Application of Information and Communication Technology (ICT) in Farm Management in Jorhat District of Assam

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Information Communication Technology (ICT) provides an opportunity for farmers to increase their farm production.ICT is a diverse set of technological tools and resources used to communicate, disseminate, store and manage information. Different tools of ICT like television, radio, newspaper, mobile phone, etc were used by the farmers to get information. The demand for agricultural crops increasing day by day to feed the people. Proper information about weather, plant disease, soil, the post-harvesting technique can increase the productivity of the farmers. In the present study, all the sources were divided into four groups accordingly their characteristics. The four groups were face to face, other farmers, traditional media, modern ICT etc. Different factors were affecting in the use of modern ICT like age, education, farm size, traditional media, mobile phone. Some factors were affecting more in the use of ICT while some factors affecting less. Old age farmers relied more on traditional media than modern ICT. Farmers those who had large farm size were using more traditional media and modern ICT. Various problems were faced by farmers while using ICT. The present study tries to know the use of ICT and factors affecting in the use of ICT.

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1. INTRODUCTION

Information Communication Technology (ICT) is the diverse set of technological tools and resources used to communicate, disseminate, store and manage information. Information plays a key role in strengthening the farmer's daily decision-making process related to agricultural activities by enhancing their knowledge about new technology, inputs, and markets. Each stage of agriculture production requires a number of specific actions or decisions by the farmer [1]. Despite the huge investment, the Indian public sector of extension service is usually criticized for the ineffectiveness, limited reach and the huge administrative cost of delivering information [1,2]. The use of sources of communication like television, radio, and newspapers have limited effectiveness [1,3] and these are unable to meet the growing information needs of farmers, relating to crop and technology choice, processing, utilization, storage and marketing of their produce. The information provides an opportunity for developing and underdeveloped nations so that they can build up their strategies and compete with the developed nations. In any sector, information is the key to its development. Agriculture is no exception to it. If the relevant information is provided at the right time to the farmers for timely action, prepare strategies for next season or year, speculate the market changes, and avoid unfavorable circumstances. Developed countries more-specialized applications, such as software used for supply chain or financial management are also becoming more relevant in smallholder farming. Simple accounting software has allowed cooperatives to manage production, aggregation, and sales with increased accuracy. In Assam farmers were using ICT to some extent for various farm management activities such as weather information, soil testing, seed, crop management, post harvesting and marketing etc. In the study area different factors played an important role for accessing the information. Most of the farmers were applying the traditional technologies because of lack of knowledge on modern technologies. Farmers were not aware about the new technologies which can minimize their working time in the field and also reduces the cost of cultivation of the crops. Because of lack of information, the proper utilization of agricultural land is comparatively less in India in comparison to the developed countries. The information about product price helps the farmer whether they are in profit or loss because huge portion of profit earn by the middle man. ICT can help the farmers in production, marketing and financial management. For increasing the production, ICT is one of the best solutions for the farmers to get information like seed, weather, soil testing, and crop management and post-harvesting techniques. For these reasons the study was conducted to see how farmers were getting information in the study area with the following objectives.

-Examine the factors influencing the awareness of ICT application using logit regression model
- Identify the problems faced by the farmers in accessing and application of ICT

2. MATERIALS AND METHODS

The research was conducted in the Jorhat district of Assam. Total sixty farmers were interviewed from three blocks of the district with the pre-tested schedule. For analyzing the objective of factors influencing the awareness in the application of ICT, the logit regression model was used. The study had postulated that the probability of farmer awareness to the application of ICT depends on the attributes like age, literacy level of farmers, farm size, television, mobile phone, etc. The index variable Z_i (Z_i is a dichotomous variable) indicating whether a farmer is aware of the application or not has been expressed as a linear function of the independent variables. Farmers reported that no single source provide them all the information that they want, thus, they rely on different sources of information. For analysis of the data different sources of information are grouped together in four categories namely face to face, other farmers, traditional media, modern ICT. (Table 1).The logit regression model was used for four groups of sources of information as the dependent variable and other factors like age, education, farm size, television, mobile takes as the dependent variable. In the study area, most of the farmers had television and mobile phone so both of them consider as the dependent variable. The different sources of information were grouped into four categories as same categories made in an earlier research paper (Table 1).

Table 1. Four group of sources of information

Sl. No.	Categories for information dissemination	Sources
1	Face to face	Krishi Vigyan Kendra, commission agent, extension agent
2	Other farmers	Farmers or relatives in same village
3	Traditional media	Television, Radio, Newspaper
4	Modern ICT	Mobile phones, Internet

The four equation of logit regression model has been used as the following:-

1. $Yi_1 = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u_i$
2. $Yi_2 = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u_i$
3. $Yi_3 = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u_i$
4. $Yi_4 = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u_i$

Where,

X_1 = Age of the respondents (years)
X_2 = Education (if the farmer is illiterate then 1, primary school pass then 2, high school pass then 3, higher secondary pass then 3, graduate and above 4)
X_3 = Farm size (hectare)
X_4 = Television (use television 1, otherwise 0)
X_5 = Mobile (use mobile 1, otherwise 0)
i = farmer id
u_i = Error - term

For the four group of sources of information if farmer access information from face to face group, then Y_{i1} = 1 and 0 otherwise. If farmer access information from other farmers, then Y_{i2} = 1and 0 otherwise. If farmer access information from traditional media, then Y_{i3} = 1 and 0 otherwise and farmer access information from modern ICT, then Y_{i4} = 1 and 0 otherwise.

3. RESULTS AND DISCUSSION

The demographic variables of the sample were age, education, farm size, etc. Age, education, landholding was some of the important parameters for factor influencing the application of ICT [4]. Most of the farmers were in between 46-50 years and most of them were primary school qualified. The land holding size of the farmers was small and marginal in most of the farmers. The different sources of information used by the farmers in the study area like television, radio, and mobile. Out of this, 76.67 percent of farmers were using television for getting information (Table 2).

Farmers reported that no single source provide them all the information thus, they rely on different types of sources for different types of information or even similar information. For the information about weather and crop disease is best available from television, while information of price was obtained from newspaper and middleman present in the village, but these sources lack information about specific choice of fertilizers for the field. Krishi Vigyan Kendra (KVK) played an important role for the farmers by doing soil testing, method demonstration, training, etc. By analyzing the data it was seen that a total of 8.3 percent of the farmers were using a single type source of information. Where the only face to face user was found 1.67 percent, another farmer was found 1.67 percent and traditional media user was found 5.00 percent (Table 3).

It was found that some farmers were using two different groups of sources of information. The combination of different group of information were–'Face to face' and 'Other farmers, 'Face to face' and 'Traditional media', 'Face to face' and 'Modern ICT', 'Other farmers' and 'Modern ICT', 'Other farmers' and 'Traditional media', 'Modern ICT' and 'Traditional media'. A total of 50.51 percent of farmers were relying on a combination of two groups of information. In the group of 'Face to face and Other farmers' 1.67 per cent, in 'Face to face and Traditional media' 6.67per cent, in 'Face to face and Modern ICT 6.67per cent, 'Other farmers' and 'Traditional media' 21.67 per cent and 'Modern ICT and Traditional media' 8.33 per cent of users were found in the study area. Here the combination of 'Other farmers' and 'Traditional media' was found highest in the case of a combination of two groups of sources.

Some of the farmers reported that they were using the combination of three groups of sources for information. The combination of three groups of information was 'Face-to-Face, Other farmer and Traditional media'; 'Face-to-Face, Other Farmers and Modern ICT'; 'Other Farmer, Traditional media and Modern ICT'. A total of 10 percent of farmers were found to depend on three combinations of sources. Where no farmer was found to use the combination of 'Face-to-Face, Other farmer and Traditional media', only 5 per cent of farmers were found to use 'Face-to-Face, Other Farmers and Modern ICT'

combination of information sources and also 5 percent of farmers were found to use 'Other Farmer, Traditional media and Modern ICT'.

Table 2. Demographic variables of the study area

Variable	Frequency	Percentage
Age(Years)		
Less than 40 and 40	14	23.3
41-45	15	25.0
46-50	9	15.0
51-55	11	18.3
56 and above	11	18.3
Education level		
Primary school	24	40.00
High school	25	41.66
Higher secondary	6	10.0
Graduate and above	5	8.33
Land holding (Hectre)		
Marginal	6	10.0
Small	26	43.3
Medium	21	35.0
Large	7	11.7
Access of ICT		
Television	46	76.67
Radio	38	63.34
Mobile	36	60.00
Internet	11	18.33

All the farmers who used traditional media and modern ICT sources, they were also accessing information from other sources. By using modern ICT along with conventional information sources, these farmers may be benefiting by having better yields or reduced cost of production or better price realization. Almost one-third of the farmers are using combinations of three sources of information, whereas 21.6 percent of the farmers are using simultaneously all four sources of information. Due to these wide variations in farmer's selection patterns across various combinations of information sources, there is a possibility that farmer's choice of any particular source is correlated with their choice of other sources of information.

For analyzing the factors influencing in the awareness of ICT the four groups of sources-Face to face, other farmers, traditional media, modern ICT were taken as independent variables and age, education, farm size, television, mobile phone were taken as dependent variables. The regression results of face to face group suggest that the coefficient of age -.229 is not significant for face to face source. The negative result

implies that older farmers were not aware to use face to face the source of information. Also the coefficient of education -.258, farm size .006 and television -.021 is not significant. The coefficient of television is negative which implies that those farmers who using more television were less aware to face to face source. The coefficient of mobile .375 is significant which implies that the farmers who have mobile phones were more aware to face to face source. Farmers use a mobile phone to make contact with KVK person or extension agent (Table 4).

The regression result of other farmer groups suggests that the coefficient of age is significant for other farmers. This implies that by increasing age farmers were more aware of other farmers. The coefficient of education -.431 is negative and significant in the case of another farmer, which implies that farmers with better education rely less on other farmers. They were more aware to get information from other sources like traditional media, modern ICT, etc. The same result was found in earlier research also [4]. Also, coefficient of television .403 is positive and significant. This implies that farmers who had television, disseminate the agricultural information to other farmers (Table 4).

For traditional media, the regression result shows the coefficient of age .464 is positive and significant. This implies that increasing age farmers were more aware of traditional media to get information. The education is positive which implies that farmers who educated more aware of traditional media. The coefficient of farm size .229 is positive and significant. This implies increasing farm size; farmers were more aware of traditional media to get information. The coefficient of education was found positive but not significant. The television factor is removed due to the perfect correlated with the respective dependent variable. The coefficient of the mobile phone is negative which implies that more mobile phone user was less aware of traditional media.

For modern ICT, in the logistic regression result shows that the coefficient of age .057 was found negative. This implies that increasing the age farmers were less aware to get information from modern ICT. The coefficient of farm size was .622 was positively significant. This implies that more farm size farmers were more aware to modern ICT. It is because more farm size farmers were more aware to new technology. The mobile factor is removed due to the perfect correlated with respective dependent variable (Table 4).

Table 3. Four group of sources of information

Sl. No.	Possible source of information	Frequencies of farmers	% of farmers
1	Only "Face to face"	1	1.67
2	Only "Other farmers"	1	1.67
3	Only "Traditional media"	3	5.00
4	Only "Modern ICT"	0	0.00
5	"Face to face" and "Other farmers"	1	1.67
6	"Face to face" and "Traditional media"	4	6.67
7	"Face to face" and "Modern ICT"	4	6.67
8	"Other farmers" and "Modern ICT"	3	5.00
9	"Other farmers" and "Traditional media"	13	21.67
10	"Modern ICT" and "Traditional media"	5	8.33
11	"Face-to-Face", "Other farmer" and "Traditional media"	0	0.00
12	"Face-to-Face", "Other Farmers" and "Modern ICT"	3	5.00
13	"Other Farmer", "Traditional media" and "Modern ICT"	3	5.00
14	All four	19	31.67
15	None of the four	0	0.00
16	Total	60	100.00

Table 4. Factors affecting different ICT groups

Factors	Face to face	Other farmers	Traditional media	Modern ICT
Age	-.229	.396*	.464*	-.057
Education	.258	-.431*	.556	.245
Farm Size	.006	-.296	.229*	.622**
Television	-.021	.403*	--	-.056
Mobile Phone	.375*	.258	-0.087	--

3.1 Problems Faced by the Farmers in Using ICT

Farmers faced different problems while using ICT in the study area such as computer illiteracy, insufficient extension agent, erratic and unstable power supply (Table 5). The erratic and unstable power supply was found main problem in the study area which was 68.33per cent. Then 65 per cent farmers had problems to connect with the extension agent. Around 60 per cent of farmers agreed that they had lack knowledge for using computer.

Farmers agreed that they were facing different problems while using different sources of information. In the research area, different problems like erratic and unstable power supply, insufficient extension agents, computer illiteracy, the high cost of mobile service, operating problems and less availability of time for using ICT were found. The erratic and unstable power supply was found topmost problems in the study area which was 68.33 percent. The insufficient number extension agent creates a problem for training the farmers in the study area. The computer illiteracy of the farmers creates to use modern ICT. Around 60.00 percent of farmers were facing problems while using the computer. The high price of mobile service was a problem for them in accessing agricultural related information. Around 41.67 percent of farmers informed that they had an operating problem while using modern ICT. And 38.3 percent of farmers agreed that they did get enough time for using ICT to collect information because they got tired for doing their day to day works in the field.

Table 5. Problems faced by the farmers in using ICT

Sl. No.	Problems	Frequency (n=60)	Percentage	Rank
1	Erratic and unstable power supply	41	68.33	I
2	Insufficient extension agent	39	65.00	II
3	Computer illiteracy	36	60.00	III
4	High price of mobile service	34	56.67	IV
5	Operating problem	25	41.67	V
6	Less availability of time for using ICT tools	23	38.33	VI

4. CONCLUSION

For sustainable future growth in agriculture the information communication technology (ICT) plays an important role in agriculture. Farmers in the study area were received agricultural information from various sources like newspapers, radio, television, mobile, internet, KVK; other farmers, etc. The traditional media is the predominant source of information in the study area until now. Most of the farmers relied on more than one source of information. The frequency of accessing information from different sources is different. Different factors like-age, education, and farm size played an important role in the awareness of the farmers. Age and farm size were the most affecting factor in accessing information. Most of the aged farmers were accessing information from other farmers, relatives, and traditional media. But the more educated farmers were less aware to get information for other farmers. More land holding size farmers were more aware to get information from traditional media and modern ICT. The Mkissan call centre also plays an important for the farmers to get information in the study area. Mkissan helps the farmers by giving different agriculture-related information like the weather report, crop disease, and price in the study area. Different problems were faced by farmers for accessing traditional and modern information like-erratic and unstable power supply, computer illiteracy, operating problem, etc. Out of which erratic and unstable power supply was the most frequent problem for the farmers. The proper training programme is necessary for increasing the use of ICT by KVK, extension agent for the betterment of the farmer's society.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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