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Integration of ICT in Agricultural Development: A Study in Chhattisgarh

Dr. Pooja Saxena

Assistant Professor, Department of Management, St.Vincent Pallotti College, Raipur

Abstract

Agriculture is the primary occupation of a large portion of the Indian population and accounts for 18 percent of the country's GDP. However, agricultural productivity in India is much lower than in other countries such as China, Brazil, and the United States. ICT plays an important role in agriculture in terms of increasing agricultural production and sales. The study investigated the use of ICT tools by farmers, and constraints faced by them in using ICT tools. The data was collected using structured questionnaire from 186 respondents and analysed using descriptive statistics, and inferential techniques. The study identified 'mobile phones' as major ICT tools used by most of the farmers in Chhattisgarh for accessing agricultural information. Lack of confidence in operating ICT tool emerged as major constraint among farmers particularly mobile phone applications due to limited exposure to use for their benefit.

Keywords: ICT, Agriculture, Farmers, Agricultural Productivity, Chhattisgarh.

1. Introduction

India is principally an agricultural country. The agriculture sector accounts for about 19.9% of the GDP (Economic survey, 2020-2021) and employs 58% of the total workforce(IBEF, 2021) which highlights the importance of agriculture in developing countries. Agriculture isan important sector, due to dependence of larger proportion of rural population on agriculture (Stienen, Bruinsma&Neuman, 2007), and due to its contribution in rural development, economic growth, poverty reduction, livelihood & food security (Green et al., 2005).India is the world's largest producer of pulses, rice, wheat, spices and spice products(Madhusudhan (2015), and second largest producer of fruits and vegetables (FAO, 2021). Main agricultural produce in India are paddy, wheat, pulses, groundnut, rapeseeds, natural products, vegetables, sugarcane, tea, jute, cotton, tobacco leaves etc. Income of farmers is affected largely by climate variability and market volatility (Swaminathan, 2018). To cope up with the effect of these factors farmers can use information and communication technology (ICT) tools to receive weather forecasts which can help them to plan when to irrigate and when to plant (Rapong'o, 2017).Agriculture systems in India are highly complex and fragmented (Adhiguru&Mruthyunjaya, 2004; Rao, 2006), and farmers need variety of information for the purpose of farming. Extension services, research institutions, and other agricultural organizations provide relevant, reliable and useful information to farmers and help them in taking better decisions and thus create intention to adopt ICT tools on their part.Therefore, development of a strong agricultural system requires robust agricultural information system which facilitates creation, management, storage, retrieval, and dissemination of any relevant data, knowledge, and agricultural information(Bachelor, 2002; Chapman and Slaymaker, 2002; Rao, 2006; Heeks, 2002),

through various ICT tools. Now-a-days farmers are effectively using the wide range of ICT tools and have become dependent to acquire the scientific and technical information for the purpose of farming (Cash, 2001). The information received by the farmers using different ICT tools enables them in proper production planning, adoption of improved cultivation practices, effective post-harvest management and marketing (Bertolini, 2004; Kizilaslan, 2006).Government of India has implemented various programmes for the purpose of agricultural development and ICT tools can act as a media for dissemination of information that can help farmers while farming. Considering the importance and usefulness of ICT Indian farmers have started using it but it is not adopted by all due to different reasons.This paper is an attempt to find out the usage of different ICT tools by Indian farmers in general and farmers of Chhattisgarh in particular. The paper is organised in to following sections: Introduction section is followed by Review of Literature, Objectives, Research Methodology, Data Analysis, Results and Discussion and Conclusions.

2. Review of Literature

The authors have organised the review of literature in to three sub sections: (i) ICT adoption, (ii) ICT use, (iii) barriers.

2.1 ICT Adoption:

Warren *et al.,* (2000) found that age and education level of farmers significantly influences ICT adoption. Farmers belonging to lower age group and higher educational level are more likely to adopt ICT.In an another study Abdullahi et al., (2021) have found positive effects of relative advantage, top management support, complexity and competitive pressure on the ICT adoption in agribusiness organisations, howeverfactors such as cost and vendor support were found to put no significant influence on ICT adoption in agribusiness companies.Wongsim et al., (2018) in their study identified cost of ICT, software, training and education, farmer attitude to the use of IT, and skill development in ICT as critical factors influencing ICT adoption in agriculture.

2.2 ICT Use

Lokeshwari (2016) conducted a study to find out use of ICT among rural farmers in Coimbatore District of Tamilnadu. The study revealed that farmers especially younger ones use ICT to get agriculture information and their attitude towards ICT was found positive. The study also identified certain barriers due to which farmers are not able to use the complete services offered through ICT. Unawareness about various ICT services and lack of proper training to use ICT resources were found as major challenges of adoption of ICT. The majority of the farmers considered the information with respect to 'prices of agricultural commodities' and 'animal husbandry & dairying' as needed information.There are several factors that influence ICT usage among farmers like trust in ICT, lack of training to use ICT (Taragola and Gelb, 2005). Kurtenbach and Thompson(2000)categorize influencing factors in to following categories: "access to IT", "demographic", "IT training /education", "trust", and "time". Further they identified that "infrastructure" and "cost of technology" affect the ICT adoption in developing countries in nascent stage.Further Kumar and K. P. (2015) conducted a study in Kerala and found from their study that education, proficiency affect farmers usage of ICT. Anon (2006) identified that farmers in rural India are using E-Choupal, an ICT intervention, to find out market and procurement prices of agricultural commodities.

2.3 Barriers

Jayathilake et al. (2010) conducted a study to identify ICT adoption among farmers in Sri Lanka. They

found from the study that "cost of technology", "inability to use ICT", and "trust" acted as barrier to adopt ICT among farmers in Sri Lanka. Major constraints faced by farmers in adoption of ICT in agriculture was highlighted by Tey and Brindal in the year 2012 by grouping various factors into several categories i.e., socio-economic, agro-ecological, institutional, informational, farmer perception, behavioural factors and last but not the least technological factors. In an another study Long et al., (2016) propounded the key barriers in the European agricultural context major key findings of the study highlighted that both technology users (farmers) and technology providers face barriers; one among them is market competition faced by technological innovation products face by established products (Costa-Campi et al., 2014). Adding to this non supportivepolicies or administrative systems especially against a radical innovation is major challenge faced by ICT adaptors in agriculture. (Weiss and Bonvillian, 2013).

3. Objectives

The study is conducted considering importance and benefits of ICT tools in farming. The objectives of the study are:

1. To examine the adoption and use of ICT tools by farmers in Chhattisgarh.
2. To identify barriers that prevents effective use of ICT by farmers in Chhattisgarh.

4. Research Methodology

Data for the purpose of the study was collected through Interview method. A structured schedule was constituted after rigorous literature review. Both primary and secondary data was utilized in this study. Primary data was collected through interview method. 186 farmers were sampled randomly from different villages of Chhattisgarh. The authors conducted face to face interviews to collect the data. For collection of secondary data journals, magazines, newspapers, books, etc. were taken into consideration. Data was analyzed using both descriptive and inferential statistical tools using statistical techniques such as such as frequency and percentage analysis.

5. Data Analysis

5.1 Demographics

Table 1 shows demographic profile of the sampled respondents. It is found that majority (62%) of the farmers belong to the age group of "above 45 years", followed by "36-45 years" (19%), "25-35 years" (14%), and "below 25 years" (6%) respectively. With respect to education 45% of the farmers had attended "middle school", followed by "secondary school" (23%), "primary school" (20%), "not completed primary school" (10%), and "graduation" (2%) respectively. Average monthly income of 52% farmers from agricultural produce were "up to Rs. 5,000", followed by "Rs. 6,000-10,000" (27%), "Rs. 11,000-15,000" (16%), and "above Rs. 15,000" (5%) respectively.

Majority (59%) of the sampled respondents were cultivating in "1 -5 acres" of land, followed by "5-10 acres" (22%), "11-15 acres" (12%), and "above 15 acres" (7%) respectively. It was also found that majority (73%) of the farmers were "owners" of the agricultural land, followed by "tenant" (20%), and "owner cum tenant" (7%) respectively. 76% respondents were exclusively involved in agricultural farming only, whereas 24% respondents were not only involved in farming but also in other occupations. Majority (74%) of the respondents had "more than 15 years" farming experience, followed by "11-15 years" (16%), "6-10 years" (6%), and "1-5 years" respectively.

Table 1: Demographic Profile of Respondents			
Particulars	Subgroups	Count	Percentage
Age	Below 25 Years	11	6
	25-35 Years	26	14
	36-45 Years	35	19
	Above 45 Years	115	62
	Total	**186**	**101**
Education	Not Completed Primary School	19	10
	Primary School	37	20
	Middle School	84	45
	Secondary School	43	23
	Graduation	4	2
	Total	**186**	**100**
Average Monthly Income	Up to Rs. 5000	97	52
	Rs. 6000-10000	50	27
	Rs. 11000-15000	30	16
	Above Rs. 15000	9	5
	Total	**186**	**100**
Land Holding(Size in Acre)	01-05 Acres	110	59
	05-10 Acres	41	22
	11-15 Acres	22	12
	Above 15 Acres	13	7
	Total	**186**	**100**
Tenancy Status	Owner	136	73
	Tenant	37	20
	Owner cum Tenant	13	7
	Total	**186**	**100**
Other Occupation	Yes	45	24
	No	141	76
	Total	**186**	**100**
Farming Experience	01-05 Year	7	4
	06-10 Year	11	6
	11-15 year	30	16
	Above 15	138	74
	Total 183	186	100

Source: Survey Data

5.2 Use of ICT Tools

Table 2: Adoption and Use of ICT Tools for Agricultural Information

Sr.	Statements	Number	Percentage	Rank
1	Fellow Farmers	160	86	4
2	Community Radio/AI Radio	166	89	3
3	Television	167	90	2
4	Information kiosk/Common Service Centres	125	67	12
5	Mobile Phones	171	92	1
6	Personal Computers/Laptop	140	75	9
7	internet	141	76	8
8	WhatsApp	140	75	9
9	Facebook	130	70	10
10	YouTube	158	85	5
11	Conference and Workshops	126	68	11
12	E-mail	56	30	15
13	E-Books	87	47	14
14	CD/DVD	112	60	13
14	E-magazine/ E-newspaper	149	80	7
15	Kisan help line	153	82	6

Source: Survey Data

Table 2 showsadoption and use of ICT tools for getting agricultural information of the sampled respondents and respective ranking on the basis of their responses. It is found that majority of the farmers (92%) preferred “mobile phones” to get agricultural information, followed by “television” (90%), “Community Radio/AI Radio” (89%), and “Fellow Farmers ”(86%) respectively. With respect to “YouTube” (85%) of the farmers had considered it followed by “Kisan help line” (82%), “E-magazine/ E-newspaper” (80%), “internet” (76%), and “Personal Computers/Laptop” (75%), “WhatsApp” (75%), “Conference and Workshops” (68%), “Information kiosk/Common Service Centres” (67%), “CD/DVD” (60%), “E-Books” (47%), and “E-mail” (30%) respectively.

Table 3: Barriers in Accessing and Using ICT Tools

Sr.	Statements	Number	Percentage	Rank
1	No network connectivity	93	50	10
2	Weak response from agriculture department	112	60	8
3	Lack of financial resources	141	76	5
4	inadequate Training	86	46	12
5	High illiteracy	130	70	6
6	Poor electricity	149	80	4
7	Do not understand information delivered	67	36	14
8	Format and language problem	117	63	7

9	Lack of confidence in operating ICTs	167	90	2
10	Lack of Agricultural Extension Officers	173	93	1
11	Lack good leadership	56	30	15
12	Lack of seminars, workshops & training programme	160	86	3
13	Lack of agricultural demonstrations	74	40	13
14	Growers get information untimely	99	53	9
15	Unavailability of local information centre	90	48	11

Source: Survey Data

Table 3 showsbarriers in accessing and using ICT tools of the sampled respondents. It is found that majority of the farmers (93%) faced "Lack of Agricultural Extension Officers" as major barrier in accessing and using ICT tools followed by "lack of confidence in operating ICTs" (90%), "Lack of seminars, workshops and training programme" (86%), and "Poor electricity" (80%) respectively. With respect to "Lack of financial resources " (76%) of the farmers had faced difficulty followed by "High illiteracy" (70%), "Format and language problem" (63%), "Weak response from agriculture department" (60%), and "Growers get information untimely" (53%), "No network connectivity " (50%), "Unavailability of local information centre" (48%) respectively however "inadequate Training" covered (46%) of the farmers, followed by "Lack of agricultural demonstrations" (40%), "Do not understand information delivered" (36%), and "Lack good leadership" (30%).

6. Result and Discussion

This study has been conducted to provide empirical as well as theoretical framework to examine the adoption and use of ICT tools by farmers in Chhattisgarh in addition to that researchers have also identified the barriers that prevents effective use of ICT tools by farmers in Chhattisgarh. Use of ICT in agriculture helps in delivery of timely and speedy information to the farmers however authenticity and genuineness of the sources of the information must be verified. For quality service and quick decision making factors like user friendliness, cost effectiveness, ease of handling and universal access creates attractiveness among the users; internet equips the agriculturist with the same. Findings of the study revealed that mobile phones have played crucial role in providing agricultural information to farmers followed by mass communication mediums like television, community radio/AI radio. Apart from traditional mode of communication internet usage and social media sites like Youtube&Whatsapp have also acted as major tools for dissemination of information. However farmers have also taken help of peer farmers and Kisan help lines for gathering information. Findings of this study are consistent with Chavula (2014); and Eucharia et al. (2016).

There are various problems which farmers face while accessingICT tools. Some of the researchers like Singh et al. (2014); Mahant et al. (2012); Radheshyam (2015) in their studies have discussed about the barriers faced by ICT use in agriculture. Lack of infrastructure, leadership, absence of "Agricultural think tanks", and lack of knowledge were some of the major barriers which should be properly taken care off. Earlier researchers Tey and Brindal (2012) have identified various factors that acted as barriers for farmers in accessing and using ICT tools in agriculture and grouped them into several categories i.e., socio-economic, agro-ecological, institutional, informational, farmer perception, behavioral factors and last but not the least technological factors. The findings of this study is consistent with the previous

studies and may fall into the aforesaid categories, results identified that majority of the farmers faced "Lack of Agricultural Extension Officers" as major challenge in accessing and using information sources followed by "lack of confidence in operating ICTs", "Lack of seminars, workshops and training programme" and "Poor electricity" respectively. With respect to "Lack of financial resources " of the farmers had faced difficulty followed by "High illiteracy" , "Format and language problem" , "Weak response from agriculture department" , and "Growers get information untimely" , "No network connectivity " , "Unavailability of local information centre" respectively. Conducting seminars and workshops on regular basis in regional languages will enhance farmer's knowledge on e-agribusiness and will ultimately boost their confidence. Government policies along with strong infrastructure can play an important role in deploying ICT tools in agriculture sector. Agriculture covers major part of Indian economy and in this global competitive world ICT can bring revolutionary changes in Indian agriculture sector.

7. Conclusion

ICT plays significant role in agricultural business beginning from enhancing knowledge of farmers to equip them with the advance technology to increase productivity and to improve efficiency of work. Understanding major factors of ICT adoption and major constraints faced by farmers in accessing information sources will help not only the managers in agri-business to frame proper policies and strategies to overcome barriers but will also help the farmers to inculcate modern business practices. The study makes valuable contribution in identifying major sources of agricultural information and various challenges faced by farmers of Chhattisgarh while accessing sources of information. The study identified 'mobile phones' as major ICT tools used by most of the farmers in Chhattisgarh for accessing agricultural information. Lack of confidence in operating ICT tool emerged as major constraint among farmers particularly mobile phone applications due to limited exposure to use for their benefit.

8. Limitations and Future Research Direction

This study was limited to Chhattisgarh state and sample size was restricted to 186 farmers only. This study will add on to the literature on ICT in agricultural business in Chhattisgarh, which can be leveraged to further study of the Chhattisgarh state at large. Future research can be conducted to explore usage and satisfaction of ICT policy in agriculture. Comparative studies can be conducted among farmers of different districts of Chhattisgarh to understand ICT policy in different districts and its implementation of advanced technologies. Descriptive and inferential statistical tools using statistical techniques such as frequency and percentage analysis was used in this study, advanced statistical tools and techniques like factor analysis and SEM can be used in future studies for identifying the factors and constraints.

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