Leveraging Mobile 2.0 in India for Agricultural Market Access

March 2010

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This research was carried out as part of the Mobile 2.0 project of LIRNEasia (www.lirneasia.net) and was funded through a grant from the International Development Research Center (Canada) and the Department for International Development (UK)

The authors would like to thank Bhavesh Nayak and Rajendra Kumar of IFMR Trust, for their assistance in providing information on the Kadi Pilot as well organizing the field visits.

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List of Abbreviations

ABWFR	Asset-Backed Warehouse Finance Receipt
APMC	Agricultural Produce Marketing Committee
ATMNE	Agricultural Terminal Markets Network Enterprise
BOP	Bottom of the Pyramid
FINO	Financial Information Network and Operations
ICT4RL	Information and Communication Technologies for Rural Livelihoods
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IFMR	Institute for Financial Management and Research
IVR	Interactive Voice Response
NSEL	National Spot Exchange Limited

1.0 Agricultural market access via ICTs

1.1 Introduction

Farmers in developing countries are often unable to engage effectively in agricultural markets in their countries since these markets are prone to inefficiencies (Barret, 2005; Fafchamps, 2004; World Banks, 2002 amongst others). Small and subsistence farmers in particular tend to have unfavorable linkages to markets due to a lack of market orientation (Timmer, 1997). The commercialization of agriculture and the subsequent structural complexity it has induced in the food system has meant that poor farmers face higher transaction costs to access competitive markets (Pingali et al, 2005; Pingali, 2006). The lack of effective engagement translates into the inability of farmers to utilize market information in their livelihood decisions. These suboptimal decisions in turn restrict the possibility for farmers to leverage their produce or commodities to improve and sustain their incomes, by engaging, for instance, in financial instruments such as forward contracts. The inability to enter into such contracts precludes them from access to crop insurance and working capital loans using their produce as collateral (e.g. a forward contract or commodity backed financing using warehouse receipts).

Providing access to accurate and timely market price information without physically visiting markets is the first step in reducing the transaction costs and allowing farmers to engage effectively in agricultural markets. Ratnadiwakara et al (2008) argue that provision of market price information in a timely manner reduces information asymmetry, which in turns allows farmers to reduce their transaction costs while also increasing their bargaining power in market transactions (also Jaleta & Gardebroek, 2007). A crucial benefit of having access to market price information (especially forward and/ or future prices) is that it gives farmers more control over their crop planting and harvesting schedules which they can then optimize so as to align their agricultural outputs to meet the demand in local and external markets. This in turn would help facilitate a more stable revenue stream from their produce.

ICTs can play an important role in bridging the information deficiencies and can provide access to markets. From pure market price dissemination to more sophisticated systems that link farmers to output markets, ICTs can play an important developmental role. Its potential as a

poverty alleviation tool has been recognized and countless examples exist in the developing world of initiatives to improve farmers' livelihoods via ICT driven linkages to markets.

However, assessing the potential of ICTs to positively impact overall rural livelihoods requires a more nuanced understanding of such livelihoods. Of late, the developmental literature on poverty alleviation strategies advocates the need for a more systematic analysis of the factors that affect rural livelihoods. For example the rise of the sustainable livelihood approach in the late 90s coincides with this recognition of the need for a holistic framework for poverty-focused development, centered on people – their needs, capabilities, adaptability, vulnerabilities, diversity and their relationship to the social, legal and institutional environments in which they live (Chambers 1987, 1995; Chapman et al, 2003; Cskai & Haan, 2003). In this context, effective engagement in agricultural markets requires the confluence of a variety of factors (inter alia laws/ policies as well as inclusion of multiple actors). ICTs then facilitate this confluence, by facilitating the flow of information (critical to the sustainable livelihoods). However, the choice of technology (both processes as well as infrastructure) is dependent on context (i.e. aligning demand-driven factors such as awareness and user choice/ ability with respect to technology and existing technology infrastructure with what is the most technologically appropriate solution (Gerster & Zimmerman, 2005; Souter et al, 2005; Conroy, 2006; Richardson, 2006, amongst others).

1.2 Role of ICTs in agricultural markets

As outlined earlier, the agricultural marketing process in the developing world tend to suffer from information asymmetry and high transaction costs, especially information search costs (Dao, 2004; Ratnadiwakara et al, 2008). Early studies (Batchelor, 2002) have already established that rural communities have a high demand for market information and specifically commodity price information.

While Kizilaslan (2006) argues that effective dissemination of information for agricultural and rural communities aids the fight against poverty, it is also imperative to understand the role of information amongst the rural poor. Duncombe (2006) articulated that amongst rural communities information plays an analytical as well as functional role both in the short as well as long term and should be considered as part of a dynamic process of change (access, assessment, application and action) rather than just as a static resource. Such dynamic information

should be actionable at different levels (micro/meso/macro) and should serve to foster interaction between different levels of activity (i.e. linking structures and processes). ICTs can facilitate the generation of information required by the rural poor to make better informed decisions that affect their livelihood strategies and ultimately their livelihoods (Chapman and Slaymaker, 2002). Hence systems that provide information and communication to the rural poor to improve their livelihood strategies must be linked to institutions and external stakeholders that may affect the livelihood of the rural poor. In addition such systems must be enabled to address the specific needs of the rural poor i.e. be demand-driven.

In developing countries, farmers generally do not have access to information on the value of their crops and depend on intermediaries to facilitate the selling of their produce at markets. Lack of market price information for farmers create information asymmetries that reduce their bargaining power especially with middlemen who facilitate the sales (Jaleta & Gardebroek, 2007). This leads to lower prices for their produce. Having access to actionable information i.e. timely and accurate market price information, can allow farmers to make relevant and timely livelihood decisions throughout the entire agricultural value chain process.

Projects to address market information asymmetries in the developing world are being conducted via a variety of ICT related projects. Some of these are donor driven or government sponsored pilots while others are private sector led initiatives (in large part but not limited to telecommunication companies introducing value added services). In Africa projects such as Kenya Agricultural Commodity Exchange (KACE), TradeNet in Ghana, Malawi Agricultural Commodity Exchange (MACE) in Malawi, Manobi in Senegal and South Africa are some examples of projects that attempt to address these inefficiencies through a variety of ICT driven mechanisms that reduce information asymmetries and/ or allow them to engage in online exchanges (Ferris et al, 2006). In South Asia, numerous ICT interventions intended to reduce information asymmetries and subsequently provide alternate markets and exchanges for farmers exist. In South Asia, as in the rest of the developing world, the media used to deliver such services vary: from Internet (Aquachoupal, e-Choupal, e-Krishi, etc.) to radio to mobile (GGS, Agriwatch, Warana Unwired, e-Krishi)[1]. Amongst these, India's e-Choupal initiative by ITC[2] in 2000 was one of the first and most well known. E-Choupal has facilitated the generation of more stable incomes by allowing farmers to improve their decision making ability on optimal

[1] For more information on ICT interventions for rural communities in South Asia refer to de Silva et al (2008).
[2] The ITC group is one of India's largest private sector companies with a market capitalization of approximately eleven billion US dollars and annual sales of 2.6 billion US dollars. ITC has a diversified presence in cigarettes, hotels, agricultural commodities, packaged foods and other consumer goods [Anupindi and SivaKumar 2006]

harvesting time for their produce. Goyal (2008) has shown how dissemination of market price information via the e-Choupal initiative improved the efficiency of rural markets (in this case that of the market for soybeans the state of Madhya Pradesh in India) by increasing the competitiveness of buyers. The reduction in transaction costs meant prices received by producers were higher. Furthermore the reduction in intra and inter market price volatility has given farmers a more stable income stream with positive livelihood benefits.

The current ground reality with respect to ICT utilization is such that access and connectivity in the developing world is primarily driven by mobile phones, as opposed to PC based telecentres. Akers (2007) showed how just the expansion of mobile coverage in Niger resulted in the reduction of price volatility in the country-wide grain market. Her research suggests that the impact on price dispersion was more significant as the number of markets with cell phone coverage increased; the argument being lower search costs via cheaper access reduces information asymmetry.

1.3 Additional constraints to better market engagement

While the literature suggests that facilitation of market price information (be it of agricultural inputs or outputs) have realized direct livelihood impacts (IICD, 2006; Molina, 2006), ICTs however are not the sole driver condition for better engagement in agricultural markets. It is incorrect to assume that purely linking farmers to more markets with better communication access would bring about transformational changes. The ground realities are such that small farmers require mechanisms to address a variety of constraints – lack of credit and crop insurance, geographic and transportation limitations, lack of knowledge on agricultural techniques and limited access to extension services.

Even when farmers have access to marketing information services, small and marginal farmers often lack experience in knowing how to leverage such services and face a steep learning curve (Lehr, 2007), but over the passage of time learn to leverage such information (Ferris et al, 2006). A recent study of small farmers in India suggests that small farmers are aware of the mechanisms through which they may leverage the information, but face considerable constraints in being able to do so (Mittal et al, 2010). For example even if farmers have access to timely and accurate market price information, the lack of suitable storage and financing against those stored crops[3]

[3] This is mostly relevant only for crops which are not very perishable.

(using for example warehouse receipts) exposes them to lower market prices after harvest when the supply is high (a fact which is used by the commission agents and middlemen to their own advantage since they are more likely to have access to such facilities.

In the developing world, farmers depend on middlemen for credit and the conditions are often unfavorable for small farmers and restrict (formally and/or informally) who they can sell their produce to and the price at which it is sold (Molina, 2006; Mittal et al, 2010). These unfavorable financial relationships mean that small farmers cannot raise enough credit for higher quality inputs which in turn leads to lower crop yields of poorer quality and thus lower profits.

This suggests that effective engagement in agricultural markets require the confluence of a variety of stakeholders and institutions that in turn provide information/communication, supply-chain logistics, crop loans and insurance. The convergence of these actors into a more integrated system, with ICTs facilitating the linkages will decrease transaction costs and reduce divergence from 'the law of one price', thus making agricultural markets more efficient (Eggleston et al, 2002). These efficiencies then help materialize more sustainable livelihoods for the agricultural poor.

The objective of this study is to look at the current state of play in the provision of agricultural information (primarily market information) via mobile phones in India. More importantly this study seeks to understand the lessons from practical applications that bring together multiple stakeholders as outlined earlier. On the latter, a pilot in Kadi, Gujarat in India being conducted by IFMR Trust, where farmers were also available to avail of commodity back financing, was selected for further study. In particular this case study attempts to understand the extent to which systems and processes are important in linking farmers to markets, and specifically understand the kind of actors required to make such a project sustainable. This rationale was borne from cognizance of the fact that livelihood impacts are dependent on the external structures and processes (external actors, laws and access to credit and insurance, etc.) that are required to more effectively impact farmer livelihoods (Chapman & Slaymaker, 2002). Furthermore given the low adoption of Mobile 2.0[4] services by those at the BOP (LIRNE*asia*, 2008), this report seeks to shed light on the challenges and next steps that may be required for increased use.

[4] In the context of this study, Mobile 2.0 is used to refer to the use of mobiles for "more-than-voice" applications and services. The ability of phones to send/process/ receive voice, text, images and video and utilized for a variety of services including payments, information access and retrieval, etc. all come under this broad definition of the term

1.4 Rural access to market price information in India

India's rural population of 742.5 million people accounts for 72% of its total population. While the agricultural sector's share of GDP has been continuously declining it is still quite high. Agriculture accounted for 17.1% of GDP in 2008 but accounts for 52% of labor force in 2004-2005 (Government of India, 2009). In fact India has one of the largest rural populations in the world engaged in agriculture – with 124.7 million being classified as cultivators[5] and a further 102.4 million employed purely as agricultural laborers[6]. The average operational land holding of Indian farmers is only 4.94 acres (Mittal et al, 2010).

There are approximately 6,261 whole sale markets and 20,870 rural primary markets in India with the majority of the former and about 15% of the latter being regulated by the respective state marketing boards, namely the Agricultural Produce Marketing Committee (APMC) of the individual states (Chauhan, 2008). In the traditional marketing system, the price setters are generally the commission agents and traders who function in the regulated markets and on whom most small farmers are dependent on for credit. This results in a large difference between farm-gate prices and end consumer prices of agricultural commodities with small famers only receiving a small portion of the final consumer price. The majority of the wholesale markets are poorly designed and limited to non-existent infrastructure and processes for packing, grading, sorting and cold storage. (MOFPI, 2006)

Traditionally most farmers, especially small to marginal farmers are dependent on personal contacts in the market and in their villages for market price information. The use of brokers and collectors for market prices has been highlighted in an increasing volume of literature (for instance Gabre-Madhin, 1999). A situational assessment survey of farmers in India (NSSO, 2005) revealed that "other progressive farmers" was the main source of agricultural information for farmers (16.7%). Input dealers, traditional media and extension were all less important (See Table 1.1). The information from such sources is often inefficient both in terms of reliability as well as timeliness and is perceived as such by farmers (Mittal et al, 2010). Farmers in fact often rely on

[5] According to the 2001 Indian census a cultivator is "a person is classified as cultivator if he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation." For a complete definition refer to http://censusindia.gov.in/Metadata/Metada.htm#2m

[6] According to the 2001Indian census an agricultural laborer is A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which She/he works." For a complete definition refer to http://censusindia.gov.in/Metadata/Metada.htm#2n

personal experience, traditional practices and a certain amount of guesswork in interpreting the data received by them (if at all) in their livelihood decisions.

Table 1.1: Agricultural information sources of farmers

Source	**Percentage (%)**
Other Progressive Farmers	16.7
Input Dealers	13.1
Radio	13.0
Television	9.3
Newspaper	7.0
Extension Worker	5.7

Source: Access to Modern Technology for Farming, Situation Assessment Survey of Farmers (NSSO, 2005)

With communication costs continuously dropping, getting market prices from a contact is only a phone call away. A 2008 study by LIRNE*asia* found that 36% of the Indian rural BOP population owns their own mobile as opposed to 7% who have a household fixed phone[7] (LIRNE*asia*, 2008). Furthermore the study found that more than two thirds of the rural BOP population had used a phone in the last week.

Another 2008 study revealed that the number of active rural internet users stood only at 3.3 million, which is about 0.4% of the rural population of India (IMRB International, 2008). With multi-purpose mobile handsets (with radio and camera) and services (radio, camera, large storage capacities and high data transfer rates) becoming more common, mobiles may be the more effective instrument for the delivery of e-services to rural areas than computers (Bhatnagar, 2009).

Based solely on the rural penetration rates, mobiles represent the largest distribution platform for developmental initiatives (World Bank, 2009) are more suited for disseminating market information to the rural poor than other ICTs (Ochieng & Davis, 2006) . Hence it is not surprising that mobiles, more than PC kiosks, are having an impact on agriculture and related markets. Jensen's (2007) study of Kerala fisherman has empirically illuminated how mobiles had

[7] It must be noted that the LIRNE*asia* figures are representative of the rural BOP population which is just the lowest subset (by socio-economic classification) of the overall rural population. It is reasonable to extrapolate from the LIRNE*asia* study (2008) that the number of mobile SIMS per 100 amongst the entire rural population of India is actually higher than the 36% found for just the rural BOP population. The Telecom Regulatory Authority of India (TRAI) however reports the number of mobile SIMs per 100 amongst the rural population to have stood at 28.85% as of September 2008 (TRAI 2009). At the time of the paper, the latest figures were available only uptil September 2009 which put the figure at 30%. This is still considerably lower than what would be expected based on the LIRNE*asia* study.

considerably reduced price volatility and eliminated wastage in the Kerala fish markets. The agricultural community in India can now avail of a variety of market information services via their mobiles being provided through partnerships between content providers, agricultural cooperatives and telecommunications operators.

Table 1.2: Use of Mobile 2.0 Services by Indian BOP teleusers[8]

	Use regularly (%)	**Use, but not regularly (%)**
Banking and financial services		1
Payment services		
Government services		
Health services		1
Voting	1	1
General information services		
Agricultural or fisheries information		

Source: LIRNEasia 2008

Despite the growth in rural mobile connectivity, a recent survey by LIRNE*asia* on use and access of ICTs at the BOP found that Indian BOP users who own mobiles mostly used it for just taking and receiving calls. Awareness and use of Mobile 2.0 services continues to remain low. Besides 10% being aware of mobile voting, knowledge of other Mobile 2.0 applications such as Banking and financial services, payment services, government services, health services, general information services and agricultural/ fisheries information is negligible to non-existent (LIRNE*asia*, 2008). Usage of such services is even poorer (Table 1.2). These results suggest that the there is a very long way to go in making Mobile 2.0 agricultural market information services acceptable by the rural poor.

[8] Blank cells denote that the number of respondents were not statistically significant.

2.0 State of play of current market price information services in India

This paper primarily deals with the case study of the IFMR Trust's Pilot project in Kadi (Section 3.0). However there are a multitude of services currently employed in India that seeks to increase access to agricultural markets via mobile phones. This section outlines some of the other Mobile 2.0 services that provide market information services to farmers. Chief amongst them is the service by Reuters Market Light which stands out in terms of a business model which is network agnostic. The other identified services however have been driven mostly by telecommunication operators (in partnerships with others) seeking to increase their rural customer base by the provision of value added services that target the rural population. This doesn't imply that one is better than the other and the verdict is still out on which model has been more beneficial.

2.1 Reuters Market Light (RML)

Launched in October 2007, RML was intended to provide farmers with agricultural market price information, weather as well as crop advisory information via the mobile phone. The service launch was preceded by an 18 month market research, concept tests and market trials. The information available via their service is localized, thus each subscriber gets information pertinent to his location and/ or subscription parameters. Hence a subscriber will get market prices from the mandis he has subscribed for and for the commodities that are of interest to him. RML currently tracks prices for 250 commodities across 1,000 mandis (with 195 in Maharashtra). In addition weather and crop advisory information is also location specific. They provide weather forecast for nearly 2,500 locations. The mode of delivery is via SMS but they expect to include other modes such as voice and/or WAP in the future. Provided that their handsets allow it, it is possible to get the SMS in the local language. For example, users in Maharashtra can get their SMS alerts in either English or Marathi.

RML's operations spans 8 states with most of the offices engaged only in content collection, production and aggregation. The service itself is available in Haryana, Punjab and Himachal

Pradesh in addition to Maharashtra and Goa[9]. As of 2009, RML had 450 employees with a majority engaged in content collection and aggregation. The lack of a suitable information provider for market prices has meant that they have had to employ their own dedicated price collectors for the mandis that they cover. However, weather, crop advisory information as well as local news are generally obtained via agreements and partnerships with third party sources, which are both private as well as state level institutions.

Currently RML operates on a direct-selling approach whereby users buy scratch cards which enable them to register for the service for a specific amount of time. Currently this service is network agnostic in all the states where RML operates and they utilize a bulk SMS service provider to push messages to users, irrespective of the telecommunication network they are subscribed to. However as it expands to other states it has left open the possibility of other delivery mechanisms. Users who subscribe for this service have 4 possible packages that they can choose from, dependent on the time frame for which they subscribe. When the service first debuted in 2007, users in Maharashtra could only buy a one month subscription for INR 60. This was quickly expanded to include packages for 3 months (INR 175), 6 months (INR 350) and 12 months (INR 650). They have also explore different price points and in Haryana and Punjab (which are predominately agricultural states), the 3, 6 and 12 month packages cost INR 250, INR 550 and INR 850 respectively. According to RML, the initial trend was towards purchasing 3 month subscriptions. But over time 6 and 12 month subscriptions are the most popular. RML currently reports the average subscription to be about 5.5 months.

As of October 2009, RML has a subscriber base of 170,000 customers spanning 12,000 villages. By some estimates their geographical footprint in India allows them to potentially cover up to 1 million farmers.

2.1.1 Challenges

2.1.1.1 Business model

The RML operation has several challenges going forward. Their business model relies on selling scratch cards through various distribution points. However they still do not have a reliable database of addresses for subscribers and through their own studies it has been revealed that existing subscribers have had difficulty in renewing their subscriptions. This suggests that they

[9] As of December 2009

need to expand their distribution points, something that they have been doing. If they could partner with network operators they could concentrate more on content and leave sales and distributions to the operators. Their ongoing discussions with operators have not led very far but they remain open to his possibility. So far their only direct collaboration with an operator has been with Idea Cellular for a specialized package[10] in addition to RML's own standalone subscription service in the states of Goa and Maharashtra. Key to their strategy is to remain open to partnerships with multiple operators rather than to go into exclusive agreements with just one so as not to dilute their customer base.

The fact that the current trend in the subscription packages has been towards longer duration ones suggest that users are finding value in the service. However there has been some unhappiness among users about the cost, with a rate of INR 15/ month being flouted as a more reasonable package by farmers (Preeti, 2009). However given their current costs in relation to sales and distribution, RML has been reluctant to reduce prices and counter that documented cost-savings for farmers from using this service means that it will continue to remain a premium service.

While exact investment data is not available, media interviews with senior personnel suggest that so far they have invested at least USD 2 million and expect that it will take a few more years to break even (Dingra, 2009). Their philosophy has been that economies of scale would be required before they break even and hence are trying to expand as fast as possible to cover other states as well. As part of this strategy RML intends to expand to 12 more states by the end of 2010.

2.1.1.2 Content collection, production and aggregation.

With respect to market prices they are reliant on their own data collectors to ensure accuracy of price data. This creates a substantial overhead in employing staff to collect prices from the markets that they cover. The lack of third party sources to provide accurate and timely market price information does however give them a competitive advantage over other potential

[10] Through its stores and distribution points in Goa and Maharashtra, Idea Cellular sells special Idea Krishi vouchers (scratch cards) for INR 75 with one month validity. The card allows the user to subscribe for mandi prices and arrivals from 3 talukas of their choice for 2 crops of their choice (from a total of 49 choices). In addition they get a 24 hour weather forecast for their specific taluka as well as advisory information pertinent to production, placement and sales realization. For their choice of 2 crops they also receive crop advisory information on best practices. The service is available via SMS in Marathi, Hindi or English. For more information refer to http://www.ideacellular.com/IDEA.portal?_nfpb=true&_pageLabel=IDEA_Page_ValueAddedServices&vasCode=content_vas_mh_KrishiVoucher.html

competitors. As the service expands they will need to go into partnerships and agreements with more and more third party entities to ensure that they can provide localized and context specific information. This is especially true with respect to crop and location specific advisory information that is piped to users. In fact there current model's unique value proposition has been the context and location specific information that they are able to pipe through to users. Currently based on what they receive from their external content providers, the information could be as specific as letting farmers know if the markets (of interest to him) are closed or open as well any potential disease outbreak in his region that may affect him.

2.1.1.3 Technology

RML currently delivers its content via SMS. This is cheaper to implement than a voice based service (e.g. IVR) and according to RML makes it easier to archive information for future use. However this does have some limitations. Information delivered in local languages would have the highest impact, but this often requires handsets capable of handling Unicode fonts. Most farmers according RML only possess low end handsets which are not capable of handling Unicode fonts. An IVR solution would be the easiest to use especially in areas with low literacy rates but RML finds this currently too costly to implement. Another option for RML would have been to provide access via WAP on GPRS or 3G[11] but this again runs into the issue of farmers possessing handsets capable of handling GPRS or 3G. Further more data download costs would also make this a more expensive option for farmers.

RML has kept its options open, even exploring the possibility of having their own downloadable application similar to Nokia Life Tools. Currently it has also partnered with Nokia Life Tools for content sharing initially just in Maharashtra but also plans to expand this partnerships across India.

2.2 Other similar services in India

2.2.1 IFFCO Kisan Sanchar Ltd.

Mobile operator Bharti Airtel partnered with IFFCO to form a joint venture company in 2008, to provide 5 free daily voice updates on mandi prices, farming techniques (including dairy as well

[11] India has yet to licensee 3G spectrum.

as animal husbandry), weather forecasts, rural health initiatives and fertilizer availability, etc. mainly targeting the 55 million farmers who are members of IFFCO. 48,000 farmers had already subscribed to this service by May 2008 mostly from Uttar Pradesh. As of the date of this report they are now active in the states of Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Kerala, Rajasthan, ,Uttaranchal, Madhya Pradesh, , Maharashtra, Orissa, Punjab, Tamil Nadu and West Bengal. Airtel currently reports having signed-on 1.5million subscribers for this service from these 18 states[12].

The service is marketed as part of specialized mobile tariff package only on Airtel's network with an IFFCO Kisan branded SIM card.

2.2.2 Mandi on Mobile

BSNL, the national state owned Telecommunications Company and OnMobile a private-sector VAS provider partnered with the Uttar Pradesh Agricultural Marketing Board (Mandi Parishad) in late 2008 to start a service called "Mandi on Mobile." The service allowed BSNL subscribers to call a number and receive current market prices of about 108 commodities, from all the 247 mandis in the state. The completely voice-based solution (which even accepted voice commands) solution, allowed farmers to just enter the commodity and the district and would get current taluka-wise mandi rates for the chosen commodity in the specified district.

The project was started out as pilot project and to-date hasn't expanded beyond the state, even though Bharti has since then partnered with others to start a similar pilot in other states (See Section 2.2.3)

2.2.3 BSNL & NFL

The still unnamed service was started in early 2010 in a tie-up with BSNL and National Fertilizer Limited. The tie-up was primarily to recharge vouchers for BSNL mobile customers through the distribution network of NFL. In addition the vouchers would allow subscribers to get a free SMS or voicemail 5 times daily with the mandi prices, soil testing, farming techniques, dairy and weather forecasts in the local language of the region of the subscriber. This service is initially

[12] http://www.medianama.com/2010/01/223-bsnl-beyond-pilots/

only being offered in the states of Madhya Pradesh and Chhattisgarh where NFL has a large market share for its product base.

2.2.4 KRIBHCO Reliance Kisan Ltd

Reliance Telecommunications and Krishak Bharati Cooperative Limited (KRIBHCO), a fertilizer producing cooperative, formed a joint venture in June 2009, called KRIBHCO Reliance Kisan Ltd. This JV was again primarily a rural distribution model for telecom and non-telecom products. In structure this is similar to the IFFCO Kisan Sanchar Ltd's service. However desk research has revealed limited information on the nature of the value added services targeting market price dissemination via this system. Reliance did in late 2009 announce a full suite of upcoming VAS targeting mGov services in Maharashtra and Kerala which would include market price information as well[13].

2.2.5 Mandi Bhav

Tata Teleservices (TTSL) partnered with Impetus Technologies to launch a Mandi Bhav as a VAS targeting rural farmers. Via this service, subscribers on the Tata Indicom network can get real-time spot market prices on 500 commodities from over 3,000 mandis across India. Launched in early 2009, the service was initially available in Hindi, Marathi and English in the state of Punjab. Since then it has expanded into Haryana, Himachal Pradesh, Uttar Pradesh and Maharashtra and is to be available in up to 9 languages. The service costs INR 30/month. Service delivery is via WAP, SMS or via a downloadable application that runs on the phone.

[13] http://telecomtalk.info/reliance-communications-to-offer-m-governance-in-maharashtra-and-kerala/14627/

3.0 IFMR Trust Pilot in Kadi

IFMR Trust is the not-for-profit business incubator of Institute of Financial Management and Research (IFMR). It started a pilot project to facilitate trading in castor seeds at the Kadi taluka[14] in the Mehsana district of the state of Gujarat in February 2009. The pilot objective is to help small and marginalized farmers improve the price realization for their agricultural commodities while also allowing them to avail of commodity backed financing opportunities to increase their holding capacity. The pilot started out with the involvement of three IFMR Trust entities: Agricultural Terminal Markets Network Enterprise (ATMNE), IFMR Holdings and IFMR Capital.

3.1 Rationale for this pilot

Located 65km (almost an hour's travel) from Ahmadabad, Kadi is well known for cotton production as well as castor seed production.

IFMR Trust carried out a detailed survey of the castor farmers in the main castor growing regions around Kadi. From their initial studies they realized that the price received by farmers from the APMC mandi in Kadi was generally in the range of INR 420-450 per bag[15] during the immediate post-harvest season. The study revealed two important lessons: farmers generally couldn't store their castor seed crop post-harvest so they generally sold off their produce once they brought it to the mandi at the prevailing price. Secondly even if they had storage capacity[16] their need for cash, post harvest, meant that their only option was to sell it off at the mandis soon after harvesting. Traders however could capitalize on this situation and thus were able to purchase the goods from the farmers for a low price when the supply was high right after harvest and then store the goods before reselling at the mandis during the off-season when supply was low.

The pilot was started with the following objectives:

[14] Talkuka is an administrative sub-division of a district.
[15] Castor seeds are generally sold in gunney bags. Each bag size is standardized and when filled with castor seeds roughly weighs 75kgs.
[16] Castor seeds are not very perishable and can be stored for even a few years without the need for specialized environmentally controlled storage facilities. The only requirement is that storage space should be sufficiently dry.

- Provide an accurate, transparent and optimal price realization process for farmers.
- Provide commodity backed financing for farmers against their harvested castor seed crop as collateral

The idea was to also leverage this pilot to:

- Explore other services currently lacking for small farmers namely: transportation from village to market/ buyer, village level warehousing, and agricultural extensions services
- Explore other financial services currently lacking for small farmers such as forward contracts and delta-hedging[17].
- Develop Assest-Backed Warehouse Finance Receipts (ABWFR) which can be traded to financial institutions such as mutual funds and others (Mor & Fernandes, 2009).

3.2 Pilot Partners

The pilot was established via tri-partite agreement between IFMR Trust (ATMNE), NSEL and NK Industries. The roles of each of these parties are summarized in Table 3.1.

Table 3.1: Roles of the main partners in the Kadi pilot project

Organization	Type	Role
ATMNE	Not-for-Profit	Intermediary for farmers, trading on their behalf on the NSEL platform. Activities include canvassing farmers for the service; educating farmers on market prices, provision of commodity backed financing as well as immediate cash payments to farmers on sale.
NSEL	Private Sector	Provides the trading platform on which the castor seeds are bought and sold. Also certifies the quality of the commodity and also provides warehousing facilities via a third party company (Sohan Lal & Company)
NK Industries	Private Sector	The only buyer from the Kadi terminal on NSEL platform. The NSEL trading platform is situated within its premises.

[17] Delta hedging is an "options strategy that aims to reduce (hedge) the risk associated with price movements in the underlying asset by offsetting long and short positions. For example, a long call position may be delta hedged by shorting the underlying stock. This strategy is based on the change in premium (price of option) caused by a change in the price of the underlying security. The change in premium for each basis-point change in price of the underlying is the delta and the relationship between the two movements is the hedge ratio" (Source: http://www.investopedia.com/terms/d/deltahedging.asp. Last accessed 3/5/2010)

3.2.1 ATMNE

ATMNE is a supply chain company that is a part of IFMR Trust funded by its Network Enterprises Fund (NEF) which is managed by IFMR Ventures. NEF was the main investment vehicle for IFMR's projects in closing identified gaps in rural supply chains including rural tourism, dairy, crafts, apparel and furnishings, rural energy, vocational training, rural drinking water, consumer goods (FMCG) and agriculture terminal markets. ATMNE's purview is solely over agricultural terminal markets.

While the pilot project involves several IFMR Trust entities working in collaboration, ATMNE serves as the main interface to the farmers for this pilot. Their activities in the Kadi pilot include advertising the service to farmers at the grassroots level as well as registering farmers to access services provided by ATMNE. ATMNE staff appreciated that farmers engrained in traditional growing and selling practices were cautious of new methods as well as of outside "advice" originating from a non-governmental actor. Farmers used to selling their produce to the same known traders at the APMC mandi, were initially wary of trusting a new buyer, let alone understanding the concept of "commodity backed financing." This meant that ATMNE personnel had to (and continues to) expend considerable effort to build awareness and trust amongst the farmers, frequently visiting and liaising with them to understand their problems. In particular they spend considerable effort to educate farmers on the functioning of the electronic exchange as well as the financial concepts behind commodity-backed financing and how the farmers can leverage the exchange and these financial instruments for improved livelihoods. Often times they establish good relationships with village elders and opinion makers. Positive word-of-mouth-references by early adopters have helped the ATMNE team build creditability with other farmers.

ATMNE is an institutional member of NSEL which allows them to trade on NSEL's platforms. They thus serve as an intermediary to the farmers, selling commodities on their behalf on the NSEL platform. They provided instant cash settlements to farmers who sell their crops as well as loan facilities (financed by IFMR Capital) to those who avail of their commodity backed loan facilities.

3.2.2 NSEL

NSEL is an electronic spot trading exchange which was started in 2008. Currently operating in 7 states they provide delivery based spot trading for 17 commodities. Members of NSEL are allowed to trade on their platform and are all trades are guaranteed by the exchange with trading parties insured against credit risk and counter-party defaults. NSEL provides customized solutions based on commodity and location and bring together relevant parties where needed to handle the entire supply chain. For example they were the ones who brought in N.K Industries into this pilot as well as arranging warehousing facilities. In Kadi, they operate out of the premises of NK Industries and have an internet enabled computer through which ATMNE can access and conduct trades on the exchange on behalf of the farmers. As per the terms of its service, NSEL guarantees the quality of the traded castor seeds as well as the quantity and, if the farmer avails of it, the safe storage of his commodity in the warehouse which is also located on the same premises. Warehousing is outsourced by NSEL to an external company called Sohan Lal & Company.

3.2.2 NK Industries

NK Industries (formerly NK Oil Mills) is major exporter of castor oil and its derivatives. They are a vertically integrated firm engaged in the manufacture of castor oil (crushing, processing, refining as and extraction of derivatives) as well as marketing and exporting. Its Kadi manufacturing plant is about 1.5km from the main APMC mandi and houses computing facilities for famers to access the NSEL trading platform. Personnel from both ATMNE as well as NSEL are located within the premises to help respectively with sale of the produce and to trade on the platform.

3.3 Operations at the Dharampur branch

ATMNE operates a branch office in Dharampur, which is one of the five talukas of the Valsad district in Gujarat. The branch office was set up to cover the Dharampur area as well as the four surrounding areas of, Karda, Varkhadia, Maharajpura and Vadharoda (village). The Dharampur office is about 55km from Kadi. This branch office acts as the focal point in recruiting and educating farmers. The Dharampur staff actively engages with farmers to popularize their service

as well as to encourage them to come to the Dharampur office to register them to access the ATMNE services.

When a farmer comes to register at the Dharampur office, he brings a proof of identity (usually an election card) and proof of address. Those who own the land on which they farm also bring their land records. The farmer's digital photo as well as digital thumbprint are then taken and encoded into a smart card (FINO card) that is issued to the farmer. The FINO[18] card then serves as a biometric identification card of the farmer and provides him access current as well as potential future services that ATMNE might provide. During the registration process, staff also conducts a detailed farmer household profile which is later verified by a visit to the farm. All these details are entered into ATMNE's Customer Management System (CMS).

In addition farmers coming to the Dharampur office can see the average daily price being offered for Castor Seeds at the APMC mandi as well as at the NSEL price on a price board outside the Dharampur office.

3.4 Operations at the Kadi Hub

The NK Industries processing plant serves as the trading hub and houses the ATMNE office; NSEL's trading platform as well as the warehouse. By the time the farmer comes to the NSEL hub he already has an idea of the average price at the APMC mandi that day. There is generally low intra-day volatility in the APMC mandi's average price of castor seed. Even though the mandi is open from 10am to 5pm daily, the daily supply, and hence the average price (due to low intra-day volatility), of castor seed is generally known by 11am. The farmers sometimes visit the APMC hub (which is 1.5km away from the NSEL hub) prior to coming to the hub. But most often the farmers who sell at the NSEL hub have already obtained APMC prices through their mobiles by either calling the ATMNE staff or by calling other farmers/ traders at the mandi.

[18] Founded in 2006, FINO build technologies which facilitate financial institutions to serve those from the BOP who don't have access to traditional banking and/or financial services. More information can be found from their website: http://www.fino.co.in/

3.4.1 Weighing

The first activity as soon as he enters the NSEL hub is to have his produce weighed. Castor seeds are generally transported and sold in gunny bags each weighing approximately 75kgs when filled with castor seed. Depending on the quantity a variety of modes of transport are used. When the commodity is brought in a van or truck, the entire vehicle is first weighed on an electronic weighbridge. After quality inspection and unloading the vehicle is again weighed and the weight of the vehicle is subtracted from the original weight to determine the weight of the commodity. In the event that the farmer brings the produce in small quantities then each bag is weighed on a smaller electronic weighing scale after unloading.

Figure 3.2: The electronic weigh bridge (left) and the electronic scale (right) used for weighing the commodities at that hub.

3.4.2 Quality Certification

The farmers then proceed to get the Quality Certification (QC) which certifies the quality standard of the commodity. The quoted price on NSEL is for a specific optimal quality standard (up to 5% moisture and oil content of 44-48%). When the farmer comes to get his quality certification both moisture and oil content are tested from a sample of each bag. A 4.2 liter square container filled with the castor seed sample is used to test the sample. The sample is then

checked for weight as well as foreign matter such as dust, stone and damaged seeds. Foreign matter content is gauged by sieving the sample through a 4x4mm sieve. Based on these measurements, deductions are calculated for the price per 20Kgs based on a standardized and transparent deduction chart. All this information is then encoded on the QC which is issued to the farmer at the conclusion of the quality testing process.

Figure 3.3: The sieve (left) and the 4.2litre container (right) used to check the foreign matter content and weight (Image source: Sinha, 2009)

3.4.3 Selling/ Storing

Armed with the Quality Certificate he then proceeds to the NSEL platform where he can check the price being offered that day for a specific quality standard. NSEL then offers the farmer a price based on the quality standard of the castor seeds the farmer has brought. At this point the farmer makes the decision to either sell the produce straight away or to utilize the commodity backed financing offered by ATMNE

The farmer's decision to sell or store is based on two factors (in decreasing order of importance):

1. His current cash requirements if any
2. His assessment of the future price trends and the value of his crop

Should he decide to sell immediately, ATMNE as a member of NSEL, trades the farmers commodity on the platform. NSEL clears all transactions only at the end of the day and payment is made only the following morning. However, ATMNE reimburses the farmer the full value of his traded crop immediately following the trade. Unlike the mandi where farmers have to sell in lots of multiple bags, here the farmer is able to sell as little as one bag of castor seeds.

Should the farmer decide to store his commodities, he then deposits his commodity at the warehouse and is issued a warehouse receipt against his produce. The storage rent is INR 0.15 per day per bag. He then hands over the warehouse receipt to ATMNE, which immediately pays the farmer 70% of the value of the commodity as per the current price available on the NSEL exchange. ATMNE charges an annual rate of 10% for the commodity backed loan.

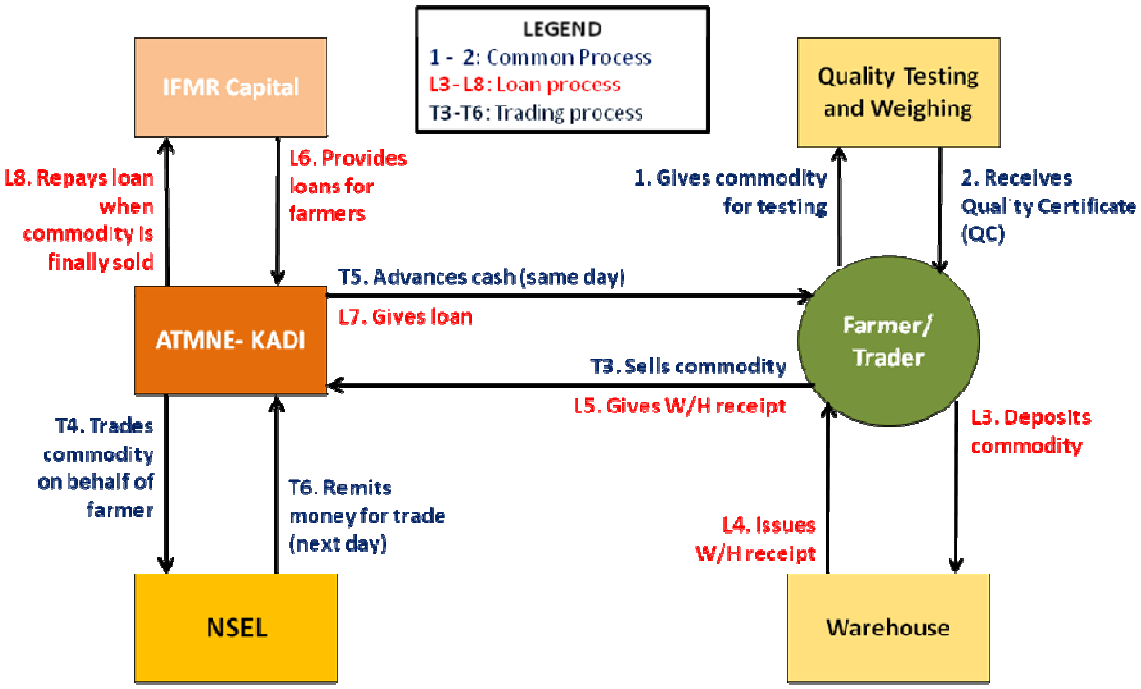

Figure 3.4: Overview of the Castor Seed Pilot operations.

3.4.4 Liquidating warehoused commodities

The farmer who has availed of commodity backed financing, monitors the price from his village. Having registered with NSEL through ATMNE, he keep receiving a daily price SMS. His decision to sell is similarly often a factor of his immediate cash requirements as well as his desire to avail of the best possible price, in decreasing order of priority. His decision to sell has to also

factor into account the amount he has to pay ATMNE as interest as well as the amount that is payable to the warehouse for storing his commodity. Farmers by nature are risk-averse (Mittal et al, 2010). Our discussions with ATMNE personnel and some farmers revealed that while the decision on when to sell is entirely on the farmer, he does ask ATMNE personnel for advice. With his daily monitoring of the prices on the NSEL Kadi Exchange as well as at Kadi APMC mandi, he tries to understand the trends (the farmer's assessment is also partly based on his own experience with post-harvest historical prices trends). It is important to understand that farmers are still not getting actual historical trend data, so in essence his assessments are based firstly on his experience and secondly on the advice he may get from ATMNE personnel (in order of importance from the farmer's point of view). An exact figure on the average time-period a farmer utilizes the warehouse facilities was not known. Furthermore given that only 8 farmers had even availed of commodity backed financing, it is difficult to assume generalizations on how effectively farmers analyze and benefit from the market price trends. For example one farmer who had availed of the commodity back financing sold of his initial volume of 5 bags in less than a month after availing of it. On his second cycle he stored 163 bags for a little over a month and had yet to sell it when the field visit was conducted in October 2009.

When the farmer makes the decision to sell he goes to the Kadi hub where ATMNE trades his stored commodity on his behalf on the exchange. He is then immediately reimbursed the sale amount after deducting the loan amount, interest and warehouse charges.

3.5 Use of ICTs

There are three important aspects of technology use that sets the NSEL hub apart from the APMC mandi. Firstly, all weighing is done electronically at the NSEL hub as opposed to the traditional two-pan beam balance scale which is used at the mandi. IFMR Trust's initial study before the implementation of the pilot revealed that the farmers had generally lost between 400g to 500g per bag due to inaccuracies in the traditional scales at the mandi. NSEL hub uses ground sensors to electronically detect the weight of the vehicles that come into the premise. By subtracting the weight of the vehicle after unloading the commodities they reveal very accurate measurements of the weight of the commodity that has been brought to the hub.

Secondly, all trading happens through the online NSEL exchange which is accessed via computer terminals at the hub. At the APMC market, trading happens via an open outcry auction based on lots.

Thirdly farmers, who register with ATMNE for FINO cards, also have their mobile numbers passed onto NSEL. NSEL in turns sends an SMS in real-time whenever there is a new purchase price for castor seeds at the Kadi hub[19]. Currently the only way for farmers to get daily prices at the mandi are by either visiting the market themselves or by calling someone at the mandi or (in the case of the farmers that ATMNE works with) by calling the ATMNE personnel themselves. The farmers that ATMNE works with in this pilot often give their personnel a missed call. The ATMNE personnel then calls them back and they thus get the daily price at both the mandi as well as at the NSEL hub.

3.6 An assessment of the Kadi Pilot

With its current administrative and geographical footprint, ATMNE can cover farmers from over 125 villages in and around Kadi. As of August 2009, the pilot project had registered 747 farmers and had facilitated 787 trades via the NSEL platform. In total they have traded 1,849 MT of caster seed amounting to a total volume of trade equivalent to about INR 42.2 million (Mor, 2009). Their data suggests that within the first 183 days, the average price of castor increased by as much as 30%. At a minimum farmers have obtained prices that have been 1-2% higher than the prevailing price at the mandi. With middle men no longer in the picture, the farmers avoided commissions which has collectively resulted in farmers getting on average about INR 20-50 per bag more than what they would have obtained at the mandi (IFMR Trust, 2009).

Higher profit realizations for farmers when compared to the APMC mandi are possible due to a variety of reasons:

- The vertical integration of NK Industries' supply chain results in cost savings allowing them to offer a higher prices

[19] With only one buyer for the Kadi hub, there is rarely any intra-day change in the price. Hence in effect farmers only end up getting one SMS a day except in the rare occasion when there is a movement in the price during the same day.

- Standardization of weighing and quality certification process has meant higher quality commodities realize a higher price than at the mandi with poor quality certification process.

- Lack of commission and other market related charges on the seller[20] as opposed to the APMC mandi.

With transaction costs going down due to the above, farmers will clearly prefer the NSEL platform for spot sales especially when they have higher quality commodity. The argument that a large part (if not all) of the higher price realization comes from the reduction of transaction costs is further reinforced when look at the price trends between the APMC mandi and the NSEL exchange (Figure 3.5). It is evident from the graph that prices at the mandi and at the NSEL exchange follow each other at roughly the same difference pretty consistently. With the NSEL hub and the mandi only 1.5kms apart the overall demand faced at each of these locations is roughly the same which further explains the co-relation between the two price trends.

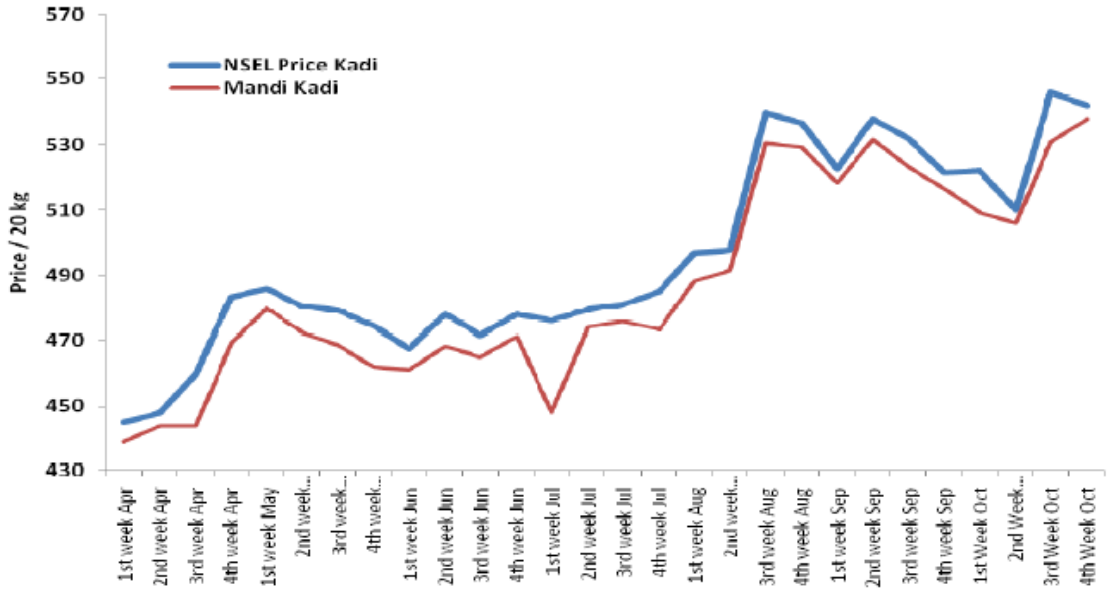

Figure 3.5: Comparison of castor seed prices on NSEL and at the APMC Mandi from April – October 2009 (Source: Sinha, 2009)

[20] Only licensed traders are able to function in the APMC mandis. They pay transaction fees based on the volume they trade and a state tax. Most often they pass on these charges to the farmers unless if the commodity is covered by some form of Minimum Selling Price (MSP) regulation.

However given that only 8 specific cases of commodity backed financing being utilized, it is difficult to gauge the success of that aspect of the project. The discussion with one of the farmers who had availed of these loans revealed that he had profited from using warehousing when he had stored 5 bags for a little less than a month but exact profit margins were not available.

3.6.1 Farmer education

Most farmers engrained in traditional practices had no prior understanding of how electronic exchanges functioned or how they could obtain loans based on their harvested commodities. In fact the initial feasibility study revealed that as much as 30-40% of the farmers in that area had taken loans from traders with a commitment to sell their commodities to the traders upon harvest. This has meant that ATMNE has had to expend a lot of effort to raise awareness and educate farmers on how they could leverage their harvested commodities to get loans that could sufficiently cover their short-term cash requirements while allowing them to capitalize on market price appreciations during the non-seasonal months. Hence it is understandable that the uptake of commodity backed financing has been low during the initial stages. As of October 2009, only 8 loans have been issued. Those that have availed of these services have done it on a trial basis to gauge the benefits and build confidence in this process. One farmer had availed of the loan initially for only 5 bags. Having gained from market price appreciations using this process, on the next cycle he chose to utilize the bulk of his harvested crops (163 bags) for a commodity-backed loan.

ATMNE has tried to capitalize on positive word of mouth, strengthening their relationships with village elders and early adopters but clearly this is an ongoing process

3.6.2 Technology Adoption

Technology adoption has been slow. Farmers who register with ATMNE received daily price alerts from NSEL via SMS. However, most farmers have tended to ignore the SMSs for a variety of reasons. Low education levels have meant that a large number do not know how to read. Even if they do know how to read most only know Gujarti and the SMS are delivered in Hindi. But often times the reason for low adoption is lot more basic – most of the farmers do not know

how to retrieve messages on their phones, knowing only how to take and receive calls using their mobile phones. All this has meant that farmers more often than not rely on giving ATMNE staff a missed call on their mobiles. ATMNE personnel then call back the farmer and give them an update on the current NSEL price. This is not sustainable in the longer term and remains one of the challenges of the project. An IVR[21] solution would seem to be an optimal solution. NSEL claims that an IVR solution would only take 72 hours to implement, however they have as yet not chosen to implement it presumably because of the cost hasn't be justified as yet in the initial stages of this pilot when the number of farmers have been low.

3.6.3 Cost of Service to Farmers

Farmers, who avail of the loan facilities available via this pilot, incur a 10% interest cost on their loan as well as a daily cost of INR 0.15 per bag for storage. Nationalized banks only give loans to farmers using land as collateral and their interest rate is 7%. Farmers, who were interviewed during the course of this case study, were satisfied with the higher 10% interest rate charged by ATMNE since they did not require using their land as collateral for the loan. However, they expressed dissatisfaction with the cost of storage. For example in the case of the farmer who stored 163 bags, he was paying INR 733.5 as monthly rent to store his commodity at the warehouse. Farmers would have preferred to store it free of cost at their own land, but are unable to do so under the terms of this service. This is understandable since NSEL guarantees the quality and quantity of the castor seeds traded on its platform and hence requires a centralized warehouse at the Kadi premises to ensure that stored commodities are un-tampered with during the course of the storage. This is closely tied to farmer education, and ATMNE has to continue to impress upon the farmers the need for a trusted third party guaranteed warehouse to allow them to give loans to the farmers.

3.6.4 Quality Differentiation

Quality of the castor seeds being traded at the APMC mandi is usually determine by the local APMC appointed auctioneer who gauges the quality simply by scooping up a handful of the

[21] Interactive Voice Response (IVR) is a technology that automates interactions with telephone callers using pre-recorded voice prompts and menus to present information and options to callers. A touch-tone telephone keypad entry is used to gather responses.

commodity from a bag in his hand. The IFMR Trust pilot however ensures a rigorous and transparent quality verification system. The value reduction if the quality doesn't meet a pre-determined quality specification is also applied transparently. Farmers have after sometime come to appreciate this method of testing and now feel that the process is more fair and transparent to the one they were used to at the mandis. Similarly electronic measurements of weight have meant that their bags are weighed correctly. At the mandi's it was common for farmers to lose between 400-500g of weight per bag due the inaccurate manual scales utilized there. This has meant that even at those times when the exchange price and the mandi price differed by only INR 2, they still preferred the NSEL hub due to accurate weighing and quality testing.

Should this difference in measurement and quality testing continue between the NSEL hub and the mandi, then it is possible that more and more farmers would eventually prefer the hub over the mandi purely on the basis of the better and higher valuation of their commodity due to accurate scientific testing at the hub. Goyal (2008), in her study on soybeans from a similar initiative by ITC in the state of Madhya Pradesh, found that farmers might over time select the location with superior scientific quality testing over the traditional mandi. Such self selection though eventually put a downward pressure on the NSEL price due to increased supply.

3.6.5 The Way Forward

In the first six months of operations the volume traded through this pilot was approximately 25% of what would have normally been traded during the same period at the mandi[22]. This shows the pilot has having had a moderate amount of success in a short amount of time. However there is still some distance to go. Scaling up from the current 747 registered farmers will require much effort in raising awareness as well as educating farmers on how best to utilize the electronic exchange as well as alternate financial instruments available to them.

Once farmers understand the benefits behind scientific testing and learn how to leverage commodity backed financing to smoothen their income streams and also to increase their livelihoods, its foreseeable that more and more farmers will utilize the NSEL hub. The farmers who have registered already prefer the hub to the market for a variety of reasons:

[22] The average annual turnover in volume at the Kadi market is about 14500 metric tons. (Source: http://agmarknet.nic.in/profile/profile_online/displayformdetails.asp?mkt=1401)

- Better price realization due to accurate weight measurements, scientific quality testing and particularly due to higher prices offered on the exchange. When the fact that middlemen have also been eliminated is factored in, collectively this leads to higher profit margins for the farmers from their traded goods.
- The streamlined process at the NSEL hub allows farmers to complete their entire transaction (from testing to trading to cash reimbursement) within half an hour, whereas at the mandi they often spent the entire day. While this in itself is not the pivotal reason for using the hub, it provides an added benefit to using the NSEL hub.

The case study did reveal one potential issue. Currently the NSEL hub in Kadi serves as a monopsony within the premises since there is only one buyer (NK Industries). The higher quality experience for the farmers, if it continues, will result in an increase in supply at the NSEL hub which over time would decrease the average NSEL-Kadi price. It is evident that competition effects from more buyers in future at the NSEL hub would potentially offset the increased supply effects. This has been an area of concern for ATMNE who has impressed upon NSEL the need to increase the number of buyers. However the nature of the business is such that it is unlikely that another buyer would enter this pilot in the current configuration. Any other buyer would always have to factor in his transport costs to take the produce from the NSEL hub to his processing plant. NK Industries doesn't incur transport costs since its plant is located in the same premises. This gives NK Industries a competitive advantage that cannot be easily countered.

All of the original objectives of this pilot especially in the use of alternate financial instruments, such as forward contracts have yet to be realized. The technology challenges with respect to the mode of service delivery (SMS versus voice) and farmer's technology uptake will still need to be resolved as the project is scaled up and/ or replicated. The success of this pilot so far has little to do with access to ICTs for farmers and more to do with the positively reinforcing confluence of various actors (IFMR Trust, NK Industries and NSEL).

4.0 Conclusion

With low rural mobile penetration and even poorer use of Mobile 2.0 services, the current ability of such Mobile 2.0 based agricultural market information services to directly impact rural BOP users seems to be still unrealized.

The various services outlined in this study, report relatively large subscriber numbers. The LIRNE*asia* study (2008) however reveals that use of such services is low to non-existent for those from the rural BOP. Even the case study of the IFMR Trust pilot reveals that farmers barely read the SMS price alerts. However this is not to say that the information search costs and thus transactions costs have not been reduced for the rural poor by such services. Market prices are just a phone call away (further reiterated by the case study of the IFMR Trust pilot). When juxtaposing the subscriber numbers for these services (which are most likely being used by larger farmers) with the fact that small farmers rely on other progressive farmers for market information (NSSO, 2005) suggest that the impact of these Mobile 2.0 services are possibly filtering down to the rural BOP..

The ability of these services to impact farmer livelihoods is not questioned. RML's internal studies have showed that farmer's have benefitted either as cost-savings or as increased income from the sale of their commodities at the most opportune time by using their service (Pawar, 2009). Jensen (2007), Akers (2008) and Goyal (2008) have already shown how just having mobile connectivity can positively impact farmer livelihoods and bring market efficiencies such as reduced price dispersion.

The IFMR Trust case study does however underscore the importance of two important factors required for farmers to more effectively engage in rural agricultural markets. Firstly, the case study reveals the significance of bringing together external actors and providing farmers access to services (other than ICTs) that are equally if not more important to their livelihoods, namely credit and warehousing facilities. This reaffirms the recent development literature on the need for a holistic approach that incorporates the processes, institutions and laws that affect farmer livelihoods (Chambers, 1987, 1995; Chapman et al, 2003; Cskai & Haan, 2003). To fully unleash the potential of agricultural markets especially derivatives markets, what is required is a reliable and cost-effective warehousing system in India. As of 2009, the Central Warehousing Corporation of India, a governmental entity established in 1957 to provide logistics support to the agricultural sector in India only has 492 warehouses in the country with a capacity of 10.72

million tons of storage capacity[23]. This is too little for country the size of India. This has left warehousing capabilities outside of the reach of small farmers. Government initiatives such as the Gramin Bhandaran Yojana (Rural Warehousing Plan) as well as more sustainable business-model based private sector and non-governmental initiatives like the IFMR trust operation can fill this gap.

Secondly the case study reveals the importance quality and grade standardization and reliable testing mechanisms. As Goyal (2008) reveals superior quality testing allows famers to self-select over time and realize higher incomes from higher quality produce which would otherwise be washed out via the ineffective manual and subjective procedures in place in mandis. This is true even in the case of the Kadi pilot. Furthermore, the NSEL hub's electronic weighing was more accurate than the weighing in the mandis. The ability of farmers to gain approximately 400-500g per bag due to accurate weighing is another reason why farmers make better profit margins than at the mandi.

Technology use and access especially with respect to Mobile 2.0 services is secondary in the case of the IFMR Trust pilot. However it is clear that even here mobiles (even if it is just via voice) have enabled the reduction of transaction costs, especially information search costs.

4.1 Policy Implications

This study does reveal several policy implications that can aid the leveraging of Mobile 2.0 services to increase market access for poor farmers:

1. Leverage demand-driven technology choice(s)

   There is consensus in the more recent literature on ICT4RL studies (de Silva et al, 2008; Chapman et al, 2003 amongst others) that ICT interventions that seek to address rural poverty need to be in local languages and that technology choice should be demand driven. Clearly Gujariti speaking farmers receiving SMS price alerts from NSEL in Hindi hasn't worked well in Kadi. Also as Mittal et al (2010) point out, voice based services have higher impacts than text based services especially when literacy is low. Even if literacy were higher, text based services which would be cheaper to deliver than voice based ones would require slightly more advanced handsets that are capable of rendering the local languages and which

[23] http://cewacor.nic.in/

may not be within the budgets of poor farmers. While the progressive farmers may be subscribing to Mobile 2.0 based agricultural applications, it will take time for farmers from the BOP to be comfortable accessing such services. One of the farmers interviewed during the case study revealed that initially neither he nor his son knew how to access an SMS on their mobile phone. However over time his son had learned how to access the SMS, even if they still continue to rely on voice calls to get market prices.

Hence Mobile 2.0 service providers should consider some form of voice based interface to their services (either an IVR solution or for that matter even a call center) in addition to the other interfaces already being offered.

2. Awareness building and training

   Voice based solutions (IVR or call center) are more expensive to implement and run than those based on SMS, WAP or USSD and these costs will almost be certainly be passed on to the end consumer. So if cheaper options are to be availed of by small farmers, then raising awareness and training (formal and informal) is going to be key. This cannot be left to just the not-for-profit sector. It makes sense for mobile 2.0 service providers to expend more efforts in raising awareness in how to use these technologies amongst small farmers. As is revealed from the case of the farmer's son who learned how to use SMS but continued to use voice, even if awareness is built sufficient incentives need to be created for small farmers to more readily use these services. In that case, clearly the farmers have no incentive to learn new technology skills when ATMNE staff is ready to return the missed calls.

While ICTs and specifically Mobile 2.0 based agricultural applications do have a role to play in reducing transaction costs, for small farmers to engage more effectively in agricultural markets other constraints such as access to credit and relevant infrastructure (from transport to storage) need to be met. Mobile 2.0 services have a role to play here as well and can facilitate the linkages between stakeholders in the agricultural marketing system. But first small farmers need to be more comfortable with technology and be able to access them at a cost affordable to them.

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