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Socio-Economic Impact of Mobile Phones on Indian Agriculture

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Foreword

The Indian agricultural sector, at present, suffers from decelerating productivity growth rate. It is essential to catalyse agricultural productivity, raise rural incomes, and release land for urbanisation and industrialisation to feed the growing population. Serious challenges must be addressed in order to achieve faster productivity growth. These include infrastructure constraints, supply chain inefficiencies and significant problems in the diffusion of and access to information. The increasing penetration of mobile networks and handsets in India, therefore, presents an opportunity to make useful information more widely available. This could help agricultural markets operate more efficiently and overcome some of the other challenges faced by the sector. It is therefore timely to take a fresh look at the impact of mobile telephony on agriculture performance in India.

This paper is the first in India to look at the impact of mobile phones on the crop sector and, in particular, on small farmers. The key finding of this research is that mobile phones can act as a catalyst to rejuvenate the collapsing extension services in the country. However, this does not in any way dilute the need for urgent and significant improvements in supporting infrastructure and capacity building to realise much needed productivity gains in agriculture.

(Rajiv Kumar)
Director & Chief Executive

February 24, 2010

Abstract

Deficits in physical infrastructure, problems with availability of agricultural inputs and poor access to agriculture-related information are the major constraints on the growth of agricultural productivity in India. The more rapid growth of mobile telephony as compared to fixed line telephony and the recent introduction of mobile-enabled information services provide a means to overcome existing information asymmetry. It also helps, at least partially, to bridge the gap between the availability and delivery of agricultural inputs and agriculture infrastructure.

This paper investigates a series of questions that explore this topic: What kind of information do farmers value the most to improve agricultural productivity? Do mobile phones and mobile-enabled agricultural services have an impact on agriculture? What are the factors that impede the realisation of the full productivity enhancing potential of mobile phones? The answers to these questions have important implications for mobile operators, for information service providers, and for policy-makers. The quality of information, its timeliness and trustworthiness are the three important features that have to be ensured to enable farmers to use it effectively to improve productivity.

The study found evidence that mobiles are being used in ways which contribute to productivity enhancement. However, to leverage the full potential of information dissemination enabled by mobile telephony will require significant improvements in supporting infrastructure and capacity building amongst farmers to enable them to use the information they access effectively.

As mobile penetration continues to increase among farming communities and information services continue to adapt and proliferate, the scope exists for a much greater rural productivity impact in the future.

Key words: Mobile phones, Farmers and Fishermen, Agricultural productivity

JEL classification: Q16, Q18

Socio-Economic Impact of Mobile Phones on Indian Agriculture[1]

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1. Introduction

The Indian agricultural sector has been characterised by low productivity growth despite periods of strong growth in the past. Serious challenges must be addressed in order to achieve faster productivity growth. These include infrastructure constraints, supply chain inefficiencies and significant problems in the diffusion of and access to information. The challenge for the government and policy makers is to regain agricultural dynamism. To achieve a higher agricultural growth rate, the next generation green revolution in India must be preceded by the next generation of technology and infrastructure development. Small and marginal farmers, who are the vast majority of Indian farmers, are often unable to access information that could increase yields and lead to better prices for their crops. The sector also faces problems arising from a shortage of investments in rural infrastructure, which adversely affects farm productivity growth.

An improvement and strengthening of agricultural infrastructure is needed at all levels of the supply chain – input delivery, credit, minimising post-harvest losses, cold storage chains, marketing etc. Shrinking extension is another component of infrastructure that needs attention. The government has a huge research and development infrastructure in the form of institutions such as the Indian Council of Agricultural Research (ICAR), state agricultural universities (SAUs) and *krishi vigyan kendras* (KVKs). The role of this set-up in research and extension activity is of great importance. However, crumbling public extension services are a cause for concern.

After the green revolution in the mid-sixties, there has been no major technological innovation, which could give a fresh impetus to agricultural productivity. Insufficient extension services and poor access to information further widen the gap in the adoption of technology and lead to poor productivity levels.

A push towards higher agricultural productivity will require an information-based, decision-making agricultural system (precision agriculture). This is often described as the next great evolutionary step in agriculture. Precision agriculture, in turn, is heavily dependent on an efficient information dissemination system – GPS and mobile

[1] During the course of this study, the authors interacted with numerous individuals and organizations. It is difficult to acknowledge each one of them everyone by name but we are deeply indebted to the members of the organizations- IFFCO-IKSL, RML, ITC and MSSRF for their support. The time spared by the farmers, traders and various farmers' cooperative societies during the surveys deserves a special mention. Their deep interest and cooperation in our research helped us to gain insight in many complex issues. We owe immense gratitude to Prof. Rajat Kathuria, Prof. Mahesh Uppal and Dr. Rajiv Kumar for their constant guidance and suggestions. The contribution of Vodafone's SIM (Socio-economic Impact of Mobile) Advisory Panel in supporting this study is gratefully acknowledged. I deeply owe my gratitude to Rajkumar Shahi who helped us with the figures and Anil Kumar for formatting the paper. I will also like to thank Tara Nair for editing this paper.
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mapping technologies offer the means to set up such a system.[5] The increasing penetration of mobile phones and mobile-enabled information services in rural India can reduce information asymmetry and complement the role of extension services. In the context of India, the impact of mobiles as a mode of providing information for farming purposes would depend on how effectively the mobile network links farmers to market information. The impact on productivity can be measured in terms of increased returns –through changes in cropping pattern, yield increases and better price realisation (inputs and output) – to farmers. Non-price factors like information on the availability of inputs, seed quality, and adoption of modern techniques are also critical to raising productivity.

2. Objective of the Study

The study tests the hypothesis that mobile phones help reduce the information asymmetry that exists in the agricultural sector and improve farm productivity and profitability. Profitability would improve through a reduction in (i) transaction costs with respect to both inputs and output; (ii) information search costs by saving on time and (iii) travel cost. We expect farmers' revenue to increase because of both increased access to information on prices and reduced wastage/spoilage, including that from crop infection. Better and timely decision-making on the optimal cropping pattern to be adopted and the use of better inputs, particularly improved seeds varieties, are expected to deliver better yields and profits. The key argument here is that that information received through mobile phones could play a complementary role to extension activities and would have a better impact than other one-way information sources (e.g. radio, television, newspapers etc.).

The recent introduction of a number of mobile-enabled information services suggests it is time to take a fresh look at their impact on agriculture in India. These services deliver a wide range of information to farmers and fishermen. This study is the first to look at the impact of mobile phones on the crop sector in India with a focus on small farmers. The results are based on information collected through focus group discussions and interviews with farmers carried out in Uttar Pradesh, Rajasthan, Maharashtra and the National Capital Region of New Delhi and with fishermen in Pondicherry. The study does not cover all regions of India nor is it fully representative of rural India.

The questions the study sought to address include:

- What kind of agricultural information do farmers and fishermen value the most?
- Are mobile phones being used much for agricultural purposes in practice and, if so, how?
- Have mobile phones helped drive agricultural productivity improvements for farmers and fishermen and, if so, how?
- What are the constraints on realising the potential productivity benefits of mobile telephony?

[5] Accessed from http://www.gisdevelopment.net/application/agriculture/overview/agrio0011.htm by Rasher Michael

The answers to these questions have important implications for mobile operators, information service providers, and policy-makers. We found evidence that mobile phones are being used in ways that contribute to productivity improvement. However, the key message of the study is that to attain the full productivity enhancing potential of the greater access to information enabled by mobile telephony, significant improvements in supporting infrastructure and capacity building amongst farmers are critical.

3. Literature Review

Available literature on the drivers of productivity growth shows that the development of markets improves the input-output interface. This, together with the development of research, extension and literacy, leads to growth in crop productivity. Education and awareness leads to the adoption of new technology and use of modern inputs like machinery, fertilisers etc. (Mittal and Kumar, 2000; Kumar and Mittal, 2006; Kumar and Rosegrant, 1994; Evenson et al., 1999; Fan, et. al.; 1999). Today, information and communication technology (ICT) and mobile-enabled agricultural services act as instruments to deliver extension services through infrastructure for mobile telephony and help create awareness amongst farmers.

The increasing penetration of mobile networks and handsets in India presents an opportunity to make useful information more widely available. This could help agricultural markets operate more efficiently, and overcome some of the other challenges faced by the sector. A key background to our study is the research by Jensen (2007), examining the impact of mobile phone use by Kerala fishermen. Jensen 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. Mobiles allow fishermen, particularly the more prosperous ones, to get timely price information and decide on the best place to land and sell their daily catch.

A study by Abraham (2007), which also looked at Kerala fishermen, found that the widespread use of mobile phones increased the efficiency of markets by decreasing risk and uncertainty, although it noted that realising potential efficiencies depended on easy access to capital. Using mobile phones at sea, fishermen are able to respond quickly to market demand and prevent wastage from the catch – a common occurrence before the adoption of phones. Mobile phones help co-ordinate supply and demand, enabling traders and transporters to take advantage of the free flow of price information by catering to demand in undersupplied markets. A study on Senegalese fishermen yielded similar, results (Rashid and Elder, 2009). The reduction in price dispersion with increased cell phone use is also seen in the grain markets in the sub-Saharan African country, Niger. Cell phones have a greater impact on price dispersion where travel costs are high (Aker, 2008). Similarly, during a project implemented in Senegal, it was found that farmers in the field were able to check prices before they set off to markets and thus they could secure, on average, about 15 per cent higher profits. The adoption of mobile telephony by farmers and agricultural traders in Ghana has helped them reduce both their transportation and transaction costs. The members associated with trade networks, now equipped with new technology, are able to organise their activities more efficiently and with considerable cost savings (Ragnhild Overa, 2006).

Bhavnani et. al, 2008 point out that despite the increasing rural demand for relevant, timely agricultural information on the one hand and recent advances in quality and capacity of ICT services on the other, the benefits remain unevenly distributed among people. The main causes are the lack of a policy and regulatory environment and the poor availability of ICT and mobile infrastructure (Bhavnani et. al, 2008). The cost of the use of available infrastructure is also an issue. Those having resources and skills benefit more than those who lack them. Even the Jenson and Abraham studies found that large fishermen gained more than small ones. High transaction costs deter the entry of small farmers into the market. Interventions aimed at reducing transaction costs would, therefore, encourage increased farmer participation in competitive markets and help meet broader poverty reduction objectives (Pingali et. al., 2005). The expansion of mobile phone networks and increase in mobile-density in Uganda has enabled higher market participation by farmers producing perishable crops located in remote areas and helped them realise higher prices by reducing the information asymmetry that existed between farmers and traders (Muto and Yamano, 2008).

The Chinese government has invested US$1.13 billion in establishing a mobile infrastructure for about 26,000 villages in recent years through the state owned company, China Mobile, to enable farmers to keep track of weather conditions or forecasts and product prices. In July 2006, China Unicom launched an agricultural wireless information project for farmers in 26 provincial districts. This programme helped farmers access useful information for efficient planning and production (Fong, 2009).

According to Bertolini (2004), knowledge and information are important factors for accelerating agricultural development through increased production and improved marketing and distribution. ICT could make the greatest contribution by telescoping distances and reducing the cost of interaction between stakeholders. ICT has the potential to help farmers in the entire cycle of production, i.e., from production to sales. ICT impacts both observable and unobservable transaction costs (Bhatnagar, 2008). Most efforts to make ICT available to rural farmers have sought to improve the availability and quality of information either indirectly through producer associations, extension workers and the like, or directly through broadcast radio information, telecentres, and mobile short messaging services (SMS) (Bertolini 2004). 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 that helped reduce waste through a feedback system. The study found that up to 40 per cent of crop loss could be prevented with quick interventions facilitated by information received via SMS. Farmers also expressed their willingness to pay for such services if it would save their time and money.

In traditional Indian markets, commission agents and traders dominate the supply chain and are the major price setters. Most farmers are dependent on them for information (Mittal and Mukherjee, 2008). For the crop sector, information search costs form a significant part (to the tune of 11 per cent) of the total cost incurred by farmers during the agricultural cycle, starting from the decision to sow to marketing. Mobile phone usage by farmers can reduce the information search costs, thereby dramatically lowering transaction costs and enabling greater farmer participation in commercial agriculture (de Silva and Ratnadiwakara, 2008). The rural ICT initiatives

in agriculture such as computerisation of agri-markets, e-Choupal and eSAGU[6], informational extension services, digitalisation of land records by the Karnataka government and computerisation of co-operative milk collection centres have lowered costs for farmers, added value to output and improved transparency in the system (Bhatnagar, 2008).

The literature surveyed highlights the fast growth of mobile telephony in the emerging developing countries of Asia and Africa and their key role in reducing information search costs and information asymmetries and increasing market efficiencies. The use of mobile phones has been found to encourage poor farmers of these countries towards greater market participation and diversification to high-value crops. This has helped increase their earnings through higher price realisation and reduction in wastages.

4. Methodology and Data

Growth in agriculture can be measured in two ways. One, agricultural output is simply decomposed into area and yield components. This helps understand the dynamics of agricultural growth, particularly when area expansion is the main source of output growth. As technological change and other (non-land) inputs become more important, an alternative approach that is able to identify the sources of output growth in terms of inputs and (total) productivity becomes necessary. The contribution of improved technology is measured as total factor productivity growth, which can further be decomposed into several factors, viz. research, extension, education, infrastructure, health of natural resources and so on. The growth in input use is influenced by several factors like input-output prices, technological innovations, institutions, infrastructure and policy initiatives. This study tries to understand the improvement in yields (productivity) that can be attributed to factors like extension and infrastructure.

Our research draws primarily on a series of field investigations conducted from August 2008 to November 2008 in the states of Uttar Pradesh, Maharashtra, Rajasthan and New Delhi and the union territory of Pondicherry. These visits comprised a series of focus group discussions and individual interviews[7] with farmers, fishermen, labourers, traders, commission agents, non-profit organisations and businesses involved in the agricultural sector. The team conducted 14 focus group discussions and 46 individual interviews in 11 districts and 20 villages (Annexure 1). Around 187 farmers were interviewed in all, of whom 152 were small farmers with less than 6 acres of land[8] (Annexure 2a, 2b). The questionnaire is presented in annexure 3.

The farmers and fishermen interviewed covered villages with only standard mobile phone services and those with access to mobile-enabled agricultural information service. These services were provided by IFFCO Kisan Sanchar Limited (IKSL), a

[6] It is a web-based personalised agricultural advisory system to deliver quality expert advice to farmers in southern states of India.

[7] Telephonic interviews were conducted in some districts and follow-ups were also done with these interviewees over time.

[8] This included total land held by farming households that were often comprised of joint family units living in the same house. The team used 6 acres as the cut-off for the purposes of this study. Indian agricultural standards define small farmers as those with less than 4.94 acres of land.

partnership between the Indian Farmers Fertilisers Co-operative Limited (IFFCO) and Bharti Airtel,Reuters Market Light (RML) provided by Reuters, and the fisher friend programme by Qualcomm and Tata Teleservices in partnership with the MS Swaminathan Research Found (MSSRF). We also looked into the services provided by ITC under the 'e-choupal' programme (details in Annexure 4).

Our focus group discussions and individual interviews covered both, farmers who had mobile-phones but had not registered for these services and those who had signed up for mobile-enabled agricultural information services (Table 1).

Table 1: The distribution of the sample used during survey

Surveyed Districts	**Farmers subscribing to mobile-phone enabled service**		**Farmers owning mobile-phones but not subscribed to information service**		**Farmers using e-Choupal service of ITC**		**Total number of farmers interviewed**	
	Focus Group	***Individual***	***Focus Group***	***Individual***	***Focus Group***	***Individual***	***Focus Group***	***Individual***
Allahabad	24	6	43	4	3	5	67	10
Agra	6	3	18	0			24	3
Mathura			10	2	10	2	10	2
Alwar	5	2		1			5	3
Dausa		1		0				1
Bhilwara		1		0				1
Baran		1		0				1
Jaipur		1		0				1
Pondicherry		8		0				8
Satara	14	1	32	0			46	1
Pune	2		2	0			4	
Delhi			3					3
Total	51	24	108	7	13	7	156	34

Note: Every farmer that we interviewed had a mobile.

With the exception of the investigation in Delhi's main fruit and vegetable market, the *Azadpur mandi*, all the locations covered were rural, with village populations ranging from 3,000 to 10,000. All interviewees were over the age of 18, male and had varying degrees of formal education.[9] A few of the small farmers had obtained university degrees, some of them post-graduate degrees. Women who were approached refused to be interviewed or participate in focus group discussions because they were neither primary decision makers nor primary users of information available through mobile telephony.

[9] This reflects both the reality of the sector and the judgment of the organisations that selected the participants investigated.

The farmers interviewed grew a wide variety of crops including staple and cash crops, perishables and non-perishables, and crops grown for household consumption. Almost all farmers practiced multiple cropping with wheat being the most common crop grown. In Uttar Pradesh, farmers were often living in joint, multiple-family households with family sizes that ranged from between 12 and 15 people. Family incomes typically varied between Rs. 2000 and Rs. 6000 per month from agriculture. In Maharashtra, by contrast, the average household income of the farmers interviewed ranged from Rs. 12,000 to Rs. 17,000 per month and the average household size was fewer than six people. The interviewees in this region also had greater access to irrigation, storage facilities and credit and hence were wealthier.

Since mobile-enabled agricultural information service providers were operating only in a few states, this became the criterion for selecting these states. Table 2 gives details of these states.

Table 2: Basic facts about regions covered

Region	Population (million)	Per cent Urban	Per Capita Income (Rs.)	Fixed Lines per 100 people	Mobile Lines per 100 people	Service Provider
Maharashtra	107.3	42.4	47051	2.4	32.9	RML
New Delhi – NCR	16.8	93.2	78690	17.5	140.5	-
Rajasthan	64.1	23.4	23933	2.4	41.9	IKSL
Tamil Nadu*	65.9	44.0	40757	3.3	52.2	Fisher friend
Uttar Pradesh	188.8	20.8	16060	1.4	29.2	IKSL
India	1138.0	27.8	33492	3.2	40.4	-

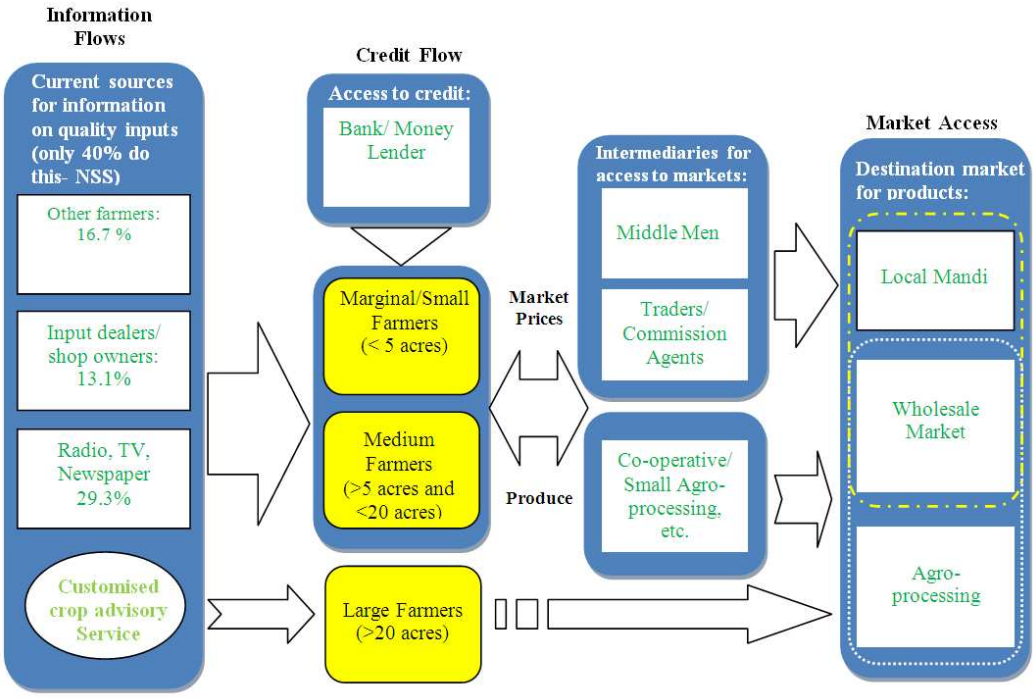
Sources: Population and per capita income (at current prices) from the Central Statistical Organisation, Ministry of Statistics and Programme Implementation, GoI. Per cent urban is based on Census of India 2001 data; Mobile and Fixed Line data as per "September 2009: The Indian Telecom Services Performance Indicators (July - September 2009)" from the Telecom Regulatory Authority of India (TRAI).
Note: Population and per capita income are given for the year 2007-08.
** Information for Pondicherry on mobile lines is not available separately as it is not an independent service area.*

The following sections turn to the findings from the fieldwork, beginning with an overview of the type of information needs that were common to all farmers. We then report on how our interviewees perceived specific mobile-based services before going on to consider the productivity impact of mobile usage that emerged from the research. The constraints that hinder the full realisation of the potential benefits of mobile phones are also discussed in the paper.

5. Information Needs, Sources and Mobile Enabled Services

There are an estimated 127.3 million cultivators in India.[10] The majority of them are farmers subsisting on small plots of land, less than 5 acres in size.[11] Deficits in physical infrastructure, in the availability of agricultural inputs such as seed, fertiliser and services in rural areas and in access to information are the major reasons for low productivity growth. These factors create the communications and logistics environment for farming. Access to information is one the many enablers of productivity growth. Figure 1 presents how different categories of farmers access their information, credit and markets.

Figure 1: Overview of communication needs in agriculture by the size of the farm



5.1. Sources of Information

A national survey of farmers found that only 40 per cent of farmer households accessed[12] information about agricultural techniques and inputs (NSS, 2005). Farmers have access to various sources of information. At the all-India level, of the sixteen different sources sought for accessing information on modern technology for farming, the most popular was 'other progressive farmers' with the percentage of farmer households accessing information through the source at 16.7 per cent, followed by input dealers (13.1 per cent), radio (13.0 per cent) and television (9.3 per cent). Other progressive farmers and input dealers are contacted by farmers mainly either on a needs basis or seasonally (Table 3).

[10] 2001 Indian census.
[11] India's average operational land holding is less than 2 hectares (4.94 acres).
[12] The survey evaluated actual access as opposed to ability to access.

Table 3: Sources of agricultural information used by farmers

Source	Per cent of Households
Other Progressive Farmers	16.7
Input Dealers	13.1
Radio	13.0
Television	9.3
Newspaper	7.0
Extension Worker	5.7

Source: Situation assessment survey of farmers conducted by the National Sample Survey Organisation (June, 2005), GoI
Note: The figures are proportions of the 40 per cent of households that reported accessing information from each source.

Table 4: Sources of information accessed by individual farmers surveyed in selected districts

Sources of Information	Per cent of farmers					
	Allahabad	***Agra***	***Mathura***	***Rajasthan****	***Satara***	***Pondicherry***
Mobile phone	100	100	100	100	100	100
Mobile-phone-enabled service	60	100	0	85.7	100	100
TV	70	33.3	0	71.4	100	0
Newspaper	60	0	0	42.9	100	0
Kiosk	50	0	100	0	0	0
Other farmers / fishermen	40	33.3	0	28.6	0	0
Radio	30	33.3	0	42.9	0	0
Input dealers	20	100	0	0	0	0
Extension workers	80	33.3	0	28.6	100	0

*Note: * Rajasthan includes districts Alwar, Dausa, Bhilwara, Baran and Jaipur*

Our study also found that most farmers had access to a variety of non-mobile enabled information sources that they consult for regular agricultural information (Table 4). This included TV, radio, newspapers, other farmers, government agricultural extension services, traders, input dealers, seed companies and relatives. However, the perceived quality and relevance of the information provided by these sources was highly variable. Most of the farmers we interviewed lacked access to consistent, reliable information for many of their needs and often relied on a combination of traditional knowledge, experience and guesswork to make decisions. With the exception of villages with access to the successful ITC rural kiosk programmes, most of the farmers surveyed did not have a single channel or access platform that served as a comprehensive source for their information needs. Another constraint that farmers face is that when market price information is available to them, they are often unable to exploit the price disparities that exist between major and minor markets due to their inability to transport their produce to markets with higher prices.

5.2. Mobile-Enabled Information Services

A core part of our investigation was to see how mobiles act as an instrument of information dissemination. Thus, an assessment of new mobile-based information services targeting farmers and fishermen was undertaken. We sought to evaluate whether these services provide a more effective way to meet farmers' information needs – timely, more accessible, more consistent, and better customised.

We looked at two mobile services targeting farmers, IFFCO Kisan Sanchar Limited (IKSL) and Reuters Market Light (RML) and the fisher friend programme for fishermen. These service providers source and distribute information in different ways, but all three provide an assortment of information as identified in Tables 5 and 6.

Table 5: Mobile information services for farmers

	IFFCO – IKSL	**Reuters – RML**
Began Service	June 2007	October 2007 (pilot in January 2007)
Locations Surveyed	Uttar Pradesh, Rajasthan	Maharashtra
Cost	Free Voice messages Helpline service at a cost of Rs. 1/min	Rs. 175 for three months Rs. 350 for six months Rs. 650 for an year
Nature of Delivery	Voice message	SMS-text message for two crops as subscribed to by the farmer
# of Daily Messages	5	4
Information Provided	• Weather • Crop/animal husbandry advisory • Market Prices • Fertiliser availability • Electricity timings • Government Schemes	• Weather • Crop-advisory (one crop) • Market Price (for 2 crops and 3 markets each) • News (commodity specific and general)
Other Services	• Customised advisory through helpline	• None
Subscribers (at time of investigation)	• Uttar Pradesh: 200,000 • Rajasthan: 65,000	• 82,000 (India-wide); 77,000 in Maharashtra
Comments	• If message not immediately received by farmer, it can be retrieved by dialling a number at a cost of Rs.1 per min. • Messages delivered at unpredictable times of day • Revenues are made from the sale of SIM cards	• Message will be retrieved/saved if farmer's phone is switched on within 24 hours of message delivery • Messages delivered at preset times of day • Subscription is only revenue source

5.2.1 IKSL and RML

In our sample of farmers, 41 per cent of those interviewed were subscribers to one of the two services and no farmer in the sample subscribed to any other similar service.[13] All IKSL subscribers in the state received the same voice messages irrespective of location or crop choice (Annexure 5). By contrast, RML allowed farmers to choose two crops and customised the information each farmer received (Annexure 6). RML also supplied weather information at the taluka level. IKSL's voice messages were sent at unpredictable times during the day and if the farmer did not access the voice call immediately, the information was lost. RML delivered information via text message enabling farmers to access information more conveniently.[14] However, an important factor in the choice of delivery method is literacy. Most IKSL farmers reported that the voice message was preferable to a text message for this reason. RML subscribers largely preferred text messages and did not report literacy concerns.[15] Text messaging provides better information-accessibility than voice-mails since the information remains stored in the mobile phone and can be accessed any time. Stored information in an SMS is much easier to understand, follow and share (with other farmers) than a voice message, which is often missed. From the survey, we found that on an average, only two voice-messages are accessed daily by farmers. But literacy concerns among the IKSL subscribers in UP and Rajasthan led to a preference for voice messages over text messages, despite the superiority of the latter.

Overall, we found significant difference in the subscribers' perception of the two information services. The RML service was perceived as providing information that was better tailored to the subscriber and was considered easy to access. The IKSL service was generally perceived to be more hit or miss in the value it delivered and was often described as lacking in relevance to farmers' needs.

It is important to emphasise that although, IKSL and RML intend to provide customised information services, they are not able to provide the farmers the maximum benefit from the mobile as a two-way communication mode. Awareness about the range of customer support service provided is low; consequently, farmers do not contact the information service provider with further queries. Steps need to be taken to improve farmers' knowledge of the range of services provided to maximise the gains from the mobile as a two-way communication device.

5.2.2 Fisher Friend

The team complemented the investigation of mobile interventions in the farming community by examining one specific programme from the fishing sector, the MS

[13] The only other relevant service encountered in the areas surveyed was the BSNL helpline. This was a toll-free service that farmers could call for agricultural information. However, in every single case where a farmer we interviewed was aware of this service, it was described as "not satisfactory' and there were no examples cited of successful use of this service.

[14] RML had started their service with voice messages, but later switched to text messages as they found that voice delivery limited content that could be delivered and prevented predictable message delivery. The switch enabled greater accessibility (predictable time delivery, text message permanently stored on phone) and content customisation.

[15] Maharashtra has a higher literacy rate than the other regions surveyed. Literacy levels by state: Maharashtra (76.9 per cent), Rajasthan (60.4 per cent), Uttar Pradesh (56.3per cent). Source: Census of India 2001.

Swaminathan Foundation's (MSSRF) fisher friend programme. The fisher friend programme builds on a vast network of pre-existing infrastructure and relationships that MSSRF has built up in the fishing communities of Tamil Nadu and neighbouring coastal regions. This service provides information to fishermen through physical centres in fishing villages. The fisher friend programme relays the same information by mobile in order to solve the 'last mile'[16] problem for fishermen at sea.

Table 6: Mobile information service for fishermen

	FISHER FRIEND
Launch date	December 2007 (pilot – still in pilot phase)
Cost	Free (handsets and service)
Nature of Delivery	Menu-based access (text)
Information Provided	• Weather (wave height, wind speed) • Market Prices • Optimal Fishing Zone (longitude and latitude) • Rural Yellow Pages • Government Schemes
Comments	• Estimated range of service at sea is 5 nautical miles • Availability of information has been sporadic – at the time of investigation, service had not been functioning every day

The idea behind the fisher friend programme followed the realisation that fishermen needed to access important information even while at sea. A first effort towards meeting this need was the installation of loud speakers along the coastline, which broadcast information from the village knowledge centre. The fisher friend programme, in one sense, represents an evolution of earlier attempts to solve the last mile problem, moving away from PC-based delivery mechanisms to mobile delivery mechanisms.[17] A similar transition to mobile delivery mechanisms has also been seen in the Warna village project for sugarcane growers (Veeraraghavan et.al 2009)

Perceptions regarding the fisher friend information service were mixed. This partly reflected technical challenges faced by the programme that affected accessibility and the updating of information.[18] The mobile service was available for only five nautical miles from shore, which limited accessibility. While fishermen reported varying levels of satisfaction with the different information categories provided, almost all fishermen who were able to access the service and were interviewed found value in the weather information provided and having mobile access at sea. Under these circumstances, it may be said that the fisher friend has yet to demonstrate its full potential. However, the team was able to find some examples of impact that give a glimpse of what might be achieved in the future (Annexure 7).

[16] The 'last mile' refers to the final leg of delivering connectivity from a communications provider to a customer.

[17] Discussions with MSSRF staff brought out that the benefits of switching to a mobile delivery platform – low cost, real-time delivery and expanded reach, particularly to fishermen at sea – were starting to influence the organisation's future vision.

[18] The information provided was sourced centrally and distributed through MSSRF's local village centres as well as through fisher friend. Fishermen reported that for significant periods of time, the entire service or certain information – such as optimal fishing zones - was not available.

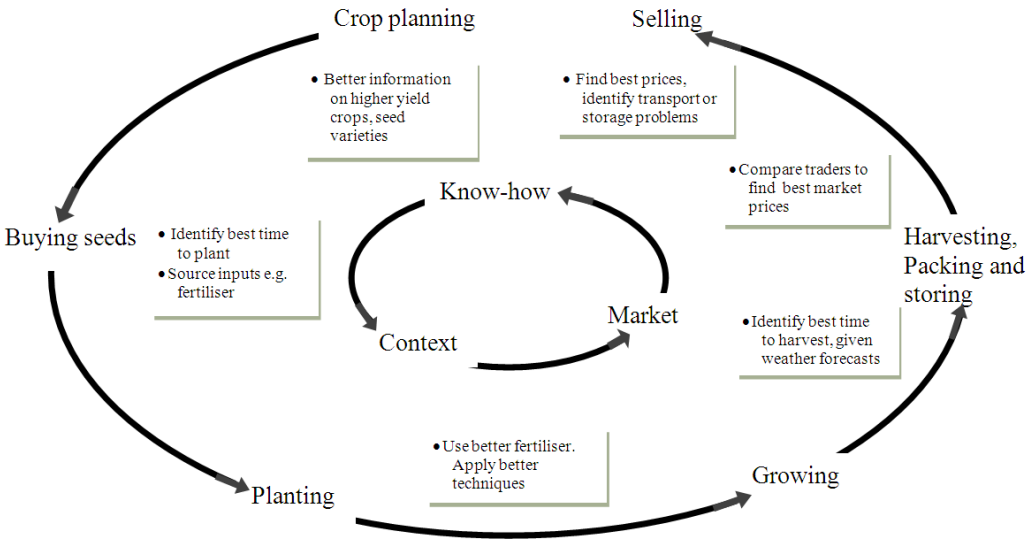
5.3. Type of Information Required

5.3.1 By Farmers

The interviews and focus groups in different areas indicated that producers had a wide range of information needs, which varied through the growing season. However, the broad categories of information required were common to all of them, irrespective of their location and crops. These categories were:

a) *know-how*, which helps a farmer with fundamental information such as what to plant and which seed varieties to use
b) *contextual information* such as weather, best practice for cultivation in the locality and
c) *market information* such as prices, demand indicators, and logistical information. These are presented in Figure 2 and Table 7.

Figure 2: Information needs of farmers through the agricultural cycle



Of the range of information required, we found that small farmers prioritised weather, plant protection (disease/pest control), seed information and market prices as the most important. Close to 90 per cent of the farmers in Uttar Pradesh and Rajasthan ranked seed information as the highest priority while over 70 per cent cited market prices as the most important category.[19] Although our sample is small, the nature and frequency of information accessed on the mobile is similar to that accessed by farming households in the NSS. While the small sample size used makes it difficult to conclude that mobile telephony is an efficient substitute for conventional information delivery mechanisms to meet farmers' information needs, our study clearly underlines the hidden potential of mobile-based agricultural information services.

[19] Percentages refer to results from 22 individual interviews conducted in Uttar Pradesh and Rajasthan.

Table 7: Farmers' Information needs

Stage		Typical Information Needs
Know-how	• Crop choice • Seed variety	• What are the new crop options or seed varieties? • Are there higher value crops or better seed varieties I could be planting?
Context	• Weather • Plant protection • Cultivation best practice •	• When should I sow? When should I harvest given my climate/soil? • What are best cultivation practices for my crops and soil? • What inputs should I use? How best can they be applied? Where can I find them?
Market Information	• Market Prices • Market Demand • Logistics	• What are the prices and demand in relevant markets? • Has there been a transport breakdown?

Small farmers cited market prices, weather information, information on diseases/plant protection, pesticides and seed information as their top needs. Market prices are valuable in not only deciding where and when to sell, but also in deciding the cropping pattern. In the case of vegetables and flower cultivation, farmers have the scope to choose the harvest time (a delay of 2-3 days) to get a more favourable price, if accurate market price information is available. This is particularly true in cases where market prices fluctuate a great deal over short periods. In cases where farmers are constrained in terms of the markets they may sell their crops in due to transportation problems or 'bondedness'[20], there was some evidence that their bargaining power with traders improved when they were armed with market price information. It should be noted that this final point, though often cited as a potential benefit of empowering small farmers with price information, was not found consistently in the investigation (Case studies in Annexure 7).

Weather information is particularly crucial for most of the small farmers in our investigation. Many of these farmers lacked access to irrigation and consequently, were highly dependent on rainfall and weather conditions for the success of their crop. Rainfall information is critical at certain key junctures of the cropping cycle: during planting, for the application of fertiliser/pesticide, and during harvesting/storage. If inputs are applied in the field just before rain, they are likely to be washed away and wasted. If rains fall just after the harvest but prior to crop sale, there is a chance of damage to produce. One farmer estimated that such post-harvest crop losses could total 10-35 per cent of total potential revenue.

Information on how to diagnose and treat disease is important for farmers. Plant disease that could wipe out the entire crop is one of the biggest risks that farmers face.

[20] Bondedness refers to a situation in which the farmer has no freedom to choose the market he sells in because he is forced to sell to the agent from whom he got credit.

Getting accurate diagnosis and timely cure, according to the farmers interviewed, remains a major challenge. In some cases, farmers had access to pesticide company doctors or agricultural extension workers who would visit farmers in the field, but this was not consistently true. It was also noted that often, the expertise needed to diagnose plant disease was not available locally and there were no clear channels to tap into broader regional or national experts.[21]

Three dimensions of information on pesticides and other inputs were cited as highly valuable to farmers – they need to know what inputs to use for their specific requirements, how best to apply those inputs, and where they can find the specified inputs. This information need covers seed variety, fertiliser, pesticide/ weedicides and other plant medicines. The issue of input availability was highlighted in all regions surveyed, including the more prosperous Maharashtra area.

While farmers were interested in other categories of information such as best cultivation practices and crop choice, only a minority of the sample prioritised them. Typically, these other categories would be most important when a farmer sought to try new strategies in order to increase yields and revenues.

5.3.2 By Fishermen

For the fishermen surveyed in our investigation, the most important information pertained to weather. This included wave heights, wind speed and other information that indicated turbulent conditions. It influenced their view on whether or not a good catch could be had on a given day and, more importantly, whether they could safely take their boats out. A wrong decision would result in significant damage to boats and nets and loss of life. The fishermen in the communities we surveyed relied on traditional knowledge to make these decisions, but many were starting to take advantage of the weather information provided by the fisher friend programme (case stories in Annexure 7).

Other information noted as important included emergency contact information (e.g. coast guard), information on high potential fishing zones[22] (PFZ) and market prices. The emergency contact information offered fishermen a potential safety valve should they be faced with a crisis while at sea. PFZ information provided through fisher friend proved highly useful information on a number of occasions, resulting in large hauls, including on days when reliance on traditional methods would have had them stay on shore. Market prices were noted as useful in choosing which market to sell fish in, although our investigation did not find that fishermen were commonly in the practice of actually selling in markets other than their typical market.

[21] In one case, the survey team helped to resolve a disease problem in lemon in Allahabad, by linking the villagers to experts based in New Delhi. This could be resolved because of the availability of mobile phone connectivity.

[22] Potential Fishing Zone is a location in the sea-water having high probability of availability of fish.

5.4. Quality and Consistency of Information

From the perspective of the small farmer and fishermen who formed part of our survey, the quality and reliability of information remained a major issue despite the large number of information sources available. Rarely do these sources provide the farmer with access to consistent, reliable, updated information that is tailored for his use. Further, no single source was able to provide the breadth of information required by the farmer through the demands of the farm cycle.

Two exceptions were notable to the 'single source' problem. The ITC kiosks were able to provide a 'one-stop' centre for a wide range of information required by farmers. Moreover, the ITC programmes we investigated were regarded as providing timely, reliable information. Many small farmers also relied on traders as single sources of information for multiple topics throughout the year. Traders were also a source of credit for many small farmers. Thus, traders played a central role in the life of many small farmers.

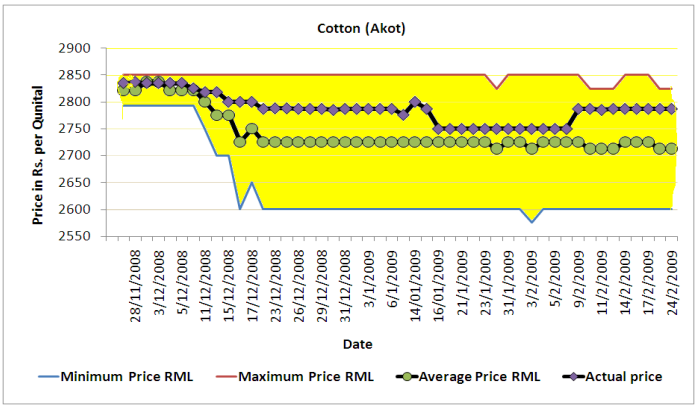
The potential value of mobile telephony to facilitate information access is that it could allow the delivery of tailored information, as and when needed by the farmer. For this to be realised, the farmer must know, 'trust' and be able to connect with a range of information sources that can meet his information needs. Several farmers in our survey group noted that they felt mobile telephony had the potential to be a more reliable source to obtain information as compared to other available sources – mainly because they felt that mobile communication was more personalised.

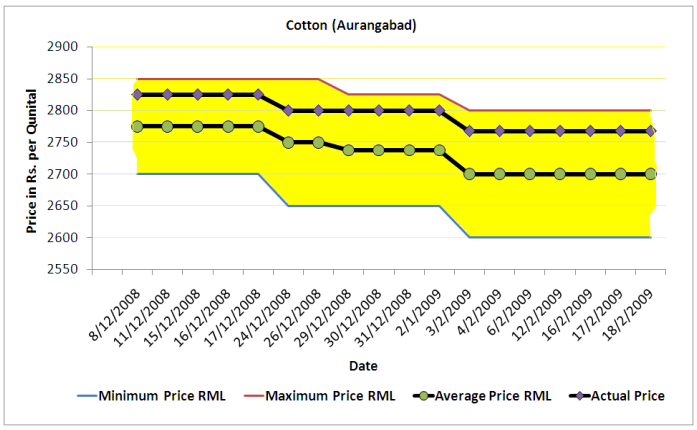
Farmers with e-choupal access leveraged the Sanchalak as the touch point for ITC and internet-sourced agricultural information. Our investigation found that the quality, reliability and accuracy of the information obtained through other channels were perceived to be highly variable. Typically, a given set of farmers may have trust in a particular source for a particular type of information - for example traders for knowledge of current demand for a particular crop – but have problems in accessing reliable information on other critical topics. One farmer noted that while he typically relied on the input dealer for seed information, he felt that the information provided was wrong 25 per cent of the time.

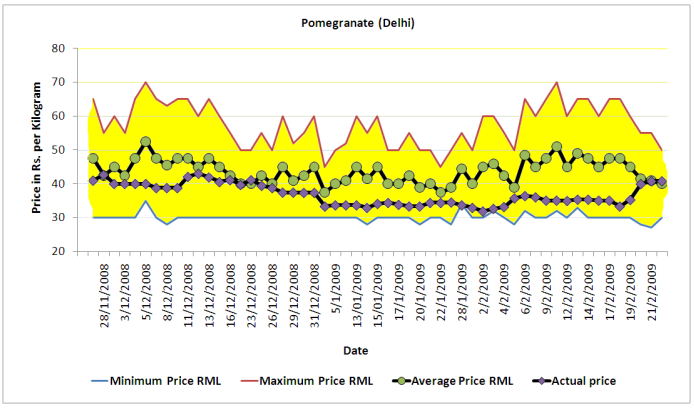
What was most striking about our findings was that there was lack of consistency and reliability in information available to small farmers before the mobile-enabled information services started. Accurate weather information was cited as particularly difficult to get. A number of farmers, particularly those subscribing to the Reuters information programme, noted that they had much more confidence in the information received via the Reuters service than that received from other sources.

In Figure 3, the daily maximum and minimum prices received through the RML service are plotted along with actual *modal* prices, for the cotton and pomegranate crops in Akot, Aurangabad and Delhi markets, during the period November 2008-February 2009. In all three plots, the actual price lies between the RML provided maximum and minimum prices. This indicates that the price-information given by RML service is consistent with the actual price and explains the greater confidence in RML information expressed by farmers in our survey.

Figure 3: Graphs compare prices of Cotton and Pomegranate crops given by RML service with the actual price in various markets.







Notes:

1. *The maximum and minimum prices are taken from SMS-based text messages of Reuters Market Light (RML) programme. The name of the market is given in brackets.*
2. *The actual prices are the modal prices and are sourced from the website of agmarket. http://www.agmarknet.nic.in/agnew/NationalBEnglish/DatewiseCommodityReport.aspx.*
3. *Due to non-availability of actual prices of cotton crop for the Aurangabad market, prices from the nearby Jalna market are taken as proxy.*

It was found that the non-ITC and those who did not use mobile phones did not perceive their existing information sources as sufficient in the qualities they sought – reliability, relevance and timeliness. While the quality of information access via mobile, whether as a phone or an information platform, is ultimately dependent on the information source, the team did find that there was a perception that better quality of information would be available because of mobile phone access.

6. Impacts of Mobiles on Agriculture

While most farmers reported that they used their mobile phones primarily for social purposes, almost all interviewees also used it for agricultural activity, with some respondents citing significant productivity gains as a result. Table 8 ranks the information accessed by interviewees on their mobile phones and compares it with information accessed from other sources as reported in the NSS 59th round survey. Information regarding seeds is the most frequently accessed information in our sample. This is true of the NSS as well. The *mandi* (market) price is the second most important piece of information accessed by farmers in our sample, followed by plant protection and fertiliser application. While the rankings between our survey and the NSS differ somewhat, information on fertiliser application and plant protection are crucial in both surveys.

Table 8: Ranking of the use of modern technology by farmers to access agricultural information

Information	Use of modern technology[1]	Use of mobile phone[2]
Seed	I	I
Mandi (output) price	NA	II
Fertiliser application	II	IV
Plant protection	III	III
Harvesting and marketing	IV	V
Farm machinery	V	VI

Notes:1. Results are based on the information provided in the Situation Assessment Survey of Farmers, Access to Modern Technology for Farming, NSS 59th Round, NSSO, GoI, June 2005. The sources of information used in this table are radio, television, newspapers, input dealers and other progressive farmers.

2. Information is based on the survey done under the study, consisting of individual farmers in Uttar Pradesh, Rajasthan and Maharashtra.

NA: NSS survey did not cover 'Mandi Prices'.

6.1. Impact on Small Farmers

Among small farmers, almost all reported some increase in convenience and cost savings from using their mobile phones as basic communication devices to seek information such as input availability or to check on market prices. But, there were differences between the reported usage and benefits from mobile usage between farmers in Maharashtra and those in Uttar Pradesh and Rajasthan.[23]

[23] A positive impact was specifically reported in only one of the six focus groups involving IKSL subscribers. By contrast, all focus groups involving RML subscribers in Maharashtra reported a

The Maharashtra farmers reported far higher use of their mobile phones to access information in general as well as from mobile-enabled information services. These farmers also reported a diverse set of benefits accruing from mobile usage including yield improvements, price realisation and increased revenues through better adjustment of supply to market demand.[24] In contrast, benefits were limited only to improvements in yields among the farmers of Uttar Pradesh and Rajasthan.

The areas where farmers benefited from improved access to information included seed variety selection, best cultivation practices, protection from weather-related damage, handling plant disease and price realisation. 'Best cultivation practices' was the most significant category across both information services,[25] while the impact of market price and demand information was mostly reported among RML subscribers. Market information influenced farmers to alter where and when they sold their crop in order to maximise revenues and in some cases, provided ammunition to farmers to negotiate better pricing terms from local traders.

There were a few underlying differences between farmers from Maharashtra and those from Uttar Pradesh and Rajasthan. First, there was a difference in the information service accessed by these groups. The RML service was active in Maharashtra while IKSL served Uttar Pradesh and Rajasthan. Second, the farmers interviewed in Maharashtra were significantly wealthier than their Uttar Pradesh and Rajasthan counterparts and reported substantially fewer challenges in terms of infrastructure gaps, access to credit or other potential limitations on leveraging information. Finally, a significant proportion of farmers interviewed in Maharashtra were involved in horticulture and the unique market characteristics of this crop may have played a role in the reported impact.

6.2. Impact on Fishermen

The team found examples of impact of the fisher friend programme ranging from larger catches (the fishing sector equivalent of 'yield') to the prevention of losses. A number of interviewees also said that weather and optimal fishing zone information had an impact on overall revenue by inducing fishermen to venture out to sea on days when they would otherwise have remained on shore.[26] We did not, however, find any evidence among our sample that the fishermen engaged in market arbitrage to maximise price realisation.[27] The team also saw the personal impact of the

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positive impact from the use of the service. Overall, of small farmers interviewed who were IKSL subscribers, 11 out of 44 reported a positive impact from the use of the service. It should be noted that 10 of these 11 were from individual interviews and were specifically sought out by the team to recount examples of impact.

[24] Farmers reported using market demand predictions to adjust the quantity of supply they harvested and took to market during a given period. Future market demand predictions were included, where possible, in the news message sent to RML subscribers in the afternoon.

[25] Despite the challenges noted in the success of the IKSL service, the team interviewed 11 farmers who attributed economic benefits to the information service.

[26] An example offered related to a recent three-week stretch. Had they relied on traditional habits and judgment, the fishermen would have gone out to sea only three times. However, armed with knowledge of wave height, wind speed and other weather conditions, they ventured out 10 times instead and managed to earn incremental revenues.

[27] It was reported that prices differed among contiguous villages but several reasons were offered why the fishermen did not choose to sell outside their local market. These reasons included transport costs, lack of cold storage and lack of trust in the information provided by their contacts in other

programme in reports of decreased vulnerability and isolation while at sea, with several interviewees stating that the programme had 'saved their life' by helping them avoid being caught in severe weather conditions at sea.

As with the farming community investigation, the team noticed a differential in the impact, depending on whether a mobile was used as an information platform or was used merely as a communication device. In several cases, the value of the mobile as an information platform was greatly enhanced because it could be used as a means to communicate newly accessed information to others and allowed even those who did not have access to the fisher friend service to share in the benefits. An analysis of the fisher friend service in the light of Jensen's study of Kerala fishermen reveals the superiority of using the mobile phone as an information platform to disseminate information over its use simply as a communication medium. Whereas fishermen in the Jensen study derived the benefits of arbitrage and wastage-reduction through the optimal use of mobile phone as a communication medium, the fisher friend service enhanced the gains to fishermen by providing a bouquet of information critically useful to them. In particular, it was found that the information on weather forecasts and the optimal-fishing-zone helped fishermen haul in a bigger catch with less effort, augmenting their economic gains. The receipt of the weather forecast information also lowered significantly the chances of loss of life as well as damage to their boats and nets in extreme weather conditions. However, poor road connectivity to markets and the non-existent cold-storage infrastructure did hinder fishermen from taking the fullest advantage of communication technology. Similarly, the lack of GPS facility in small-boats limited their gains below the potential.

The impact of the mobile as a basic communication device was reported as critical for dealing with emergencies like an engine breakdown at sea.[28] It additionally provided some advantages in terms of time/travel savings by co-ordinating activities such as calling for net repair services and ensuring that ice was made available when a fisherman returned to shore. One fisherman reported that this improved the quality of his fish and helped him realise a higher price.

One fisherman reported that using a mobile phone helped him reduce wastage. This was not because he exercised market arbitrage, but because information he received from friends on the shore regarding supply conditions in the local market helped him adjust his time at sea and the quantity of his catch. If supply was already high, he would stop fishing earlier, whereas if supply was low (and consequently prices high) he continued fishing longer.

While the fisher friend programme allowed fishermen to access several types of information, it was only weather and potential fishing zone information that were cited as having real impact.

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markets. They noted that information from these friends may not be "regular, timely and correct" and that if they were to receive market price information they trusted, they might change the markets where they sell their fish.

[28] One example given was that of a boat which suffered an engine breakdown far from shore. While they were unsuccessful in contacting the coast guard despite repeated attempts, they were able to reach MSSRF staff. The staff members then contacted coast guard officials and a successful rescue operation was carried out.

Weather was consistently reported by almost all the people we interviewed as the most important feature offered by the fisher friend programme. The impact here is especially significant for fishermen in simpler boats (catamarans and simple fibre boats) who are more vulnerable to damage from rough sea conditions. These fishermen also have lower thresholds for wind speed and wave height.[29]

The optimal fishing zone information identifies 'zones' where a high catchment of fish is predicted on a given day. The team investigation found the impact of this information to be mixed among those who acted on the information. Several interviewees cited increased catches while others reported frustration at achieving no positive results. One criticism levelled at this information was that it was substantially more beneficial to larger boats that could use GPS information to locate the given co-ordinates and that frequently, though not always, the zone identified was at a distance accessible only by large boats.

6.3. Impact on Traders/Brokers

Traders and commission agents comprised a segment making daily use of their mobile phones and offered some evidence that their mobile use was improving overall market efficiency. A large part of agricultural produce goes through traders/brokers at government-regulated markets. These players control the final sale of goods by most farmers in India and thus are critical for market information and market transactions. Their occupation is arranging the buying and selling of goods, through either auction or private sale. In some cases, their only role is to arrange the sale and take a commission, while in other cases they can buy directly and resell commercially. The heart of the business is centred around controlling the flow of supply and demand as much as possible to ensure they have product to sell and can optimise the daily price.

The team spoke to thirteen traders/brokers at wholesale markets in Allahabad, Agra and New Delhi to investigate how mobile telephony was impacting their business. We found that mobile phones were a critical infrastructure in their business with these players making heavy daily use of these. The call volume ranged from 10-30 calls per day. They used their phones to contact a host of players (farmers, traders, employees/partners posted at other markets) in order to gauge current pricing information, market supply and demand conditions and to obtain produce for sale.

In addition to this primary function, they cited a number of other examples where mobile telephony made an impact. This included dealing with truck breakdowns, shifting crops en route according to the supply and demand situation and communicating instructions to staff – both locally and at significant distances.[30]

Finally, despite the limited set of direct findings in this investigation, the set of interviews with both farmers and market players revealed that, in a number of cases, traders took an active role as 'holistic solution providers' to farmers, particularly

[29] It was reported that a country boat – the simplest boat described in the communities investigated – can only go to sea if waves are less than 3-4 m and wind speed is less than 40 km/hr. Other boats along the spectrum have progressively higher thresholds.

[30] Although this investigation was not able to study directly the impact of mobile on improving the overall efficiency of markets, it would appear that these activities would contribute materially to smoothing out demand/supply imbalances and reducing overall wastage.

small farmers. This included serving as advisors and intermediaries via the mobile phone between farmers and numerous sources of information for information on crop choice, disease control, inputs (seed, fertiliser, pesticide) and matters of credit. In Maharashtra, villagers revealed that they call brokers in the main market to receive information on best practice cultivation techniques. Thus, the traders have historically played a 'one-stop' shop information role for many small farmers in ways similar to the desired role of mobile-enabled information service providers. The relationship has often been cemented by the extension of credit.[31]

In addition to traders, the team interviewed five market staff operating as labourers. These employees typically perform a range of odd jobs for a trader related to receiving, bagging, weighing and moving crops. It was found that while social emergencies often provided the catalyst for handset purchase, they were increasingly seeing value from the employment perspective as well.

6.4. Impact on Large Farmers and Large Fishermen

Among the small sample of large farmers interviewed by the team, we found that, like smaller farmers, they too used mobile phones primarily for social rather than business purposes. While the team did not find evidence that they used their mobile with greater frequency than smaller farmers, there was some indication that when they used their phones for business reasons, they derived greater value from their access to information on market prices and in dealing with input and disease problems.

Although not directly addressed, none of the larger farmers cited any particular constraints on their ability to act on information received and it appeared that they were able to overcome any possible constraints on market access with greater facility than small farmers,[32] affording them greater opportunities for price arbitrage.

There was also some indication that larger farmers were able to extract greater benefits from being able to access resources to deal with input availability and disease control. Apart from being able to obtain information, several of the larger farmers said that input dealers delivered directly to them. They were also able to access professional help immediately from the fields in case of plant disease. As noted previously, speed in crop disease control, especially in the case of perishable crops, can prevent catastrophic losses.

Unlike the smaller farmers in the sample, none of the larger farmers mentioned any value derived from accessing information about new cultivation techniques. There was some indication that these farmers were already well versed with modern farming practices and could access multiple sources of information to stay informed. With that said, a few of the farmers indicated that they would like more information 'delivered to them' via mobile, but they were not pro-actively seeking it out.

[31] The issue of loans and "bondedness"

[32] As transport typically is a semi-fixed cost, greater volumes of produce allow for a more viable cost-benefit calculation in the decision to hire larger trucks/transport vehicles to access more distant markets where prices might be higher.

7. Nature of Benefits Conferred by Mobile Telephony

The nature of the reported positive economic impact of mobile phones by interviewees can be categorised in one of three ways: easy access to customised content, mobility and timesaving or convenience. In the sections above, we have highlighted, in detail, how customised content enables farmers to avert losses, improve yields and increase information relating to various agricultural practices. Four of the farmers interviewed were even able to offer quantitative estimates of the economic benefits of using one of the information services. The size of the benefit they reported ranged from 5-25 per cent of earnings, with the larger gains typically attributable to the adoption of better planting techniques.

The second category – mobility – is unique to the use of mobile phones. The others reflect the fact that the mobile has become the primary (or only) communication mode for many farmers. However, as we note later, the beneficial productivity impact of mobile telephony depends also on other basic infrastructure.

7.1. Mobility Benefits

Mobiles confer distinct advantages as a communications link in isolated circumstances. Mobile users can determine when and where they can communicate and access information. Fishermen reported benefits from mobile phones as a means of two-way communication as well as a means of access to the information service while at sea. This included dealing with emergencies and acting on weather information in time to return safely to shore. Mobile use allowed fishermen to avoid potential losses to boats and nets as well as risks to personal safety. Emergency and safety benefits were consistently described as the most important benefits from the fisher friend service. As described above, benefits were also reported from the ability to change fishing location while at sea in order to profit from the optimal fishing zone information and by communicating with friends at sea. Fishermen at sea reported examples of communicating with others on land to allow them to share in the benefits of a good fishing location. Thus, the access to mobile communications amplified the value of the information provided by fisher friend by enabling information sharing between subscribers and non-subscribers.

Farmers also reported benefits from being able to make and receive calls while working on the farm. This included the ability to describe plant diseases from the field to experts and to co-ordinate better with their hired labour.

Traders and commission agents reported improvements from their ability to deal with truck breakdowns and the ability to shift crops en route in response to changing market conditions.

7.2. Improved Convenience, Time and Travel Savings

Almost all of the farmers interviewed reported some benefits in terms of greater convenience such as timesaving by using the mobile as a basic phone. For some of the farmers interviewed, the mobile represented the only convenient access to communication facilities. This is not surprising, as fixed line communication in rural India remains extremely poor. For instance, in Rajasthan, the rural fixed tele-density

is about 1 per cent while the corresponding figure in Uttar Pradesh is less than 1 per cent.

For many of the small farmers in our survey who said they benefited from greater convenience, the savings stemmed typically from avoiding local travel and could range from Rs. 100-200 per trip. A smaller minority said they had derived greater benefits from the ability to make better decisions about where to sell their output after getting market prices for a variety of local and distant markets.

In villages with a successful ITC rural kiosk programme, access to mobile phones increased the range of services the local representative, the Sanchalak, could offer. In one village, the Sanchalak reported connecting with farmers 30-40 km away. Mobile use also delivered convenience benefits to farmers who were starting to substitute some physical meetings with mobile phone conversations.[33] It was noted that the mobile was essential when the village suffered power shortages and the rural kiosk was not available.

Discussions with ITC staff revealed that mobile phones did not totally substitute face-to-face communication. It was reported that farmers often need highly personalised solutions that benefit from back and forth dialogue in person with the Sanchalak as well as the larger farming community. Many of the queries from farmers could not be fully resolved through the phone alone.

8. Constraints

The survey also revealed that in some cases, small farmers and fishermen found the lack of infrastructure, their lack of knowledge regarding the cultivation and marketing of non-traditional crops and their inability to access credit major hindrances to realising the full benefits of mobile telephony.

8.1. Infrastructure Constraints

All nine focus groups, involving predominantly small farmers in Uttar Pradesh and Rajasthan, highlighted infrastructure gaps that affected their ability to realise productivity gains through improved yields and higher prices. In order for farmers to realise the full potential of access to new information, they must be able to use it effectively. We found, consistently, that inadequate infrastructure prevented this.

Four specific infrastructure constraints limit the ability of farmers to leverage information:

- insufficient availability of critical resources (reduces yield)
- inadequate irrigation (reduces yield)
- poor physical access to markets (reduces realised prices)
- inadequate crop storage facilities (reduces realised prices)

[33] In one ITC village, it was reported that 20 per cent of farmer clients used their mobile phones to communicate with the Sanchalak. However, even these farmers continued to travel to the Sanchalak's home for in-person meetings.

Six of the focus groups in Uttar Pradesh highlighted problems such as difficulties in sourcing critical resources such as fertiliser, seed and medicine. One major problem they faced was that counterfeits were sold in many local markets and the farmers had no way of distinguishing them from the genuine product. In several groups, the farmers noted that they needed information that would help them identify these counterfeit goods that lead to productivity losses.[34]

Three focus groups in Uttar Pradesh and Rajasthan specifically mentioned lack of irrigation as a significant constraint and two of them noted that it had affected the sustainability of growing desired crops.[35] One Rajasthan farmer noted that the 'scarcity of water is the main hurdle for the development of agriculture in the region.'

Farmers reported poor road infrastructure and lack of refrigerated transport as problems affecting their access to markets. Many of the small farmers typically used small carts powered by animals or small engines to deliver their goods to the market and said that transport costs represented a prohibitive barrier to access more distant markets. This limited their opportunity to profit from market price differences by selling in markets where higher prices may be available. As one small farmer in Allahabad commented, even if he knew the prices in the larger regional market, 'there are no roads that go there.'

Lack of storage facilities was cited as curtailing farmers' ability to choose when to sell their crop, limiting their ability to maximise price realisation. One group of farmers said that the lack of storage facilities contributed to the effective monopoly of local commission agents, which they believed caused them to receive lower prices for their produce.

As a counterpoint to the findings in Uttar Pradesh and Rajasthan, the farmers surveyed in the five focus groups in Maharashtra did not report infrastructure constraints other than a few mentions of cold storage concerns.[36] There was widespread irrigation and diversification into water-dependent, high-value crops like horticulture.[37] There were no perceived concerns with availability of inputs[38] or access to markets. Not surprisingly, these farmers reported greater ability to achieve both yield and price benefits from leveraging information.

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[34] Input constraints relate not only to availability in general, but also to the availability of "genuine" inputs.

[35] Although only specifically mentioned by three focus groups, the team found that irrigation was not available to smaller farmers in almost any of the regions surveyed in Allahabad, Agra and Rajasthan. The primary reason cited was electricity problems that made the tube well ineffective. Unlike Maharashtra, which suffered from electricity limitations but had predictable electricity timings, the electricity timings in the poorer regions were typically reported to be unpredictable.

[36] Two focus groups reported access to storage facilities while two groups had no access, particularly to cold storage. However, even in the latter case, the lack of access to cold storage did not prevent them from taking advantage of market arbitrage opportunities.

[37] The availability of electricity (essential for some tube wells) ran on a predictable schedule. Consequently, it was not described as a problem by the farmers surveyed despite daily limitations of availability. Electricity was available from 5 hours/day – 12 hours/day.

[38] While one focus group mentioned a desire to get information on seed availability, this appeared to be more in order to save search costs rather than difficultly in ultimately getting the product. Getting information on price variations was one of the biggest challenges they faced.

ITC's internet kiosk service is one attempt to overcome some of the challenges presented by inadequate infrastructure (Table 9). This has been done by combining the provision of information with other services such as the direct sale of critical resources. Recognising the problems faced by small farmers in their supply chain, the internet kiosk model includes information delivery, input provision and direct procurement. It seeks to overcome infrastructure constraints by bringing markets to the farmer. Farmers we interviewed in villages with successful ITC programmes reported improved yield and better price realisation. The primary benefits reported were the introduction of hybrid seed varieties and adoption of new farming practices, leading to productivity gains of between 10 and 40 per cent. Farmers noted that by receiving comparative market pricing information as well as a firm price offer in advance from ITC, they had greater ability to choose when and where to sell their products. They also benefited from being able to sell to ITC locally and getting transport costs reimbursed.

Table 9: Example of the ITC 'e-choupal' model – Wheat in Uttar Pradesh

Problem	Examples	Solution
Lack of consistent, reliable information	• Critical resources, disease, sophisticated farming practices, accurate weather reports • market prices (in advance of market arrival)	• Information provision through e-choupal • Other services (soil-testing, advice) available through regional hubs
Lack of availability of inputs	• Seed, fertiliser, pesticide, fungicide, weedicide, medicine	• Supply of inputs provided
Access to Markets and Storage	• Crowded physical marketplace (could take 2-3 days to enter) • lack of storage (less leverage over when to sell – worse for perishable products) • Transport costs to non-local markets	• Direct procurement by ITC • Deal negotiated at time of farmer's choosing • Transport costs reimbursed
Middlemen dominate the supply chain	• Unfair practices – higher transaction costs, lower amount paid to producer	• Direct procurement • Transparent pricing known in advance • Payment based on gradations of quality

Source: Interviews, Team analysis.
Note: The specific range of services provided can vary among individual e-choupals.

8.2. Other Constraints

Although inadequate infrastructure was the constraint most often cited by farmers as limiting their ability to realise the full productivity potential of improved access to information, other issues were also raised over the course of our investigation. Two of these stood out.

i) Access to credit

Non-availability of credit at reasonable rates is a persistent problem for small farmers. Although rural borrowing from institutional agencies has doubled in the last three decades, the share of rural credit from non-institutional agencies is still above 40 per cent.[39] This reflects exclusion of small and marginal farmers from the formal credit system, the primary reason being their inability to offer collateral. This has led to an excessive dependence on informal credit sources with their exorbitant interest rates. The lack of credit availability has restricted the use of improved seeds, fertilisers and modern technical know how by farmers and this, in turn, has had an adverse impact on agriculture production and food security. Thus, farmers are in a vicious circle where lack of credit leads to lower output and lower output lead to a loss of income, which in turn pushes them out of the organised credit system.

Lack of access to credit from the organised banking system also reduces the farmer's chances of getting the best price because of restrictions (explicit or implicit) on where he can sell his crop. Access to credit was a problem raised by a majority of small farmer focus groups, although we were unable to quantify the extent to which farmers lost in terms of price realisation. We heard many contradictory responses as to whether or not farmers were bonded and thus had to sell to a specific trader, commission agent or moneylender who had extended them credit earlier in the year. Therefore, systemic deficiencies that lead to the exclusion of small and marginal farmers from the organised credit system are an issue that needs to be tackled to ensure high productivity growth.

ii) Capacity for risk-taking

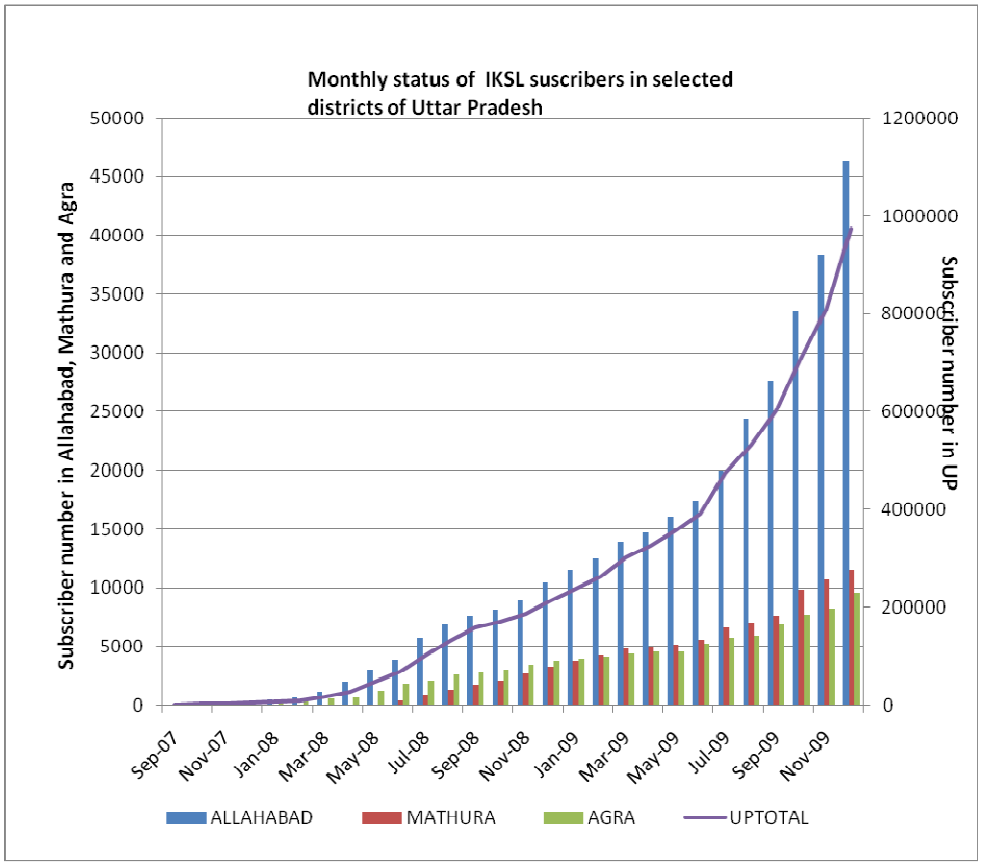
Farmers, in general, are naturally conservative. However, in order for information to drive agricultural productivity, farmers must be willing to try new strategies, which may include new farming techniques. While we found a small number who had made changes based on the information they received via their mobile phones, there were some who expressed reluctance to try new approaches even when they had access to relevant information. ITC staff said that, in their experience, persuading small farmers to adopt new seed varieties or farming methods often requires a combination of approaches: repeated dissemination of information, demonstration plots and farmer dialogues. Several focus groups in villages where hybrid seed had been introduced noted that the seed companies also promoted seed diffusion through demonstration plots and capacity building measures. It, therefore, seems likely that for broader rural productivity gains, a set of similar capacity-building activities to complement basic information provision will be required.

[39] All India Debt and Investment Survey, NSS Fifty-Ninth Round, January–December 2003

9. Looking Ahead

The interviewees stressed that for a true 'revolution' to occur, farmers must be able to get information delivered to them at a time and place of their choosing. Mobile telephony, as our survey bears out, can be a powerful tool to help meet this need. The survey, of course, has been more in the nature of an initial impact study and a more rigorous assessment of the benefits of mobile telephony with a much larger sample size is necessary to help provide policy inputs. Nevertheless, it is indicative of the contribution that mobile telephony can make towards improving agricultural productivity in the country. That farmers benefit from the introduction of mobile-enabled information services is also borne out by the increasing number of subscribers to these services. (Figure 4).

Figure 4: Number of subscribers of IKSL services



Source: IFFCO- IKSL department

Over the course of the research, we found a number of emerging ideas and applications for mobile phones that showed potential for the future.

- One example involved the use of camera phones to photograph crop diseases/pest infestations and send them to experts immediately. This visual information can improve diagnosis and advice.[40]

[40] Tata Teleservices has started to pilot this in Maharashtra.

- ITC has been piloting a new virtual commodity exchange, "Tradersnet", that enables direct buying and selling of coffee by producers and wholesale purchasers through an internet-based trading platform. SMS messages are sent to users' mobile phones every morning with the offers and grades available for purchase on that day. At the end of the day, users receive a text message with details of what actually took place. ITC had expected that exchange members would use the internet to access the electronic exchange to execute transactions. However, while members would use the internet for research, a number of them were not comfortable using it for transactions. Instead, they would call ITC representatives via their mobiles to execute trades on their behalf. One future option is to enable all actions to take place on mobile phones, thus taking advantage of the perceived higher comfort level that users have with their phones over PCs.

- ITC is also considering whether and how mobile phones can extend the rural kiosk programme. One possibility is to get farmers to feed personal information into the system via their mobile phones, enabling the efficient delivery of highly customised information back to their mobiles. The information could be updated, allowing for continual adjustment and tailoring of the information the farmer receives. Mobile phones could extend the reach and possibly, the functionality of the current e-choupal model.[41]

One key element in these examples is leveraging the portability, flexible content delivery capability and two-way communication characteristic of mobile phones to deliver low-cost but highly customised solutions.

10. Conclusion

As a telephonic device, the mobile enables access to information sources that may not otherwise be reachable. As an information platform to receive sms, menu or voice-message information, mobiles provides the ability to get connected to new knowledge and information sources not previously available with the possibility of real-time, highly tailored information delivery.

Even at this early stage, mobile phones are being used in Indian agriculture and are starting to deliver agricultural productivity improvements, an impact that is enhanced by the new mobile-enabled information services. The most common benefit of mobile telephony found in the research was derived from the use of mobile phones as a basic communications device as for many of the farmers interviewed, it was the only convenient phone access they had.

Realising the full potential benefits of mobile phones is limited, however, by a set of constraints that prevent farmers from fully leveraging the information they receive. The barriers apply more to small than to large farmers; large farmers are more able to leverage the benefits of the communication and information they can access.

[41] There were 6500 e-choupals were active, in 2009, reaching out to 40,000 villages. http://www.itcportal.com/rural-development/echoupal.htm

The constraints include shortcomings in physical infrastructure affecting access to markets, storage and irrigation. Issues regarding the availability of critical products and services including seeds, fertilisers, medicines and credit to small farmers also exist.

This array of constraints means that additional interventions may be required to improve agricultural productivity growth. Increased public and private investment will be necessary to resolve critical infrastructure gaps. Policy changes may also be needed to encourage better access to high-quality inputs and credit for small farmers. Increased extension services and capacity-building efforts can complement information dissemination via mobile phones and associated services to accelerate the adoption of new techniques. Social networks may play an important role in building the trust and confidence required to influence the adoption of new mindsets and actions by small farmers. Additionally, basic information will need to be supplemented by a range of other activities such as demonstrations and broader communication efforts.

However, even in the case of poor farmers facing significant constraints, we found that there were still opportunities to realise productivity gains from the adoption of new farming practices and actions to mitigate crop losses. In the case of fishermen, there were, in addition to economic benefits, safety benefits and enhanced quality of life from decreased isolation and vulnerability.

There are also lessons for current and future mobile-enabled information service providers about the information of greatest value to users in the agricultural sector.

- The customers are not fully informed about the existing services and various facilities under these services. Creating awareness among farmers regarding the range of services provided may help the service providers to increase their subscribers base.
- Greater customisation and frequent updating add substantial value. Generic information triggers dissatisfaction and reduces the frequency with which farmers access the service. The most frequent criticism we heard was that information was ‘old and routine’.
- Text messaging offers significant advantage over voice-based delivery in terms of convenience and content flexibility. Wherever literacy is a concern voice sms can also be used.
- Information should be in the local language and easy to understand. Most of the farmers we interviewed were prepared to pay for information services as long as they felt that they would get the information they wanted in a timely and reliable manner.

There are some important questions that were not covered by our research. One is the extent to which farmers who use mobile phones share information with those who do not. As continued mobile penetration encourages more information access and diffusion, further research may be able to evaluate if ultimately a ‘tipping point’ will be reached, amplifying the impact of mobiles on productivity and farm revenues.

Finally, it may be useful to consider whether and to what extent mobile phones would help increase overall market efficiency and reduce price dispersion in wholesale agricultural markets.

This study provided a first look at the potential offered by mobile telephony to raise productivity in the agricultural sector as a whole. We saw many examples of benefits created by the characteristics of mobility, customised content delivery and convenience. As mobile penetration continues to increase among farming communities and information services continue to adapt and proliferate, scope exists for a much greater rural productivity impact in future, but achieving the full productivity potential will depend on reducing other constraints, which limit the use of the information farmers and fishermen can obtain from their mobile phones.

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Annexure 1: Survey Locations

State	District	Village	Number of focus group discussions conducted	Number of individual interviews
Uttar Pradesh	Allahabad	Saidabad, Bijhayan, Malak Harhar, Vardaha, Panwar	5 (67)	10
	Agra	Medhapur, Mania	2 (24)	3
	Mathura	Usfar, Lalpur	1 (10)	2
Rajasthan	Alwar	Khairtal	1 (5)	3
	*Dausa	Khanvaas		1
	*Bhilwara	Lesua		1
	*Baran	Himoniya		1
	*Jaipur	Murali Papmaanbali		1
Maharashtra	Satara	Arphal, Bharatgaon, Indoli	4 (46)	1
	Pune	Kumbhar	1 (4)	
Pondicherry		Veerampattinam		4
		Ponnithittu		4
Delhi				3
Total	**11**	**20**	**14 (156)**	**34**

*Note: * interviews were conducted telephonically.*
Numbers in parenthesis indicate the total number of farmers involved in the focus group discussions.

Annexure 2a: Interview Sample - Breakdown by Farm Segments

Segment	Number	Per cent of total
Marginal-Small Farmer	152	81.3
Medium Farmer	3	1.6
Large Farmer	8	4.3
Trader/Market Player	17	9.1
Other	7	3.7
Total	187	100

Marginal-Small Farmer (< 6 acres)
Medium Farmer (< 20 acres)
Large Farmer (>20 acres)
Trader/Market Player – includes traders, commission agents, loaders and labourers
Other – includes business and non-profit organisation representatives

Annexure 2b: Marginal & Small Farmers by Regions Surveyed

Region	Number	Per cent of total
Allahabad	77	50.7
Agra-Mathura	20	13.2
Delhi-NCR	2	1.3
Rajasthan	2	1.3
Maharashtra	51	33.6
Total	152	100

Annexure 3: Questionnaire

A. General Statistics- Know the Farmers

Location …….....…

RML/ IKSL/ FF/ only mobile (service)

Frequency (No. of participants)

How did you get to know of the service? Why did you decide to join?

Size of land holdings (ask each participant)

Family size

Average Household Income

Average Population of Village

Crops grown

	Crop	**Marketable Surplus (Kgs)**	**Mandis produce is sold in**
Kharif			
Rabi			

Do you have access to credit? If yes, from which source (bank/ money lender/ friends/ other sources)? Approximately how much debt do you take each year/season?

B. Broad Questions (descriptive answers)

(Try to capture the information in 5-point statistics wherever appropriate- 1: poor; 2: Average; 3: Good; 4: Very Good; 5: Excellent)

Q.1. Do you own a mobile? Do you make calls for agricultural/business purpose? How frequently and what information do you seek and from which source?

Q2. What is the information provided through the service? How often? How does it vary by growing stage? Has the nature of the service/information changed over time? (Better/ Worse)

Q3. How would you rate the quality and timeliness of the information provided?

Q4. Of the information received, what information do you value the highest? What information the least? Why?

(Is there information they access on a daily/ weekly/monthly/seasonal basis)

a. How would you prefer to receive the information (sms, voice-mail, calls)? What percentage of current messages received through these services do you listen to/read? What percentage of the messages that you read/listen to do you find useful to you? What do you like/dislike about receiving information through sms/voice?

b. When during the day do you typically access the messages (morning, afternoon, evening – all day long, etc.)?

Q5. Before these service, how did you get this information? What were your sources?

Q6. How would you rate the quality and timeliness of the information received through these services against the information you received from other sources before these were introduced?

Q7. In addition to the service, what other information sources do you use for agricultural information (including internet kiosks if available)? What information is accessed through which source (e.g. radio for weather info, etc.)? Are these information sources better for some things than the service?

Q8. Do you feel you get value for money from the service? How has your income increased (or losses decreased) as a result of using this service? If the cost of the service is doubled, would you continue with it?

Q9. Have you made use of the info received through the service? If yes, then how specifically has it changed behaviour or influenced your decision(s)? If no, why not? Has anything prevented you from making use of the information?

Q10. What elements would you change about the current service to make it better? What other information do you need/would value that you are currently not getting (or not getting with sufficient quality or timeliness)? Would you want this delivered via mobile?

Q11. Do you ever share the information you receive with other farmers who are not users of these services?

Q12. Are they aware of any other competing mobile/phone services for agriculture information in their area? (e.g. BSNL helpline, etc.)

Rank them as 1: Not at all; 2: Slightly; 3 A lot; 4 Manifold

Q 13 Has mobile helped in seed adoption?

Q 14 Has mobile helped you to

a. get connected to markets
b. to adopt better agricultural practices

c. increased revenue
d. influenced your cropping pattern decision
e. reduced wastage?

Q 15 Ranking in terms of perceived value of information

Importance (Scale:1-not at all important, 2-not very important, 3-some what important, 4-important, 5-very important)

Type of Information	**Value of information**	**Present source of information**	**If presently by RML/IKSL, then previous source**
Seeds			
Fertiliser			
Pesticides			
Machinery			
Labour			
Use of inputs			
Other farm practices			
Harvesting			
Marketing			
Storage			
Prices-----input ----------output			
Electricity timings			
News reports			
Diseases			
Govt. schemes			
Customised crop advice			
Waste reduction			
Animal Husbandry			
Others			

Annexure 4: Partner Organisations

IFFCO (Indian Farmers Fertilisers Co-operatives Limited), a national organisation of rural co-operatives, which runs a mobile-enabled farmers' information service in partnership with Bharti Airtel, an Indian mobile operator. This service is called IKSL (IFFCO Kisan Sanchar Limited). It requires the farmers to purchase a special SIM card (IFFCO-Airtel green card). They receive free voice-mails containing agricultural information as well as access to a paid helpline service costing Rs. 1 per minute.

Reuters. The global information services company operates an Indian-based mobile-enabled information business for farmers, Reuters Market Light (RML). Farmers purchase a three-month, six-month or 12-month subscription, which entitles them to daily agricultural information through text messages. Our field interviews were supplemented by interviews with Reuters' staff in London and Maharashtra.

ITC. The Indian agribusiness company operates several models of a rural internet kiosk programme, the 'e-choupal', serving farmers across rural India. The version investigated for this report was an internet kiosk manned by a local farmer who acts as an agent for ITC (a 'Sanchalak'). Through this agent, farmers can access agricultural information, buy inputs (seed, fertiliser, pesticide) and other retail products, and can sell selected crops directly to ITC. They are also exposed to demonstration plots and training sessions. There is no charge for the information and training sessions. Our field investigations were supplemented by interviews with staff in Gurgaon and Hyderabad.

MS Swaminathan Research Foundation (MSSRF). This non-governmental organisation is piloting a mobile-information services model for fishermen in partnership with Qualcomm, a global technology company, and Tata Teleservices, an Indian mobile phone operator. This programme, "fisher friend", provides free mobile handsets to fishermen which they must share on a rotating basis, along with free access to the information service.

Annexure 5: Examples of IKSL Messages in Uttar Pradesh (translated into English)

Weed Control in Paddy crop: Weed control in paddy fields: Use khurpi or paddy-weeder. Weed-killing chemicals can also be used. For grasses and broad-leaved weeds, use Butachlore 5: globules 30-40 kgs. per hectare or Pendimethalin 30 E.C. at the rate of 3.3 litres per hectare. Dissolve in 700-800 litres water and use within 3 to 4 days of sowing. Butachlore should only be used in 3-4 cm. of water. To control broad-leaved weeds only, use 2, 4, D Sodium Salt at the rate of 625 grams per hectare. This should be spread one week after planting the paddy field and 20 days after sowing direct.

Cultivation of Bananas: Those farmer brothers who want to cultivate bananas should choose land that is mainly alluvial or clay alluvial land with good drainage. Make sure there are sufficient wind barriers, especially from the west; otherwise, hot winds during May and June can harm and dry the leaves. Plant lines from east to west in order to minimise the chances of damage from hot winds. Bananas are an excellent crop for increased production per unit area in a short period and have a good yield. *Grandnen* banana is best for cultivation; *green cover* species/variety is also good. Timely planting is key and should be done between 15 June and 15 July. 3-month-old sword-shaped leaves containing fully developed and stout *ghanankanda,* are used for planting. Plants prepared through tissue-culture are best as they have good disease resistance.

Annexure 6: Examples of RML Messages

The information in this message includes (for three markets): (i) minimum price, (ii) maximum price and (iii) quantity of the crop arriving in the market that day.

Cotton

Akot: Rs.2650 – 2850 / Q 3500

Aurangabad: Rs.2700 – 2850 / Q 800

Shevgaon: Rs.2650 – 2700 / Q 2500

This message gives weather forecast (*Anuman*) for the Satara taluka (administrative region) of Satara district: the name of the taluka, month and date, high and low temperatures, relative humidity (RH), chances of rain, and forecast of actual precipitation (9 mm here).

Anuman

Satara
03/12
H: 29^0C, L: 19^0C
RH: 77%
Chances of Rain: 98%,
Rain: 9 mm

Annexure 7: Impact of Mobile and Mobile Enabled Services – Case Stories

Box 1: Impact of information

Name: Jagadeesh
Age: 40
Education: Middle School Level
Location: *Khanvaas* village (Rajasthan)
Land Size: 9 acres (shared between three brothers)
Service: IKSL

Impact of mobile phone:
a) Cost savings from avoiding potential crop loss
b) Increased revenue from higher yield

Cost Saving – Crop Loss: This farmer acted on timely weather information received through IKSL to protect a harvested crop (*Gwar* – used as livestock fodder) that was lying on the ground exposed to the rains. He estimates that, but for this ability to act, he would have lost 50 per cent of this crop, resulting in a loss of between Rs.5,000 and Rs.6,000.

Increased Revenue: The farmer made use of information provided by IKSL concerning planting techniques and disease control to make changes in his farming practice. In his description, he shifted from 'guess-based' actions to following modern scientific cultivation practices. He attributes a 25 per cent increase in annual earnings, from Rs. 100000 to Rs. 125,000, to these changes.

Box 2: Increased interaction with experts

Name: Jagveer Singh
Age: 30
Education: Intermediate
Location: *Medhapur* village (Uttar Pradesh)
Land Size: 1.5 acres
Service: IKSL
Impact of mobile phone: *Improved decision-making ability*

Use of mobile phone has increased the frequency of his interactions with agricultural experts, while also reducing travel and time costs. He solely depends on the mobile phone to gather all the agricultural information he needs, from the *growing* to the *marketing* stage. He calls experts or *doctors* of seed-companies like *Bharat*, *Indo American* and *Shimla* at the time of sowing to know about new and better seed varieties and place of availability. The interactions with seed experts made him realise that diversifying to the cultivation of high-value *capsicum* crop would provide better value and greater market opportunities. He consulted experts from *IKSL helpline* and purchased seeds and other inputs. He obtained a high crop yield of superior quality of capsicum that enabled him to earn higher returns.

Box 3: Impact of price information

Name: Puran Singh
Location: *Khairtal* village (Rajasthan)
Land Size: < 5 acres
Service: IKSL

Impact of mobile phone:
IKSL messages help take correct decisions, reduce wastage and enhance earnings

Mr. Puran Singh, a small farmer, when informed by the IKSL service of a rise in market price of wheat from Rs.980 per quintal to Rs.1045 per quintal, decided to sell directly in the market instead of selling at a lower price to the market agent in the local mandi. Consequently, he earned an additional Rs.1500 by selling 20 quintals in the market.

While he was planning to sell his mustard seed (*sarson*) crop, he was informed by the IKSL service of an expected rise in the crop price over the next couple of days. That prompted him to wait for the price rise. Two days later, he sold 200 quintals of the mustard crop at a higher price, earning Rs.50,000 more than he would otherwise have.

Box 4: Optimising time of sale to maximise revenue from cultivating soybean crop

Locality: *Bharatgaon* village (Maharashtra)
Land Size: 4 to 5 acres
Service: RML

Impact of mobile phone:
Maximising price realisation by delaying time of sale

The soya farmers in this village have the capacity to store their crop in their homes for 3-4 months. Typically, they would sell their crop immediately after the harvest. However, they recently received information from RML on both daily market prices as well as future price predictions. Based on that information, they have chosen to store their goods and wait for a better price rather than sell immediately. While they have not yet realised the possible positive impact from this decision, it was the first time that these farmers had retained their crop without selling. This showed a significant change in behaviour as a result of the information received.

Notes: To delay the time of sale beyond a short time window, it is imperative that farmer have the financial means to do so (in addition to storage capacity). In cases where cash requirements are immediate, this financial flexibility may not exist and the farmer will need to sell the crop with haste to repay loans taken from moneylenders or traders.

Box 5: Getting a higher catch

Name: K. Prabhakaran
Location: *Veerampattinam* village (Pondicherry)
Segment: Launch Boat (large fisherman)
Service: Fisher friend

Impact of mobile phone:
a) Revenue – increased catch
b) Two-way information sharing – ability to contact at sea from land

This fisherman had stayed on land to manage family commitments and was advised by colleagues at sea that they were having a poor fishing day. He told them about the optimal fishing zone information he accessed on his mobile and they quickly changed their location and benefited from a higher catch. One of the beneficiaries managed a catch worth Rs. 30,000 – six to ten times the typical daily revenue reported by other fishermen with launch boats.

Box 6: Technology helps deliver a big catch: *taking a chance on new information*

Name: A. Alphonse
Location: *Koyalam* village (Pondicherry)
Segment: Fibre Boat (small-medium fisherman)
Service: Fisher freind

Impact of mobile phone:
a) Revenue – increased catch
b) Information sharing – ability to contact other fishermen from the sea

Evaluating sea conditions using traditional methods, the fishermen of this village judged that fishing would be poor on this day and did not venture out to sea.

One of the fisherman, who was part of the fisher friend programme, chose to rely on the optimal fishing zone information delivered to his mobile and discovered a large pool of fish. He immediately called a friend on land with his mobile and the news spread among the villagers. This prompted the fishermen to venture out to sea, resulting in an overall haul worth Rs.2500,000 for the village.

Box 7: Optimising supply to increase revenue

Locality: *Arphal* village (Maharashtra)
Land Size: 3-6 acres
Service: RML

Impact of mobile phone:
Increased revenue by matching production to market demand

The farmers in this village had been engaged in horticultural cultivation for the past two years. Flowers are a highly perishable commodity and farmers monitor production and harvesting closely to minimise waste. The farmers received information from RML about a predicted increase in the market demand for their crop. They applied a special fast growth tonic to increase production and thus capitalised on the information received to increase their sales.

The farmers reported that the amount of daily supply taken to the market is between 800-1200 flower sticks, depending on demand. In the absence of market information, they typically would take fewer than 1,000 sticks per day. These farmers have now started to adjust the quantity of output they bring to market as a result of RML market demand information, offering potential for increased revenues on high demand days.

Box 8: Leading to diversification

Name: Mr. Swapnil, Mr. Kailash
Age: 18 and 20 years
Location: *Kumbhar* village (Maharashtra)
Land Size: 1.5 acres
Service: RML

Impact of mobile-phone: *Venturing to profitable diversification with minimum risks*

Swapnil and Kailash are two brothers, just 18 years and 20 years of age, and help their father in farming. They knew rose cultivation was a profitable venture, but it was risky too. They did not know how to diversify in a safe manner. Swapnil persuaded his father to purchase the RML service to get customised information on rose cultivation. They have diverted half an acre of their 1.5 acres of land for rose cultivation. In the remaining field, they are still growing wheat and onion. They have planted 1500 saplings bought from a nursery near Pune. They have owned a mobile phone since 2004 but have subscribed to RML service only 2 months ago. The final impact on revenue is yet to be seen.

Box 9: Social benefits: *avoiding inclement weather*

Name: S. Sasikumar
Location: *Veerampattinam* village (Pondicherry)
Segment: Launch Boat (large fisherman) - TBV
Service: Fisherfreind

Impact of mobile phone:
a) Safety – Personal and Property
b) Information sharing – ability to contact other fishermen at sea

This fisherman obtained weather information through fisher freind that predicted severe thunderstorms that day, though the sky looked clear. He decided to head back to shore and advised other friends via mobile who were also out at sea.

As a result of this action, all the fishermen avoided severe thunderstorms, which helped them avoid possible damage to boats and nets as well as danger to their personal safety. The replacement value of a fishing net – Rs.30,000 – provides some idea of the financial saving as a result. This is roughly equally to the fishermens' monthly income during the two months of the fishing season when they earns the bulk of their annual income.

Box 10: Better price-bargaining capability

Name: Om Prakash
Age: 40
Location: *Lesua* village (Rajasthan)
Land Size: 17 acres (between four brothers)
Service: IKSL

Impact of mobile phone:
Increased revenue from higher price realisation

Supplies and Markets: The farmer obtained market price information through the IKSL service for the Bhilwara market located 45 km away, noting that the price quoted was Rs.2/kg higher than that on offer at the local market (Mandal market). With that information in hand, he was able to negotiate a price that was Rs.2/kg higher than that offered by the local market traders (Rs.11/kg vs. offer price of Rs.9/kg). He realised a revenue gain of Rs.2000 on 1000 kg of wheat. It was significant in that negotiation that the farmer was able to cite a credible source to the trader for the price information.

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