to the fact that very few of them are members of the IFFCO *Samiti* and they were not approached by male extension agents due to socio cultural barriers.

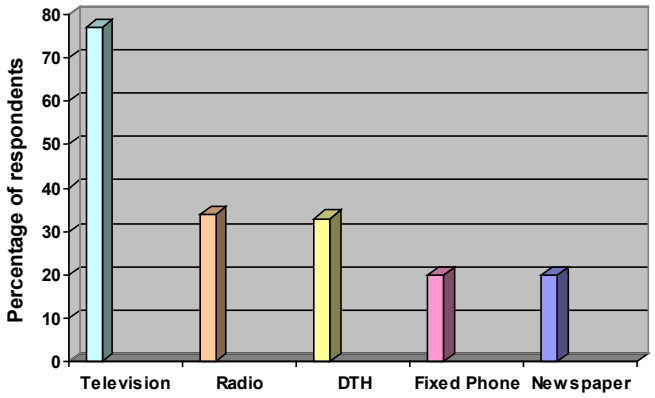
This study supports earlier research which indicates that education is positively related with the adoption of innovations including mobile phones (Donner 2006; Sarin and Jain 2008). It was found that, 90% of farmers in the sample received at least a primary education. It was observed that only 31.43% respondents relied on agriculture as their primary occupation. Most (68.57%) were primarily engaged in some other allied activity like fishery, poultry, horticulture, vegetable growing and floriculture. Some of these respondents, for whom agriculture was a secondary occupation, had bought IFFCO Airtel Green card due to cheap calling rates available on these special connections meant for farmers. Others reported that they were not aware of agricultural information services available on their mobile phones but realized the benefits only after they had started using the service. This observation confirms earlier findings which indicate that individual's whose primary occupation is agriculture take up agricultural innovations earlier when compared to individuals engaged in other activities (Nadre 2000).

**Figure 2: Land holding pattern among respondents**




Half of the users of IFFCO Airtel Green card were marginal farmers with a landholding size up to 2.5 acres. Farmers having more than five acres of land constituted 34% of the users. Small farmers having 2.5 to 5 acres of land constituted 16% of the respondents. Though, majority of the farmers had marginal land holding, their socio-economic status was high and they also had higher disposable income.

**Figure 3: Media ownership pattern in the study area**



Analysis of the media ownership pattern indicates that farmers have access to a wide range of media including television, radio, fixed and mobile phones and newspapers. It was found that television was owned by a high percentage (77.14%) of respondents out of which 43% had Direct to Home (DTH) facility available on their TV sets. In addition, 34.29% respondents owned radios, but few among them listened to it. It was found that 20% respondents had newspaper subscriptions and fixed landline phone connection. Newspapers were restricted to a small number of literate farmers who reside close to towns/ urban centres and many farmers (non subscribers) reported reading newspapers at the village grocery/tea (*chai)* shop. Fixed landline phones were also restricted to a small number of farmers from the plains due to lack of necessary infrastructure in the hill districts.

Five aspects; viz; ease of use, message comprehension, usefulness of information, trustworthiness of information and cost of the service provided by IKSL were studied to understand factors that influence use of mobile phones by the farmers.

- **Ease of use:** Agricultural information can be sent over mobile phones in two formats; viz; text message and voice message. Text message contains information in a written form and is sent as an SMS (short message service) on the mobile phone. This format requires certain level of literacy among the users. On the other hand, it offers the advantage of storage of information for later use. Information can also be sent in the form of voice messages and is especially useful if the message is in a local dialect. However, in case of voice messages, information cannot be stored for later use. Under IFFCO Airtel Green Card scheme five voice messages were sent daily free of cost to the farmers. But, if the farmer wants to listen to the information a second time, (s)he had to pay the call charge (@ one rupee per minute). In addition, the farmer can call a dedicated helpline (Helpline number- 534351), manned by experts from various fields, to seek answers to their specific queries. These calls were also charged at the rate of one rupee per minute. It was found that 91.43% of the farmers across all age groups and levels of education were able to use the mobile phone for listening to voice messages sent by IKSL. This was due to the fact that the services provided by the IKSL did not require any high level of technological competence or literacy on part of the farmer for receiving agricultural information. A farmer is only required to push the answer button to hear the voice message. Only 8.57% farmers were dependent upon others for listening to voice messages. This was attributed to improper eye sight (vision impairment) and lack of skill required for handling mobile phones.
- **Message comprehension**: Majority of the farmers (79.66%) across all socio-economic categories were able to understand the voice messages sent by the service provider. This was mainly attributed to the use of local language (Hindi). However, farmers with low literacy levels found it difficult to understand the message when scientific names (instead of local names/brand names) were used. At times, connectivity problems like background noise or breakage in reception also led to poor comprehension.
- **Usefulness of information:** Majority of the farmers (71.18%) reported that the information delivered by IKSL was high to moderately useful. However, usefulness was interpreted in different ways by farmers belonging to different socio-economic categories. Farmers with high socio-economic status reported that the service acted as a reminder and they were able to perform agricultural operations on time. Further, messages about likely pest/insect infestation helped them to take

precautionary measures and save their crop from potential loss. Farmers belonging to medium and low socio economic status found the service useful as they received relevant agricultural information at their doorstep which saved their time and cost (of travelling to extension agency). Some farmers did not find the service useful as they were not primarily engaged in agriculture or had small holdings. In later cases, they could not afford inputs suggested by the experts. It was noticed that the information provided by IKSL was uniform and mainly centred around crops grown in the plains (cereals, pulses, etc.). Farmers from the hilly region of the state did not find the information very useful as they were mainly engaged in cultivation of horticultural crops.

- **Trustworthiness of information**: Usage of ICT enabled agricultural services is shaped by peoples' perception about trustworthiness (Srinivasan 2007). In case of IKSL services, it was found that majority of the farmers (69.49%), across all socio-economic categories felt that the information given over mobile phones was reliable. Most farmers felt that information received on their mobile phones was provided by experts and was based on scientific research. Only 8.7% farmers felt that practical exposure/direct observation was more reliable than information given over mobile phones. In such cases, they expressed greater faith in information given by Farm Science Centres/Subject Matter Specialists.
- **Cost:** Cost is an important determinant in adoption and continued use of an innovation. In the present study, the cost of the mobile phone, Airtel connection with one year validity and IKSL services was Rupees One Thousand (Rs 1000/-). In addition, farmers could call other farmers subscribing to the service at cheaper call rates (fifty paisa per minute). The study showed that a large percentage of farmers across all categories found the services either cheap or only moderately costly. However, more farmers with low socio-economic status (30%) felt that the service was very costly as compared to farmers with medium (21.43%) and high (12%) socio-economic status and it was found that socio-economic status of the farmer significantly influences perception about the cost of the services. Farmers with high and medium socio-economic status found the service cheap whereas farmers from low socio-economic categories found the service expensive.

## DISCUSSION

ICTs have been put forth as a panacea for an ailing Public Extension System in India. It has been argued that mobile phones are especially suited to meet information needs of the farmers due to several unique characteristics. Against this backdrop, the present study was conducted to determine the socio-economic characteristics of farmers using mobile phones, identify factors that may influence the usage of mobile phones by them and to ascertain their relationship with the socio economic status of the farmers. It was found that while the service was especially launched to provide extension service to farmers, almost one third of the subscribers were non farmers, who inveigled a subscription in order to enjoy cheaper call rates. The study indicates that mobile phones were owned by a significant number of farmers with medium and low socio economic status in the area. This indicates significant penetration of mobile phones among disadvantaged groups and their development potential. It was found that majority of the users were young (below 35 years). However, socio-economic

status of the farmer was an important determinant of membership in the cooperative and hence subscription to the service and access to information.

Five aspects; viz; ease of use, message comprehension, usefulness of information, trustworthiness of information and cost of the service provided by IKSL were studied to understand factors influencing use of mobile phones for seeking agricultural information and their relationship to the socio-economic status of the users. It was found that majority of the farmers, across all age groups and levels of education, were able to use mobile phones for listening to these voice messages. Farmers were able to understand the voice messages sent by the service provider mainly due to the use of a local language (Hindi). However, farmers with low literacy levels found it difficult to understand messages when scientific names were used. Majority of the farmers found the information high to moderately useful as voice messages acted as a timely reminder for agricultural operations and they were able to take precautionary measures when needed. Farmers with medium and low socio-economic status felt that the service was useful as it saved time and money incurred on travel. However, some farmers did not find the service useful as they could not afford inputs suggested by the experts.

The study indicates that majority of the farmers felt that the information given over mobile phones under the scheme was reliable. Lastly, the study indicates that a large number of farmers across all categories found the services cheap or moderately costly. However, a higher percentage of farmers with low socio-economic status felt that the service was very costly as compared to farmers with medium and high socio-economic status. Out of the five factors studied, only cost of the service was found to be significantly related to the socio-economic status of the farmers. Test of significance showed that socio- economic status of the farmer influences perception about the cost of the services. It can be generalized that farmers with high and medium socio-economic status found the service cheap whereas farmers with low socio-economic categories found the services to be expensive.

## CONCLUSION

Information is one of the key inputs in agriculture whereby information deficit constraints agricultural productivity in India. Due to several constraints, India's Public Extension System is unable to meet the information needs of the farming community. In this context, it is felt that Information and Communication Technologies (ICTs) can complement and supplement the efforts of existing information dissemination systems. This paper discussed the use of mobile phones by farmers for seeking agricultural information under the scheme IFFCO Airtel Green Card, factors governing the use of mobile phones and their relationship with the socio-economic status of the farmers. Mobile phones provide access to information which otherwise may not be available, especially to marginal and small farmers and farmers in the hilly region of the state. However, full realisation of potential benefits of mobile phones is limited by certain constraints which seem to apply more to marginal and small farmers rather than large farmers. These include infrastructure problems and availability of inputs, indicating that additional interventions are necessary to enhance agricultural productivity. Lastly, it is essential to note that use of ICTs may be motivated by needs other than "getting useful information". In this case, mobile phones were mostly being used to fulfil social needs and their developmental use appears only incidental as indicated by high use for maintaining social networks and low usage to contact subject matter experts. However, successful

cases indicate that mobile phones can be used for transforming agricultural practices. This would require appropriate and relevant content, enhanced trust in technology mediated communication and addressing of other critical factors simultaneously.

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