

Marketing of Agricultural Perishable Products Using Mobile Phones for Improving Rural Income: A Case Study on Shyampur Area of Howrah District of India

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Abstract
This paper has tried to assess the impact of mobile phones and mobile-enabled services on marketing of perishable agricultural products. The results from this study suggest that the introduction of mobile-enabled agriculture information services have a higher impact in areas which are poorer and are remote from markets. One of the crucial findings in this study is that mobile phones are increasingly accessible to lower-income groups in rural areas. From the study, it was found that farmers were more excited about using the phone to access information on agriculture, and marketing. These results suggest that mobile phones can play a significant role in resolving market constraints and improve income of the rural farmers in Shyampur of India.
Keywords: Mobile phones, agriculture, marketing, farmers, India.

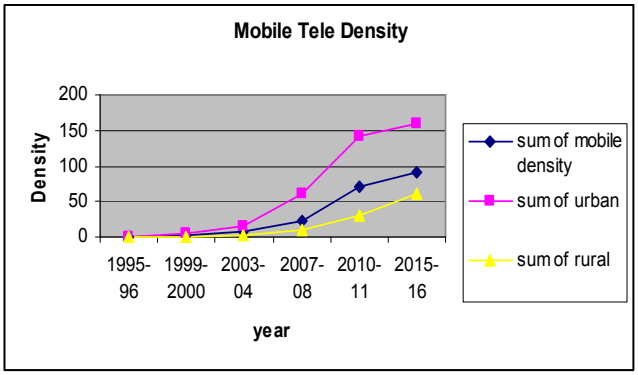
Introduction:
The expansion of mobile networks provides a unique and unparalleled opportunity to give rural smallholders access to information that could transform their livelihoods. The ownership of a mobile phone is considered as the connection of mobility and communication not only in social networks but also in business activities [Lacohée, H. et.al(2003)] . On the other hand, non-ownership is associated with social and economic exclusion. This is especially true in regards to people in developing and transitioning countries suffering from poor infrastructures [Ureta, S(2008)]. Mobile phones, although owned and used by individuals, can nevertheless have an important impact in linking markets and key stages of the value chain. A recent study of farmers conducted in Bangladesh, China, India, and Vietnam found that 80 percent of farmers in these countries owned a mobile phone and used them to connect with agents and traders to estimate market demand and the selling price (Minten, Reardon, and Chen n.d.). More than 50 percent of these farmers would make arrangements for sale over the phone.

One of the most crucial factors for making agricultural decisions in production, marketing, and finance is easy accessibility of information which has traditionally been very expensive in India. Cultivators who are curious to sell their products have to search for the right price, the right buyer, the right standards and grades of the product. Many studies have confirmed that mobile phones are undeniably improving farmers' production practices and adoption of new practices. Mobile phone coverage has also enhanced market efficiency and reduced consumer prices for certain commodities. In recent years, there has been a rapid growth of mobile phone networks in developing countries. Currently mobile telephony is the predominant mode of communication. A study showed that now almost one in two Indians owns a phone. The majority of people of Shyampur area (area under our study) live in the rural areas that depend heavily on agriculture for their livelihood. It employs nearly three-fourth of the people who are mostly smallholder farmers. But, smallholder farmers have poor market infrastructure, inadequate marketing experience, and agricultural inputs. However, one major problem in many rural areas is that farmers and small entrepreneurs generally have no way of knowing the prices before they travel to the market due to poor communication facilities. They often have to rely on middlemen who take advantage of this ignorance. Expansion of mobile phones' coverage is considered one of the remedies for such an information problem. Improvement of agricultural productivity will be realized when farmers are linked to market information. Accurate and timely market information, particularly of perishable items, can significantly reduce transaction and travel costs.

1.1. Indian Telecom Statistics:

- Telephone subscribers (wireless and landline): 1058.01 million (May 2016)
- Land lines: 24.81 million (May 2016)
- Cell phones: 1033.20 million (May 2016)
- Monthly cell phone addition: -1.1 million (May 2016)
- Teledensity: 82.82% (May 2016)

Source: "Highlights of Telecom Subscription Data as on 31st May, 2016" (PDF). TRAI



Source : http://www.trai.gov.in

The main objective of the graph is to show the expansion of mobile phones in rural and urban India. There has been 25-fold increase in mobile subscriber base in a span of just five years from 2000-01 to 2005-06. During the same period, mobile-density has increased more than 23-fold from 0.35 in 2000-01 to 8.12 in 2005-06.

In view of the above backdrop, the objective of the present study is to examine the effect of mobile phones' expansion in rural Bengal, especially Shyampur area of Howrah district on farmers' marketing decisions and prices they receive on producing agricultural perishable products.

Percentage of farmers selling their outputs in village, primary and secondary markets

Commodity	Village market	Primary market	Secondary market
*Vegetables	50.4	31.2	18.4
Eggs	70.8	29.6	19.6

Source: Authors' estimation based on 2015-16 household survey data

*List of vegetables grown by rural farmers in our study area:

Lady's finger, Onion, Garlic, Head cabbage, Brassica(Rai), Loose cabbage/Cauli flower, Chilly(Mirch), Coriander(Dhania), Pumpkin, Sweet gourd, Potato yam, Bottle gourd, Tomato, Bean, Pea, Redish, Egg plant, Potato, Spinch.

2. Literature Review:

There is a growing number of research studies in recent literature dealing with the influences of mobile phone use on farmers' (and other micro and small enterprises') performance in developing countries. Many studies, with few exceptions, have confirmed that mobile phones are indeed improving farmers' production practices and adoption of new practices.

Goodman, J (2005) investigated the relation between mobile phone use and social capital by analyzing survey data from South Africa and Tanzania. He assumed that mobile phones are used to mediate contact between different people, and so are likely to have an effect on the size, number and nature of social networks that people participate in. This in turn may affect levels of trust. As a result,he found out that mobile phones are used for both social and business relationships, but do not have a significant influence on trust.

Molony, T (2006) analyzed the importance of trust in trade relations in comparison to information and communication technology by using case studies of three different business subsectors like perishable food, in Tanzania. He concluded that mobile phones can simplify farmers' access to market information, but this is highly depending on the level of trust between the trading partners. Furthermore, he emphasized that his results do not show any positive influence of mobile phones on the trust between farmers and their trading partners.

Lio and Liu (2006) found that the adoption of new ICTs increases overall agricultural productivity, perhaps because ICT infrastructure facilitates the adoption of modern agricultural inputs.

Jensen, E(2007) found out that mobile phone adoption causes a high reduction of price dispersion in the Indian fishery sector and reestablishes the "Law of One Price". Furthermore, he described how mobile phones avoid the waste of fish catch,increase the fishermen's profits, decrease consumer prices and, thus, also increase fish consumption.

Aker, J (2008), Aker, J (2010), and Aker, J.; Fafchamps, M (2011) had a very similar research objective when investigating a market of a less perishable product. These studies presented the impact of mobile phone coverage in Niger on farm gate prices the farmers in this country achieve for grain. As a result the three studies observed a reduction of price dispersion across different markets and a reduction of the intra-annual price risks farmers face .

Labonne and Chase (2009) focused on welfare effects caused by mobile phones in the Philippines. They observed that mobile phones have a positive influence on producer prices and the marketing choice in addition to

the high positive impact on the growth rate of farmers household consumption per capita.

Muto and Yamano (2009) analyzed the impact of mobile phone coverage in Uganda on farmers' market participation and came to the conclusion that especially farmers producing perishable products in remote areas are able to increase market participation due to mobile phone coverage.

Mittal and Tripathi (2009) analyzed the influence of mobile phones on farm productivity in India. They found that the use of mobile phones can increase agricultural productivity and, therefore, rural income. But this highly depends on aspects of quality, actuality and trustworthiness regarding the exchanged information.

Mittal, Gandhi, and Tripathi (2010) interviewed Indian farmers and fisherman who stated that information delivered via mobile phone allowed them to increase yields. Mobile phone coverage has also improved market efficiency and reduced consumer prices for certain commodities.

Odiaka(2010)confirmed these results insofar as he observed differential mobile phone use among Nigerian rice farmers depending on the mobile phone coverage.

Okello et al.(2012)investigated in more detail factors affecting farmers' use of mobile phones for agricultural transactions. They determined that mobile phone use is related to farmer and farm characteristics as well as location and capital endowment.

Aker and Fafchamps (2013) assessed the impact of mobile phones on agricultural price dispersions in Niger. The study found that while mobile phone coverage reduced the spatial dispersion of producer prices for semi perishable commodities like cowpeas; it had no impact on non-perishable commodities such as millet and sorghum. The study further found that farmers owning mobile phones obtained more price information but did not receive higher prices. The explanation given was non-participation of farmers in spatial arbitrage.

In view of the above literature survey, recent studies on the impact of mobile phones on farmers and rural households in developing and transition countries show positive results in most cases with regard to the access to market information. Furthermore, the impact of mobile phones seems to be higher for farmers living in remote areas and producing perishable products such as fresh fruits and vegetables.

3. Materials and Methods:

3.1. Study period:

The data used for this study was collected between June2014 - January2015 in Shyampur area of Howrah district, India. These crops have high potential of alleviating poverty. Unfortunately, these crops have not helped farmers to alleviate poverty due to market constraints. It is therefore assumed that since most farmers own mobile phones and actually use them in marketing their agricultural perishable products, the role of mobile phones in resolving market constraints will come out vividly. Furthermore, there is relatively limited published information pertaining to the role of mobile phones in resolving constraints in marketing of agricultural perishable products in the study area.

*3.2. Data Collection procedure***:**

The data used in this paper are taken out from a household survey conducted in 2014-15 in study area where farmers are considered as surplus producers. A random sampling technique was used to select sample households. In the first stage, we selected two blocks of Shyampur P.S –SHYAMPUR-I and SHYAMPUR-II from Howrah district of India which is one of the crucial agricultural zone of Howrah district. In the second stage, we selected sample villages, from each block. Sample villages were randomly selected from each group. In total, 20 villages,(10 village from each block) were selected. A total of 124 households were selected for interviews. However, the sample size used to estimate our result is 120 (4 households were excluded due to missing values and inappropriateness of some information for certain farmers). Sample households were interviewed by experienced and well-trained enumerators who are engaged for this purpose using a structured questionnaire. The questionnaire used to collect the data was very rich and contained many variables related to market access, information searching, marketing practices. The use of mobile phone for information searching was specifically asked in order to understand the role of mobile phone for accessing markets. Other demographic and socioeconomic information was also collected.

4. Analysis of results:

Most of the respondents involved in this study were males (see Table:-1). This is likely because most men are the ones who are growing agricultural perishable products for sale. Most women are more attached to home and are responsible for ensuring that the family is taken care of. About 92% of respondents were household head and actually, more men were household head than women. The fact that most respondents were household head ensured that detailed household information searched for was obtained easily. These results show that most farmers who were growing agriculture perishable products were of middle aged. This result did not come as a surprise as growing these crops is demanding and needs energetic people.

Table:-1. Characteristics of respondents

Variables	Variables category	Male	Female	Total
Sex	male/female	77	43	120
Age	upto - 30years	29	14	43
	31years - 45years	31	17	48
	45 and above	17	12	29

Source: Authors' estimation based on 2014-15 household survey data.

For analysis of result as well as to arrive at a conclusion, we have undertaken 120 men and women as above:

Table:-2. Family size

Family size	Number	Percentage (%)
Small(up to 3)	31	26%
Medium(3 - 5)	77	64%
High(6 and above)	12	10%

Source: Authors' estimation based on 2014-15 household survey data.

Most of the respondent farmers are having medium sized family consisting of 3-5 family members.

Table:-3. Family income

Family income	Number	Percentage (%)
Low(Rs.0 – Rs.1100)	38	32%
Medium low(Rs.1100 – Rs.1500)	34	28%
Medium(Rs.1500 – Rs.2500)	29	24%
High(above Rs.2500)	19	16%

Source: Authors' estimation based on 2014-15 household survey data.

The small cultivators operating their cultivation and engaged in marketing their agro-product are having low family income ranging between Rs.0-Rs 1100 per month. In addition, most of the respondent farmers have no conventional educational qualification.

Table:-4. Education level

Education level	Number	Percentage (%)
No education/Only can put signature	53	44%
1^{st} – 5^{th} standard	43	36%
6^{th} standard and above	24	20%

Source: Authors' estimation based on 2014-15 household survey data.

Generally Indian agricultural farms are small sized where vegetables are grown. The analysis of farm size of respondent farmers indicates that most of the farmers are having medium low sized landholding (32% of the respondents).

Table:-5. Farm size

Farm size	Number	Percentage (%)
Small(0.5 bigha)	34	28%
Medium low(0.51 – 1.5 bigha)	38	32%
Medium(1.5 – 2.5 bigha)	24	20%
High(2.5 and above)	24	20%

*1 bigha=0.161885643981hectare

Source: Authors' estimation based on 2014-15 household survey data.

So far as knowledge of vegetables cultivation is concerned, we have found that most of the respondent farmers have high knowledge of vegetables cultivation in our study area.

Table:-6. Knowledge of vegetables cultivation

Variables	Number	Percentage (%)
Low(upto 24 years of age)	24	20%
Medium(25 years – 35 years)	43	36%
High(above 35 years)	53	44%

Source: Authors' estimation based on 2014-15 household survey data.

Transporting argo-products requires coordination between producers, truckers, and, at times, warehouse owners and aggregate traders. Many producers, especially in remote and rural areas, must carry their produce themselves, often by foot, to the nearest collection point. Coordinating transportation is also key to larger traders who aggregate produce for sale in urban areas or for export. The study shows that majority of the respondents (about 44%) have low ccommunication exposure to market.

Table:-7. Communication (Product transportation) exposure to market

Communication exposure to market	Number	Percentage (%)
Low (carrying by own head)	53	44%
Medium (upto 2 carrying option)	38	32%
High (multi-option by bus, train, lorry, etc.)	29	24%

Source: Authors' estimation based on 2014-15 household survey data.

Regarding farmers' sources of market information, the crucial question is that whether farmers need price information for marketing decision. Farmers' marketing decisions are not guided by price information rather by other structural problems such as immediate need of cash, availability of transportation, and others. Most farmers pointed out that one major problem in the study area were that farmers had no way of knowing accurate prices before they traveled to the market due to poor communication facilities. They often had to rely on information from middlemen traders who took advantage of their ignorance to pay lower prices. Most farmers see market information as an important component that enables them to access remunerative markets. This provoked us to inquire whether farmers need information for making marketing decisions. We explicitly asked farmers whether they search for price information before packing their outputs for sale. This study found out that about 56% of the respondents obtained market information from their fellow farmers. This was followed by 34% of respondents who obtained market information from traders. About 10% of respondents obtained market information from media house. Media house (television, radio, newspapers) formed a minor percentage as sources of market information (Table 8). Such information searching either improves their bargaining power or provides alternative markets from which they can choose from to obtain higher prices.

Table:-8. Source of market information

Market information	Number	Percentage (%)
Neighboring Farmers /Relatives / Friends	67	56%
Lateral level Traders	41	34%
Media house (Radio and TV, newspapers etc.)	20	10%

Source: Authors' estimation based on 2014-15 household survey data.

Regarding places where agricultural perishable products are marketed, table 9 shows that most respondents (44%) sold agricultural perishable products within the Shyampur. The ward market included selling: at Shyampur and to individuals at their home places. It was followed by sale in the Shyampur Centre (44%). This market included selling: in Shyampur market and other small village scattered in this area. This market also included selling to the shops and individuals at their home or at work places. The sale of agriculture perishable products in outside Shyampur (20%) constituted only a small percentage of the market places in the study area (Table 9).

Table:-9. Market place for agriculture

Market place	Number	Percentage (%)
Within Shyampur Area(i.e. within study area)	53	44%
Outside Shyampur Area (i.e. outside the study area)	24	20%
Other village	34	28%
In town	10	8%

Source: Authors' estimation based on 2014-15 household survey data.

The growth of mobile networks provides a distinctive opportunity to give rural smallholders access to information that could transform their livelihoods. We have studied whether farmers who search price information use mobile phones or not. The results indicate that the use of mobile phone for acquiring business information is very limited. Nearly 86% of farmers who own mobile phones use them to search for market information (Table 10). Surprisingly, some farmers who have no mobile phone obtain market information through mobile phones. Possible explanation would be the use of neighbors' mobile phones or sharing information from neighbors who own mobile phones.

Table 10. Percentage of households using mobile phone for market information searching

Owning mobile phone	Percentage	% of farmers use mobile phone for market information searching
Farmers who own mobile phones	59%(71*)	85.91%(61)
Farmers who do not own mobile phone	41%(49)	8.16%(4)
Total	100%(120)	54.16%(55)

Source: Authors' estimation based on 2014-15 household survey data.

*Figure in parenthesis indicates number

The study (table 11) shows that where almost 92%of the large farmers who were using mobile phones could get a better price for their commodities while only 71.42% of small farmers could benefit from the

price information.

Table:-11. Benefits of mobile phones based on farm size

Farm size	Percent of farmers using mobile phone	Getting connected to market	Getting better price
Small(<0.5 bigha)	26.47%(9 out of 34)	77.78%(7 out of 9)	71.42%(5 out of 7)
Medium low(0.51 – 1.5 bigha)	55.26(21 out of 38)	80.95%(17 out of 21)	76.47%(13 out of 17)
Medium(1.5 – 2.5 bigha)	79.17%(19 out of 24)	89.47%(17 out of 19)	88.23%(15 out of 17)
High(2.5 and above)	91.67%(22 out of 24)	90.9%(20 out of 22)	90%(18 out of 20)

*1 bigha=0.161885643981hectare

Source: Authors' estimation based on 2014-15 household survey data.

In table 11, it is remarkable to find out that "although the share of farmers perceiving price gains differed for different farm sizes, the number of farmers perceiving better market connectivity is very similar and high for almost all farm sizes. This finding suggests the fact that although with availability of information on prices and markets made available to the farmers, even the small farmers are able to access markets and are better connected to markets, but when it comes to count it in terms of actual prize realization it is only the relatively large size farmers who gain the most. This is mainly because of various constraints faced by the farmers like poor bargaining ability, credit 'bondedness' to middle men (MITTAL et al., 2010) and several other factors".

Most of the respondent farmers (84%) admitted that they are confronting some constraints when selling their agricultural perishable products in the study area. Table 12 shows that most respondents mentioned lack of market information as the main constraints in marketing agricultural perishable products. Knowing the information on prices existing in alternative markets and the ability to make better decisions on where and when to sell their products was one of the key determinants of improving their income. A large section of farmers mentioned that one major problem in marketing their products is the ignorance or inability to know the supply and demand of their products which determined the prices before transporting it to the market. In such a situation, farmers lacked negotiating power hence the traders took advantage by paying them low prices.

Table-12. Market constraints

Market constraints	Number	Percentage (%)
Lack of market information	38	32%
Lack of storage facilities	34	28%
Lack of knowledge on packing and transporting of products	29	24%
Time consumption constraint	19	16%

Source: Authors' estimation based on 2014-15 household survey data.

The second constraint mentioned was lack of knowledge on packing and transporting of agricultural perishable products. Most farmers indicated that due to lack of knowledge in packing and transporting them they ended up getting a lot of loss because most of their products get spoiled or damaged. Many farmers mentioned that this was because most products were transported on passenger buses which were often overcrowded due to lack of means of transport in the area. Once these products are damaged in terms of shape, color and quality, its price is greatly reduced.

5. Conclusion:

The results from these studies suggest that the introduction of mobile-enabled agriculture information services have a higher impact in regions which are poorer and are remote from markets. One of the key findings in this study is that mobile phones are increasingly accessible to lower-income groups in rural areas. From the study, it was found that farmers were more excited about using the phone to access information on agriculture, and marketing. These results suggest that mobile phones can play a significant role in resolving market constraints and improve income of the rural farmers in Shyampur of India. To maximize profit, farmers must use mobile phones to access timely and accurate market information, to save money and time and to reduce losses. Higher earnings as a result of using mobile phones will, in turn, increase production and improve income further.

In conclusion, it can be said that many farmers own mobile phones but to what extent this mobile phone is helping farmers in making marketing decisions is an important concern that many researchers want to understand more and more.

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