Original Research Article

Factors Affecting Utilization of Information and Communication Technology (ICT) in Agricultural Sector- A Case Study in Upper Brahmaputra Valley Zone ofAssam"

ABSTRACT

In a country like India agriculture is the major economic players in economic aspects, which is the great source of revenue is more than 50% of the population of India. The country's economic sector is based on the agricultural activities that play a significant role in the national development. Of late, ICT plays a significant role in the development of agriculture. But the part of agriculture to the economy as well as the economic condition of the farmers is not what they should have been in this era of technology in a state like Assam. The aim of this study is to find the utilization in agricultural sector in the upper Brahmaputra valley Zone of Assam. This paper tries to discuss the factors affecting utilization of ICT tools in agriculture by using Binary Logistics Regression Model. Apart from higher level of education and size of land holding, other factors like age, extension contact and participation in media are found to be negatively influenced in the knowledge of ICT in agriculture among the farmers in the study area.

Keywords: Agriculture Sector, ICT in agriculture, Economic Development.

1. INTRODUCTION:

The world is witnessing structural and transformational change with the advent of digital era. In this digital age, billions of inhabitants of this world have already got and within the coming years most will have access to at least one or more personal digital devices. Today these digital devices also are getting used within the agriculture sector and more specifically in agricultural decision making. Actors in the agricultural value chain can use the information to make well-informed decisions that facilitate effective commerce and production. These producers may make decisions about inputs, goods, and barter with traders, choose which marketplaces to sell to, store their harvests till they grow larger, or even plan for future crops with the aid of such vital information. Additionally, it makes it easier for goods to be spatially distributed across marketplaces and from rural to urban areas, which is a huge help to the population that other technologies have not been able to reach. The Gherkin farmers in Sri Lanka were able to increase their revenues by using basic mobile phone applications that decreased waste by sending information via short message service (SMS). The study discovered that prompt information and communication technology (ICT) interventions could potentially avoid up to 40% of crop loss. In order to help farmers connect sellers and buyers of agricultural commodities, the Kenya Agricultural Commodities Exchange (KACE) introduced the SMS-based information service SokoniSMS64 in 1997. It also offers pertinent and timely marketing

information and intelligence, as well as a transparent and competitive mechanism for determining market value.A research examining the impact of mobile service adoption on grain prices in Niger discovered a 10% reduction in market value dispersion. According to Aker (2010), the survey also discovered that grain traders saw a 29% rise in profit and started trading in more markets after obtaining cell phones.

In India also there are already several government and private sector initiatives that are successfully disseminating information to the farmers on a day to day. Mobile phone coverage alone causes significant market efficiencies and helped fisherman increase profit by 9 per cent and consumer prices declined by 4 per cent (Jensen 2007) in Kerala. The study also found that grain traders began trading in additional markets once that they had cell phones, had more market contacts and their profit increased by 29 per cent. The research by Indian Council of Agricultural Research shows that improving productivity and rural income require an array of enablers within the production cycle which run from crop getting to the ultimate sale of produce. The information needs of the producer vary from one stage to another (Mittal et al.,). The survey also reveals that the worth of mobile is enhanced if many others within the social and economic milieu also are users of mobile.

But in the context of Assam use of ICT is very less with compared to some other states like Tamilnadu, Kerala and Karnatak. Therefore, the present study is an effort to study the factors influencing utilization of ICT in agricultural sector in Assam.

2. OBJECTIVES OF THE STUDY:

The study is designed in the context of following objectives.

(a) Identify the factors affecting utilization of ICT tools in agriculture.

(b) Evaluate the contribution of such factors on utilisation of ICT in agriculture.

3. RESEARCH QUESTIONS

Based on the above objectives the following research question is proposed.

(a) Whether factors like education, age, income, farm size, farming experience, interaction with extension agents, and kind of enterprise have any significant effects on utilization of ICT in agriculture.

4. METHODOLOGY:

The present research is carried out in the Upper Brahmaputra Valley Zone of Assam which is the universe. The study used a multistage sampling technique. In the first stage, four districts—Dibrugarh, Sivasgar, Jorhat, and Golaghatare chosen purposively because of high dependency in agriculture. After conducting a baseline survey, four villages from each chosen district are taken into consideration for primary data collecting in the second step. Ten farmers are chosen at random from

each village. Thus, a total of one hundred sixty samples were collected. For the purpose of collecting primary data, a set of structured questionnaires has been used. For secondary data are Annual Reports of Govt. of India, various reports of Govt. of Assam and other relevant books, journals and offices have been used. Binary regression model is used to measure the influence of different factors in knowledge of ICT in agricultural sector.

5. Results and Discussion

5.(a) Socio-Economic factors and availability and utilization of ICT

Different findings relating to socio-economic factors of the farmers, availability of ICT tools, participation in media and ICT and knowledge can be discussed in the following way:

Table 1

Socio-Economic Factors

Factors	Category	Number of farmers	Percentage of farmers
Age	Below 30	21	13.12
	30 to 40	56	35.00
	40 to 50	44	27.5
	50 and above	39	24.38
Education	Illiterate	26	16.2
	HSLC Passed	40	25.0
	HS Passed	64	40.0
	Graduate & above	30	18.8
Farming Experience	Up to 5 Years	22	13.75
	5 to 10 Years	58	36.25
	10 to 15 Years	36	21.75
	15 to 20 Years	15	9.37
	20 to 25 Years	17	10.62
	25 and above	12	7.5
Land Holding	Below 10	13	8.13
	10 to 15	59	36.87
	15 to 20	54	33.75
	20 to 25	24	15
	25 to 30	10	6.25
Income	Below 5000	**76**	**47.5**
	5000 to 10000	**72**	**45.0**
	10000 and above	**12**	**7.5**

Source: Field survey conducted by researchers in 2023

(i) It is found that 13.12 % of the respondents belong to the age group below 30, 35% of the respondents belonged to age group 30 to 40, 27.5% belonged to age group 40 to 50 and 24.38 % respondents belong to age group of 50 years and above.

(ii) Out of 160 respondents, 16.2 percentage were illiterate, 25 percentage respondents were HSLC passed, 40 percentage were H.S. passed. 18.8 percentage were graduates and above.

(iii)It is found that 13.75 % of the respondents have up to 5 years farming experience where as 36.25 % of farmers have 5 to 10 years of experience, 21.75 % farmers have 10 to 20 years of farming experience, 9.37 % have 15 to 00 years of experience and 10.62 % have 20 to 25 years of farming experience. Only 7.5 % farmers have more than 25 years of farming experience.

(iv)It is found in the study that farmers having less than 10 bighas of land holding are 8.13 per cent. 36.87 per cent respondents have 10 to 15 bighas of land, 33.75 per cent have 15 to 20 bigahs of land, 15 per cent farmers have 20 to 25 bighas of land. Only 6.25 per cent of farmers have 25 to 30 bighas of land.

(v) It was found that 47.5 % of the respondents' monthly income ranges up to Rs. 5000. 45% respondents monthly income ranges from Rs. 5000 to Rs. 10000. The reaming 7.5 % of the respondents' monthly income as above Rs. 10000.

(vi)In the study area it is found that 18.75 % respondents have radio, 10 % have newspaper,79.37 % TV, all farmers have Mobile, and 78.75 % have internet connectivity. No one has subscribed any farm magazine. Although all respondents have mobile phones, 21.25% yet to have internet connectivity.

(vii)It is found 70.625 percentage respondents have knowledge about ICT in agriculture and 29.375 percentage respondents don not have any knowledge about agriculture.

(viii)It is found 65 percentage respondents have utilised ICT tools in agriculture and 35 percentage have never used ICT tools in agriculture.

(ix) It is found that 70 % farmers participated in ICT and mass media, out of this % have 45% have utilized the same.

(x) It is found that 68.12% farmers have extension contact and 31.88% do not have extension contact.

5.(b) Binary logistics regression model

Logistic regression is a statistical analytical technique used to estimate the relationship between the response variable (dependent variable), which has two or more categories, and one or more explanatory variables (independent variables), on a categorical or interval scale. According to Haridanti et al., the logistic regression analysis is a type of regression analysis that is used to explain the relationship between a group of predictor factors and a binary or dichotomous response variable. The response variable is dichotomous qualitative data, where 1 (one) indicates the happening of an event and 0 (zero) indicates its not- happening of the said event. The general form of logistic regression equation model can be expressed as follows:

$$\pi j = P(Y = 1/X) = \frac{e\beta o + \mathrm{B10X11} + \beta 2Xj2 + \cdots + \beta pXjp}{1 + e\beta 0 + \beta 10xj + \beta 22j + \cdots + \beta pXp}$$

The link function used is logit, with the logit of π i.e.

$$\mathrm{logit}(\pi) = log\left(\frac{\pi j}{1 - \pi j}\right) = \beta 0 + \beta 1xj1 + \beta 2xj2 + \cdots \beta pxjj$$

where π is π(y = 1/x1,x2,. . .,xj) and represents the probability that knowledge and utilisation would be affected if the predictor variables x1, x2,. . ., xj are taken into consideration.

The objective of the present research is to establish how binary logistics regression may be used to examine the variables affecting the usage of ICT tools in the agricultural by farmers. The dependent variable in this model is given the value 0 (different socioeconomic conditions do not affect utilisation), and the value 1 (if otherwise) is given. The Enter technique based on the Wald test and the forward stepwise likelihood-ratio (LR) method can both be used to find the statistically not significant parameters and compute the coefficient. In addition, the Hosmer and Lemeshow Test was used to evaluate model fit.

5.b. (i) Logistic Regression Model of Utilisation of ICT in agricultural sector

$$Ln2\frac{Pi}{(1-P)} = \alpha+\beta_1 LnAge+ \beta_2 LnEdu+ \beta_2 LnFarmex+ \beta_4 LnLnh+ \beta_5 LnIncome+ \beta_6 Part+ \beta_7 LnExt+ \beta 8 LnEnter + e$$

Note:

LnY1= Knowledge of ICT of farmers, (1=Yes, 0=No)

LnY2= Utilisation of ICT of farmers, (1=Yes, 0=No)

α= Constant

βi= Regression coefficient (i=1,2,3,…8)

LnAge= Age of the farmers

LnEdu = Educational level of the farmers

LnFarmEx= Farming Experience of the farmers in terms of years

LnLnh= Size of land holdings of the farmers

LnPart= Participation in mass media and ICT by farmers

LnExt= Extension contact by farmers.

LntEnter=Nature of enterprise of the farmers.

e= Disturbance terms

5.b. (ii) Data analysis and software use

IBM SPSS 21.0 software has been used for data processing. In the softwarer, Binary Logistics Regression model is run. Likilihood Ratio Test is also conducted. Apart from these, Hosmer and Lemeshow Test is used to measure the model fit.

5.(b). (iii)Result for utilization of ICT in agricultural sector

Based on the estimated value (B) of each variable in the table. The model can be expressed as

$\pi = \frac{eg(x)}{1+eg(x)}$

with the value of g(x) is

g(x)= 6.270 -.076age -4.022edu(1) -1.242edu(2)+.252edu(3) +.00 farmexp-.003 lanh+.00income—3.554 Parti(1) +.282 Contact(1) .-.734 Enter(1)

Table 2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1(a)	Age	-.076	.044	3.082	1	.079	.926
	Education			9.563	3	.023	
	education(1)	-4.022	1.415	8.083	1	.004	.018
	education(2)	-1.242	.800	2.412	1	.120	.289
	education(3)	.252	.797	.100	1	.752	.777
	Farmxperience	-.002	.049	.000	1	.993	1.000
	Land Holding	.003	.061	.002	1	.961	1.003
	Income	.000	.000	.457	1	.499	1.000
	Participation(1)	-3.554	1.354	6.893	1	.009	.029
	contact(1)	-.282	.566	.247	1	.619	1.325
	entrprise(1)	-.734	.868	.714	1	.398	.480
	Constant	6.270	2.298	7.442	1	.006	528.331

Source: Author's calculation based on the data collected from filed survey.

a Variable(s) entered on step 1: age, education, fexperience, landh, income, participation, contact, enterprise.

Education1: 10th Passed, Education2: 12th Passed, Education3: Graduate and above

The binary logistic regression model depicts that age has no influence on utilization of ICT in agriculture. This finding was similar to the findings obtained by **Muncheberg (2017)**. Similarly, low level of education, farm experience, participation in ICT and change of enterprise have no influence in the utilization of ICT in agricultural sector. The study conducted by **Mwangi M, Kariuki S. (2015)** also found the similar conclusion. Only higher education has a positive influence on the utilization of ICT in agriculture sector. With increase in education utilization of ICT in agriculture sector is found to be increasing. Finding of the present study is similar to the study conducted by **Perumal, G., 2004.** But the findings relating to farming experience, land holdings, participation and extension contact are contradicting to many research findings namely **Patil, N., 2005, Ommani, A. R. etc.** It is found that although most of the farmers have extension contact but they are not using the ICT tools. They have maintained such extension contact to know the

various facilities of government. It is also seen that most of the farmers have ICT tools and they have participated in such ICT tolls but they merely use it for entertainment rather than information.

Table 3

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	96.774(a)	.498	.687

In this model, a likelihood test can be used to determine whether or not the predictor variables have a substantial impact overall. To put it another way, we utilise the likelihood ratio test to assess the viability of the model based on the results of parameter estimation. Under Model Summary, it is found that the -2 Log Likelihood statistics is 96.744. The model summary can provide some approximation of R^2 statistic in logistic regression. Cox and Snell's R^2 attempts to imitate multiple R^2 based on likelihood. The Cox and Snell R2 result shows that the predictor variable accounts for 49.8% of the variation in the dependent variable, which is regarded as adequate.

Model Fit Test

Table 4 :Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	9.322	8	.316

At 5% level of significance and 8 degrees of freedom, Chi-square value is found to be 9.322 and table value is 16.92, which is more than the calculated value. So, we can say the it is a suitable. It means binary logistic model is appropriate.

6. Conclusion

Widespread introduction of awareness programmes among farmers needs to be conducted. Extra attention must be paid to altering attitudes and improving understanding of elderly farmers during campaigns. The farmers have limited awareness and training regarding different mobile application and website to assist the farmer, the State Department of Agriculture, Agricultural University, and KVK should also frequently organise training sessions. Despite being aware of ICT programmes, some farmers chose not utilise ICT tools because they don't think of ICTs positively. By include the successes and endorsements of the benefiting farmers in the advertising campaigns, this issue can be resolved. Efforts should be taken provide adequate infrastructure and farmers participation in the utilsiation of ICT and also to provide up to date knowledge. Public Private Partnership can be a significant aspect in the issue.

It is envisaged that a tool like this smartphone app will be essential in helping farmers cut down on transactional and unnecessary transit costs related to knowledge, negotiating, monitoring, and cooperation. But in order to effectively apply such a comprehensive ICT tool in Assam's agricultural sector and improve the life of rural people, government participation is absolutely necessary.

7. References:

1. Anitha, H., Navyashree, C. (2015). Role of Information Technology in Agricultural Production and Marketing. Adarsh Journal of Management Research, 5(2), 11-16.

2. Aneeja, G. and Shenoy, S., 2004, Information and Communication Technologies (ICTs) for agriculture. *J. Commun. Stud.,* **22** (2) : 18-22.

3. Bhosle, P. B., Jondhale, S. G. and Kadam, R. P., 2008, Effectiveness of farm broadcast in transfer of agricultural technology. Agrotech Publishing Academy, Udaipur, pp. 19-27.

4. D.W. Hosmer, and S. Lemeshow, "Applied Logistic Regression," John Wiley and Sons Inc., New York, 2000.

5. Daisy, O. & Tawanda, H. (2017), An Analysis of the Impact of the Use of Mobile Communication Technologies by Farmers in Zimbabwe. A Case Study of Esoko and EcoFarmer Platforms. *Proceedings of SIG GlobalDevelopment 2015 Pre-ECIS Workshop, Munster, Germany.*

6. Das, D.K., Jain, P.K., & Nath, D. (2016). Adoption behaviour of rice farmers of Tripura towards the system of rice intensification (SRI). *International Journal Agricultural Science, 8*(51), 2194-2197. DOI: 10.9735/0975-3710.

7. Langat, R., Litondo, K. &Ntale, J. (2016), Information Communication Technologies and Marketing Decisions among Small Scale Farmers in Kenya: Review of Evidence, *International Journal of Economics, Commerceand Management* 4(4), 1167-1180.

8. Mwangi M, Kariuki S. (2015), Factors determining adoption of new agricultural technology by small holder farmers in developing countries. Journal of Economics and Sustainable Development. 6(5).

9. Muncheberg (2017). Report on factors affecting innovation, adoption and diffusion processes. SMARTAKIS project, Agricultural University of Athens..

10. Meera, N. S., (2002), A critical analysis of Information Technology in agricultural development: impact and implications. *Ph. D. Thesis,* IARI, New Delhi (India).

11. Momenul, M., Farhana, K. & Rahman, A. (2017), Application of Mobile Phone in Agricultural Marketing in Bangladesh, *Journal of Business and Management* 19(1), 77-82.

12. Okojie, D. &Omoregbee, F. (2012), Determinants of Access and Farmers' Use of Information and Communication Technologies (1CTs) In Edo State, Nigeria. *Journal of Applied Science and Environment Management* 16(1), 41- 44.

13. Patil, N., (2005), A study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad (India).

14. Perumal, G., (2004), The impact of information technology in Indian agriculture. *Asian J. Extn. Edun.,***23 (**1) : 122-128.

15. S. Haridanti, A. Robiatul, S.A. Gita, F.Y.A. Putri, and Z. Ulfa,(2018) "Analysis of Non-Linear Logistic Model" Journal Seminar National Innovation Technology Industries 2018, p. 63, Malang: Institute Teknologi Nasional Malang, 2018.