

# Effect of Mobile Phone Technology in Improving Small Farm Productivity

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**Abstract**—The main focus of this study was to determine the extent of improvement in small farm productivity through mobile phone technologies. Data were collected using pre-tested interview schedule during 01 April to 30 June, 2016. from a sample of 50 farmers out of 100 farmers of target group and 50 farmers out of 100 farmers of control group selected randomly from the beneficiaries of Participatory Research and Ownership with Technology Information and Change project of Dimla upazila under Nilphamari district. Besides the usual descriptive statistical parameter, Correlation Coefficient ( $r$ ) was used for the statistical analysis. The information needs was determined on 20 selected farm productivity items. It was revealed that highest farm productivity improvement was observed on 'receiving product price' in target groups. Lowest improvement was observed through receiving information on 'water quality management of pond'. In case of control groups, the highest improvement of farm productivity was observed through receiving information on 'crop protection' while lowest improvement was observed on receiving information of 'pond preparation'. Majority (76.0 percent) of them had medium improvement in target group and 64.0 percent of them had low improvement of farm productivity in control groups. Annual income, extension media contact and farm size were significantly correlated in target groups whereas education and farm size were positively and family size as well as aspiration was significantly correlated (negatively) with improvement of farm productivity using mobile phone in control groups. 'Lack of adequate training about internet browsing' was the major problem faced by the farmers and 'Organizing more training program for the farmers' was the major probable solution for the problems..

## 1. INTRODUCTION

Bangladesh is one of the least developed countries of the world. About 65.72 percent of her population is living in rural area accounting about 105.806 million people [6]. Most of the agricultural producers are small and marginal farmers who comprise approximately 80 percent of all farming households and holding about 50 percent of the total cultivated land [2]. Information and Communication Technologies (ICT) could be one of helping solution for increasing the farm productivity, which depend on IT infrastructure and network communications [1]. Among ICT tools, the mobile phone is certainly an instrument of choice for most of the farmers. A mobile phone with highly advanced features is called a smart phone, which is also used in receiving agricultural information. Government of Bangladesh declared a vision of 'Digital Bangladesh by 2021' to ensure services at peoples' door steps. Mobile phone usage is playing a vital role for the enhancement of farm productivity in agriculture. Farming communities appreciate mobile phone as easy, fast and convenient way to communicate and get prompt answers of respective problems.

Now-a-days, the mobile Phone has generated an opportunity for the farmers especially to get the information about marketing and weather. Through this important technology, they directly keep in touch with market personals and offer their produce with reasonable prices. Mobile phone can increase farm productivity should there be a reduction in the constraints that limits the use of information available to farmers through their phones [5]. Mobile phones are useful to farmers during their farming preparation, farming, harvesting and marketing in rural Tanzania [4].

The overall development of the country and prosperity of her people is almost absolutely dependent on agriculture. In order to face the lingering food shortage, it is essential to increase agricultural productivity in Bangladesh. For this reason, improved agricultural technologies should be used with great care. But in practice till today only one-third of the total cultivable land is covered by the modern technologies. The government is consistently trying to improve the socio-economic conditions of the farmers by providing several ICT facilities. Besides that, NGOs are also assisting this visionary work of government to reach at the goal. The Participatory Research and Ownership with Technology Information and Change (PROTIC) project by Oxfam

works regarding this through Participatory Action Research (PAR) approach by increasing the use of ICT tools such as mobile phone. The farmers are using mobile phone for increasing their farm productivity but the effect of mobile phone is still unknown.

Mobile phone application may have an effect on improvement of small farm productivity. The farm which are belongs to 0.21 to 1.0 ha are considered as small farm. The mobile phone has reduced the gap among traders and farmers and same time farmers directly communicate with buyers and customers to find the good price of their product. Farmers' participation in market and transport management is so poor that most of the time they are being forced to sell their products to local middlemen at dumped prices [3]. Furthermore, information on seed, variety, cropping season, pest management, fertilizer application, harvesting time and post-harvest management information can be available by using mobile phone to gain better yield. In this regard, the present study will try to determine the effect of mobile phone technology in improving small farm productivity. Keeping this in mind the research will be conducted with the following objectives:

1. To assess the nature and extent of improvement in small farm productivity through mobile phone technologies.
2. To explore relationship between selected characteristics of the farmers and improvement in small farm productivity through mobile phone
3. To determine the problems faced by the farmers in using mobile phone and probable solutions to overcome the problems.

## 2. METHODOLOGY

### 2.1. Locale of the study

Dimla upazila under Nilphamari district was selected as the study area for the survey. Dimla upazila was selected purposively as the respondents under this survey are the beneficiaries (animator) of PROTIC project which is implemented in this upazila. Among all the unions of Dimla upazila Tapa Kharibari union was selected. Dakkhin Kharibari as controlled village & Uttar Kharibari as experimental village under this union were also selected purposively for conducting the survey for the same reason.

### 2.2. Population and sample

The all of the beneficiaries (animator) of PROTIC project of Dimla upazila under Nilphamari district were the population of the study. The list of all 100 female farmers was collected from concerned development partner NGO named Pollisree. From the total population, 50 (50%) were selected as the sample for the treatment group i.e. mobile phone users. The research also concerned with the control groups who are not under direct supervision of PROTIC project. A list of 100 women of control group was also collected and 50 of them (50%) were considered as the sample of the study.

### 2.3. Data collection

An interview schedule was prepared for obtaining necessary information from the respondents. A pre-tested interview schedule was used to collect data from the respondents during 01 April to 30 June, 2016.

### 2.4. Measurement of improvement of farm productivity

Farm productivity improvement through using mobile phone was the main focus of the study. For measurement of farm productivity 20 Productivity items were selected in respect with the dimensions of using mobile phone. Among 20 items 8 from agriculture, 4 from livestock, 6 from fisheries and last 2 from market information were selected. The respondents were asked to express opinion on how extent her farm productivity status has been improved in each of 20 Productivity items along a 4-point scale: 'not at all', 'low', 'medium' and 'high' assigned the scores as 0, 1, 2 and 3 respectively. The summation of the scores against all the 20 specific activities produces the 'farm productivity improvement' scores of a respondent. This score could range from 0 to 60, where 0 indicating not at all improvement and 60 indicating high improvement of farm productivity through mobile phone.

For making comparative analysis of 20 productivity items Farm Productivity Improvement Index (FPII) was calculated. FPII was calculated by adopting the following formula:

$$FPII = P_n \times 0 + P_1 \times 1 + P_m \times 2 + P_h \times 3$$

Where,

FPII = Farm Productivity Improvement Index

$P_n$  = Percentage of farmers for 'no' improvement

$P_1$  = Percentage of farmers for 'low' improvement

$P_m$  = Percentage of farmers for 'medium' improvement

$P_h$  = Percentage of farmers for 'high' improvement

Thus, the possible value of FPII could range from 0 to 300, where 0 indicated no improvement of farm productivity and 300 indicated highest improvement of farm productivity using mobile phone.

## 2.5. Measurements of problems and suggestions

The respondents were requested to mention the problems in using mobile phone and were also requested to mention the means to solve these problems. In this case an open ended question was used. Then the mentioned problems and suggestions were ranked on the basis of number of citations on the respective areas.

## 2.6. Compilation of data and statistical analysis

At the end of data collection, the collected data were coded, compiled, tabulated and analyzed. The SPSS (Statistical Packages for Social Sciences) computer program was used for analyzing the data.

## 3. RESULTS AND DISCUSSION

### 3.1. Extent of improvement of farm productivity

Farm information has now been considered as essential inputs in crop production to increase productivity. It enhances the working efficiency of the farmers and ultimately they get better yield from a crop. Keeping this mind, an effort was made to determine the improvement of farm productivity using mobile phone. For that 20 productivity items were selected among which 8 of them from agriculture, 4 from livestock, 6 from fisheries and 2 from market information.

In both target and control group farmers' responses were taken into consideration to determine farm productivity.

**Table 1: Distribution of the respondents according to extent of improvement of farm productivity**

Sl. No.	Productivity items	Percentage of farmers (Target)				FPII	RO	Percentage of farmers (Control)				FPII	RO
		Not at all	Low	Medium	High			Not at all	Low	Medium	High		
<b>A. Agriculture</b>													
1.	Land preparation	54	18	22	6	80	10	78	12	6	4	36	7
2.	Soil fertility management	52	16	26	6	86	8	76	8	10	6	46	3
3.	Seed variety selection	44	16	22	18	114	4	78	2	12	8	50	2
4.	Seed rate	56	14	18	12	86	7	80	4	10	6	42	5
5.	Fertilizer application	42	24	22	12	104	5	76	8	10	6	46	4
6.	Irrigation management	62	24	8	6	58	12	80	8	10	2	34	8
7.	Crop protection	52	18	22	8	86	6	72	8	10	10	58	1
8.	Harvesting	68	20	8	4	48	14	78	10	8	4	38	6
<b>B. Livestock</b>													
1.	Shade preparation	64	18	16	2	56	13	90	6	4	0	14	13
2.	Breed selection	58	10	22	10	84	9	94	0	6	0	12	14
3.	Feed selection	62	10	16	12	78	11	88	10	2	0	14	12
4.	Treatment of diseases	46	4	14	36	140	3	86	4	10	0	24	10
<b>C. Fisheries</b>													
1.	Pond preparation	88	4	6	2	22	17	98	2	0	0	2	20
2.	Water quality management	90	2	8	0	18	20	98	2	0	0	2	19
3.	Selection of fish variety and fingerling	88	0	10	2	26	16	97	2	1	0	4	17
4.	Feed selection	92	2	2	4	18	19	98	2	0	0	2	18
5.	Disease control	84	2	12	2	32	15	95	3	2	0	7	16

6.	Harvesting	90	2	8	0	18	<b>18</b>	95	2	2	1	9	<b>15</b>
<b>D. Market information</b>													
1.	Input price	36	16	14	34	146	<b>2</b>	84	10	6	0	22	<b>11</b>
2.	Product (output) price	38	4	26	32	152	<b>1</b>	84	6	10	84	26	<b>9</b>

The data revealed that the highest farm productivity improvement was observed through receiving product (output) price (FPII=152) information through mobile phone in target groups. Lowest improvement was observed through receiving information on water quality management of pond (FPII=18). In case of control groups the highest improvement of farm productivity was observed through receiving information on crop protection (FPII=58) while lowest improvement was observed on receiving information of pond preparation (FPII=2).

The target group farmers are very active and each of them had a smart mobile phone so they can easily receive any kind of information during their need. But the control groups farmers had not any mobile phone as a result they may not avail all kinds of information through mobile phone. Finally the farm productivity was improved more in case of target groups farmers rather than control groups farmers.

### 3.2. Overall improvement of farm productivity

The overall improvement of farm productivity scores of the target group farmers ranged from 0 to 41, against the possible score 0 to 60. The mean and standard deviation were 14.65 and 12.25 respectively. The control group farmers' overall improvement of farm productivity scores ranged from 0 to 32, against the possible score 0 to 60. The mean and standard deviation were 6.60 and 9.56 respectively. The respondents were classified into three categories based on overall improvement of farm productivity as 'low' ( $\leq 8$ ), 'medium' (9-20) and 'high' ( $> 20$ ) as shown in Table 2.

**Table 2: Distribution of the respondents according to their overall improvement of farm productivity**

Categories (Score)	Farmers number and (percentage)	Categories (Score)	Farmers number and (percentage)	Range		Mean and (SD)	
	Target		Control	Target	Control	Target	Control
Low ( $\leq 3$ )	8 (16)	Low ( $\leq 8$ )	32 (64)	0-41 (0-60)	0-32 (0-60)	14.65 (12.25)	6.60 (9.56)
Medium (9-20)	38 (76)	Medium (9-20)	15 (30)				
High ( $> 26$ )	4 (8)	High ( $> 20$ )	3 (6)				
Total=	50 (100)	Total	50 (100)				

Data presented in Table 2 shows that majority (76.0 percent) of the farmers had medium improvement of farm productivity, 16.0 percent had low improvement of farm productivity and 8 percent had high improvement of farm productivity (Target group). Similarly it was also revealed that majority (64.0 percent) of the farmers had low improvement of farm productivity, 30 percent had medium improvement of farm productivity and only 6.0 percent had high improvement of farm productivity (control group).

### 3.3. Relationships between the selected characteristics of the farmers and their improvement of farm productivity

Relationships between seven independent variables with the improvement of farm productivity as found by correlation test are described in this section. The computed co-efficient of correlation (r) between the independent and dependent variable are shown in Table 3.

**Table 3: Relationships between the dependent and independent variables**

Dependent variable	Independent variables	Computed values of 'r' with 48 d.f.	Computed values of 'r' with 48 d.f.
		Target group	Control group
Improvement of farm productivity	Age	0.074	0.253
	Education	0.197	0.592*
	Family size	0.187	-0.361*
	Farm size	0.356*	0.601**
	Annual income	0.445**	-0.256
	Extension media contact	0.391**	0.081
	Aspiration	0.023	-0.320*

\* Significant at 5 percent level; \*\*Significant at 1 percent level

Correlation test was done in both target group and control group farmers to reveal the characters related improvement of farm productivity. In response to target groups it was observed that annual income and extension media contact are correlated at 1 percent level of significance with improvement of farm productivity using mobile phone. The research also revealed that farm size is correlated at 5.0 percent level of significance with improvement of farm productivity using mobile phone whereas age, education, family size, and aspiration are not significantly correlated with improvement of farm productivity using mobile phone.

In response to control group farmers, it was observed that education is positively and family size as well as aspiration was negatively correlated at 1 percent level of significance with improvement of farm productivity using mobile phone. The research also revealed that farm size is significant with improvement of farm productivity using mobile phone at 5 percent level of significance. Age, annual income, and extension media contact are not statistically correlated with improvement of farm productivity using mobile phone.

### 3.4. Problems in using mobile phone

Farmers may face several problems in using mobile phone. For easy understanding of the problems faced by the farmers and the suggestions to overcome the problems given by them are listed in this section with their number of citation, percent and rank order.

**Table 4: Rank order of problems faced by the farmers in using mobile phone**

Sl. No.	Problems in using mobile phone	Respondents	
		Number	Percent
1.	Lack of adequate training about internet browsing	26	52.0
2.	Lack of proper knowledge regarding mobile operation	20	40.0
3.	Less availability of electricity facilities	15	30.0
4.	Call rate is higher	12	24.0

It is evident from the data contained in the table 4 that ‘lack of adequate training about internet browsing’ (52 percent) emerged as the most important problem expressed by the farmers. The lowest numbers of farmers opined that ‘call rate is higher’ (24 percent) among the problems.

### 3.5. Suggestions offered by the farmers to overcome the problems

Many suggestions were offered by the farmers to overcome the problems in using mobile phone. These are given in Table 5.

**Table 5: Rank order of suggestions offered by the farmers to overcome the problems in using mobile phone**

Sl. No.	Suggestions	Respondents	
		Number	Percent
1.	Organizing more training program for the farmers	35	70.0
2.	Internet facility should be strengthen	20	40.0
3.	Easy access to electricity facilities	18	36.0
4.	Mobile network connectivity should be strengthen	16	32.0

It is evident from the data contained in the table 5 that ‘organizing more training program for the farmers’ (70.0 percent) was found as the most important suggestions to overcome the problems in using mobile phone. The lowest numbers of farmers opined that ‘mobile network connectivity should be strengthen’ (32.0 percent) among the mentioned suggestions.

## 4. CONCLUSIONS

On the basis of the findings of the study and their logical interpretations the following conclusions were drawn:

1. Majority (76.0 percent) of the farmers had medium improvement of farm productivity in target group and majority (64.0 percent) of the farmers had low improvement of farm productivity in control groups through using mobile phone. So, it may be concluded that the overall farm productivity scenario is not up to satisfactory level.
2. Highest farm productivity improvement was observed through receiving information by mobile phone on ‘product (output) price’ in target groups and ‘crop protection’ in control groups. It may be concluded that the target group farmers were more conscious about the price of their output (agricultural products).

3. Annual income and extension media contact and farm size is correlated with improvement of farm productivity using mobile phone in target groups whereas education, farm size is positively and family size as well as aspiration was negatively correlated with improvement of farm productivity using mobile phone in control groups. So, it may be concluded that these characteristics of the farmers had significant effect.

4. 'Lack of adequate training about internet browsing' was the highest mentioned problems and 'organizing more training program for the farmers' was the highest probable solutions to overcome the problems as mentioned by the farmers.

## 5. RECOMMENDATIONS

On the basis of the conclusion the following recommendations were drawn:

1. Increased extension services and capacity building efforts can complement information dissemination via mobile phones to accelerate adoption of new technologies.
2. For increasing farmers' knowledge information delivery system should be developed. Need based information's should be provided in this regard.
3. Strengthening the linkage between GO and NGO collaboration with farmers to make available of the required inputs, technologies and information's for agricultural practices need to be ensured.
4. Research should be undertaken particularly to identify the further factors causing hindrance to expected level of improvement of farm productivity using mobile phone.

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