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Use of information and communication technology (ICT) tools by rural famers in Ratnagiri District of Maharashtra, India

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FACTORS INFLUENCING THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) TOOLS BY THE RURAL FARMERS IN RATNAGIRI DISTRICT OF MAHARASHTRA, INDIA

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ABSTRACT

This study made an attitude assessment of farmers from the rural villages of Ratnagiri district of Maharashtra in the dissemination of agricultural information using Information and Communication technologies. A structured questionnaire and interviews were used to gather information on a number of aspects related to the use of ICT from randomly selected farmers from one Tehsil and key stakeholders (government officials and agricultural industry workers). Two different questionnaires were provided to farmers and key stakeholders. The questionnaire completed by the farmer participants sought general demographic data, education level and information concerning household income and their agricultural activities. Information related to the use of ICT tools in the agricultural sector such as kind of ICT tools, preference of ICT tools, source of getting information, belief on the sources of information, preferences for types of information and the frequency and timings of its delivery. The credibility and applicability of the information that farmers received, the kind of support that was available and their overall expectations from the use of ICT tools was recorded. Key stakeholders were also asked same questions related to demographic data, level of education and the use of ICT tools in the agricultural sector. Additional information concerning their job position, their work experience and what knowledge they required to improve their performance were also recorded. Additionally, stakeholders commented on the challenges that they face when accessing agricultural information and their opinion on improving information delivery. This paper will report on an examination of relationships between the usage of ICT tools and determining factors such as gender, land ownership and technology preference. Findings from this study will be used to develop a framework and system which may more effectively deliver agricultural information and assist farmers to make better decisions about their agricultural activities.

Keywords: Information and Communication Technologies, Farmers, Information Dissemination.

1. INTRODUCTION

Information and Communication have always played a key role in agriculture. Ever since farmers have grown crops, they have searched for ways to improve the crop production. Information plays a vital role in empowering these farmers to improve their livelihoods. Important information such as sowing, improving soils, seeking the best price for their produce and ways to combat pests and diseases all empower the farmer and their decision making capabilities. Farmers have difficulty in searching the answers to such issues even if they are very experienced in the specific cropping regime. Seasonal variability in weather patterns, deterioration in soil conditions and sporadic climatic events such as drought, floods, pest and disease outbreaks complicate the decision making process of the farmers and influences their information requirements. Up-to-date information allows farmers to survive and even benefit from these changes. Providing such knowledge can be challenging as the information must be tailored specifically to distinct conditions. Given these challenges the arrival of Information and Communication Technology (ICT) is well timed. The benefits of ICT to contribute for improving agricultural productivity has been previously proposed (Armstrong *et al.,* 2010, Armstrong *et al.,* 2011, Armstrong *et al.,* 2012a,b). As a result both public and private sectors have long been on the search of effective solutions to address both the long and short term challenges in agriculture including how to answer the abundant information needs of farmers. ICT is one of these solutions that have recently unleashed incredible potential to improve agriculture in developing countries. With the growing mobile, wireless, and Internet industries, ICT has found a position even in poor smallholder farms and in their activities.

Acquiring knowledge from information and making decisions based on that knowledge is the most effective tool for the farmers (Armstrong *et al.,* 2011). However, according to the Situation Assessment Survey of Farmers conducted by NSSO, nearly 60 per cent farmers did not access any information on modern technology from any source at all India level (Aggarwal, 2003). ICT has been shown to have an increasing impact on agricultural sector and on the processes associated with food production (Blurton, 2010). This impact has coincided with great efforts by government and industry in developing countries such as India to improve the sustainability of agricultural systems in order to provide food for an increasing world population and to improve rural livelihoods.

The role of Information and Communication Technologies (ICT) to support agriculture production system has been investigated by many government agencies and university research departments and has proved to play a vital role in the transfer of technology and to share the modern agriculture practices with the farmers. However many of these farmers are not completely utilizing the full potential of the ICT (Jain *et al.*, 2010).

A number of studies have observed that for many rural areas the use of ICT such as personal computers and mobile phones has continued to increase in recent years by agricultural industry stakeholders. (Mwakaje, 2010; Krishna *et al.*, 2005; Kalusopa, 2005). Research by Mokotjo *et al.*, 2009 found that government information services to agriculture industry in Lesotho where good quality in terms of "relevance, sufficiency and currency" in order to improve agricultural production, however they were not easily accessible. This study found that a number of factors hindered the utilization of the service including the failure to visit farmers, wrong broadcasting time, lack of promotion of the service and training of farmers. Similarly, a study of United Kingdom farmers by Warren, 2004 showed that ICT identified research and policy issues outstanding in the field of Internet adoption in agriculture such as broadband rollout, the role of family members and understanding of adoption process. Other studies in Malaysia found that rural leaders use ICT and whether they perceive it to be useful. The study found that "ICT plays an important tool to expose rural community to development" (Hassan *et al.*, 2011). Other factors like language, traditional constraints (Aleke *et al.*, 2011) and political will to ensure adequate ICT infrastructure in the agriculture communities have been found to impact on the effectiveness of adoption of ICT by agribusiness (Aleke *et al.*, 2011). Studies in Benin found that the information delivered through hands on workshops by local NGOs was less effective compared to the effect of using farmer to farmer video training. The information distributed by this means proved to reach three times more woman rice farmers (Zossou *et al.*, 2009). Other recent studies have also showed positive attitude in the applied areas of video conferencing technology, viz. training, distance learning and agricultural communication and extension management and have perceived the benefits of using video conferencing by agriculture industry graduates (Meena *et al.*, 2012). The objective of this study was therefore to firstly ascertain empirical evidence of the impact of ICT on agricultural information access, and the adoption of new farming technologies by rural farmers in Ratnagiri District. Secondly, to examine specific factors influencing the use of Information and Communication Technology tools by rural farmers of the district.

2. BACKGROUND

The study was conducted in one of the 9 Tehsils (villages) of Ratnagiri District in state of Maharastra, India. The district was considered representative of the state's agricultural sector (Konkan.org 2012).

2.1 Study Area

Ratnagiri district is bordered by the Sahyadri Hills on the East and Arabian Sea on the West. It is located in the south-western part of Maharashtra state on the Arabian Sea coast of India. It is situated between north Latitude 17° and east Longitude 73°19′. It is the portion of the larger band known as Konkan. The district is 8,208 sq. km geographically. It has coastline of 237 km. Ratnagiri is the district headquarters. Ratnagiri district has nine tehsils; Mandangad, Dapoli, Khed, Chiplun, Guhagar, Sangameshwar, Ratnagiri, Lanja and Rajapur. Shastri, Bor, Muchkundi and Kajali are the main rivers in Ratnagiri. The principle farming of the region consists of rice, especially in the talukas of Khed, Chiplul, Sangameshwar, Rajapur and Ratnnagiri. The eastern parts grow nachani and yari. The Ratnagri district has coastal climate with a monsoonal rainfall pattern (Anon, 2012).

2.2 Methodology

Primary data collection was carried out using a structured questionnaire from a randomly selected group of farmers from one of the nine tehsils in the Ratnagiri district during the period from July to September 2011. The number of participants was 100 farmers. Interviews were used to gather information on a number of aspects related to use of ICT. Each participant was asked to sign a consent letter and informed that there responses are treated with anonymity. Two different questionnaires were provided to farmers and key stakeholders. The farmer based questionnaire sought general demographic data, education level and information concerning household income and their agricultural activities. Information related to the use of ICT tools in the agricultural sector such as kind of ICT tools, preference of ICT tools, source of getting information, belief on the sources of information, preferences for types of information and the frequency and timings of its delivery. The credibility and applicability of the information that farmers received, the kind of support that was available and their overall expectations from the use of ICT tools was recorded.

For the study a focus group meeting with regional and district officials, policy makers, ICT service providers, NGOs, key informants and other relevant stakeholders was also carried out. This group was provided with semi-structured questionnaires and checklists and their responses were analysed. Key stakeholders were also asked same questions related

to demographic data, level of education and the use of ICT tools in the agricultural sector. Additional information concerning their job position, their work experience and what knowledge they required to improve their performance were also recorded. Additionally, stakeholders commented on the challenges that they face when accessing agricultural information and their opinion on improving information delivery.

Data was analysed using standard statistical tests and Pearson's Chi squared analysis correlation analysis using Microsoft Excel. In addition to primary data collection, secondary data were collected from the literature review and document that were obtained from different sources including the Ministry of Livestock Development, Ministry of Agriculture and Food Security, Academic institutions, Ratnagiri District. Information on ICT services were also collected from service providers, traders, organizations and NGOs.

3. RESULTS AND DISCUSSION

3.1 Characteristics of Sampled Farmers

Of the total sample of 100 participants, 79% were male and 21% were female. Agewise majority of the respondents were between 21–45 years (60.5%), followed by those between 46–60 years (34%) and for 60 years (22%), (Table 1) No. respondents between 14–20 years could be explained by the fact that this category must be pursuing primary education.

Table 1: Mean and Standard Deviation of Farmers in Different Age Groups

Age	*Mean*	*Std. Dev*
Age Group 21–40	7	8.14
Age Group 41–60	13.88	14.63
Age Group above 60	8.25	8.73

Table 2: Mean and Standard Deviation of Farmers with Different Educational Qualification

Qualification	*Mean*	*Std. Dev*
Primary High School	11.13	13.55
SSC-HSC	10.00	10.62
Bachelor-Masters	2.38	1.85
No Education	4.00	3.93

Regarding education levels, it was found that 81% of farmers were found literate. Most of the respondents had completed primary education (25%), High School (19%), S.S.C (25%), H.S.C (7%). Very low number of respondents had completed higher education including Bachelor Degree (4%) and Master Degree (1%), (Table 2). Over 95% of the respondents were found to be married with the remaining 5% not married. In terms of number of members in each family; most of the respondents had more than 5 members in family (44%), followed by 5 members (25%), 4 members (22%) and less than 4 members (9%). Regarding the economic activities it was reported that (91%) of the farmers in the sample are growing rice, nachani (19%), mango (16%), coconut (14%), cashew nut (12%) and also other crops like chickoo, vari, bananas, beans, lemon and vegetables. It was also reported that many farmers keep livestock like cattle (52%) and poultry (19%). In terms of farmer's land holdings, most of the respondents own or lease 4 acres or less (*i.e.* 89%) and only few farmers have greater than 4 acres land (*i.e.* 11%). The majority of farmers own their own land (87%) while others rent (9%) or have a combination of own and rental (4%). With respect to their income levels, majority of the respondents had earnings of 3000 ₹ per month (51%). For the remaining respondents it was found that for earnings of 3001–5000 ₹ (21%), 5000–8000 ₹ (9%), 8000–10000 ₹ (9%), 10000–15000 ₹ (3%), 15000–25000 ₹ (4%) and more than 25000 ₹ (3%) was reported, Table 3. This fact proves that most of the farmers are not earning sustainable levels of income using traditional techniques. All the farmers were found to use fertilizers, either from that which they produce (83%) or provided by government (39%).

In terms of usage of ICT services it was found that most of the farmers had access to them through which they could get information related to agriculture. Many mobile phone networks like BSNL, Airtel, Vodafone, Tata Docomo were available in the study area. It was found that 71% are having their own mobile phones; television was watched in 72% houses. The remaining respondents reported as also having access to home phone (25%), computer (8%), radio (9%), CD/DVD (5%). It was also found that 13% of the farmers did not have any access to ICT services.

Table 3: Mean and Standard Deviation of Farmers in Different Income Range

Income	*Mean*	*Std. Dev*
Income less than 5000	17.13	19.19
Income in the range 5000–10000	6.25	6.02
Income in the range 10000–20000	5.75	3.45
Income more than 20000	3.25	1.58

The major sources of agricultural information for the farmers were mainly neighbours, fellow farmers (97%), government officers (94%), extension workers (29%), newspaper (68%), related websites (4%) and magazines (2%). In terms of the perceptions as to whether farmers thought the information they received about farming as being credible; it was found that they preferred using government officers while gathering agricultural information (*i.e.* 94%),followed by their fellow farmers or neighbours (89%) and newspapers (73%). In terms of information required the majority of farmers reported that they wanted information related to the use of insecticides (92%) and the use of fertilizers (91%) respectively. Other information requested included weather forecasts (67%), market prices (32%), organic farming (26%), soil improvement and testing (14%), pest management (11%) and financial management (8%).

3.2 Interactions between Cofactors

3.2.1 *Correlation between Gender and Usage of ICT Tools*

The relationship between use of ICT tools and gender was found not to be significant based on Pearson's Chi Squared analysis (Chi squared = 7.3, at 0.05 level). Much larger percentage male farmers in the survey could explain this. However there is some trends showing that female farmers were more likely to use no tools (14% compared to male farmers (4%) (Figure 1).

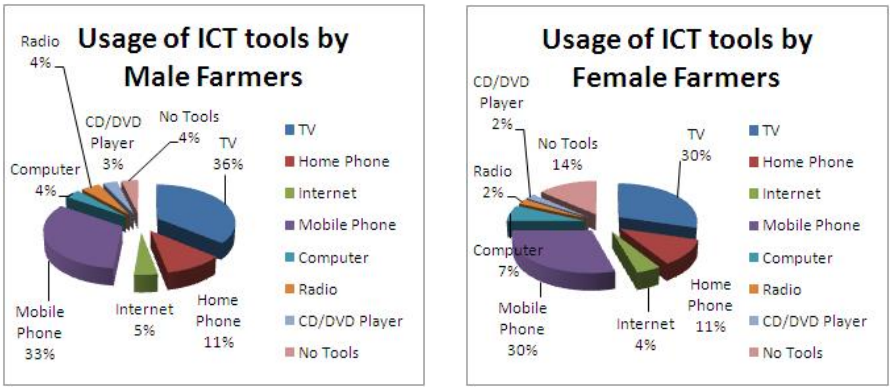

Fig. 1: The Use of ICT Tools Based on Gender

3.2.2 *Correlation between Land Ownership and Usage of ICT Tools*

The relationship between use of ICT tools and land ownership was found not to be significant based on Pearson's Chi Squared analysis (Chi squared = 7.2, at 0.05 level) (Figure 2). This may have been the result of the large percentage of

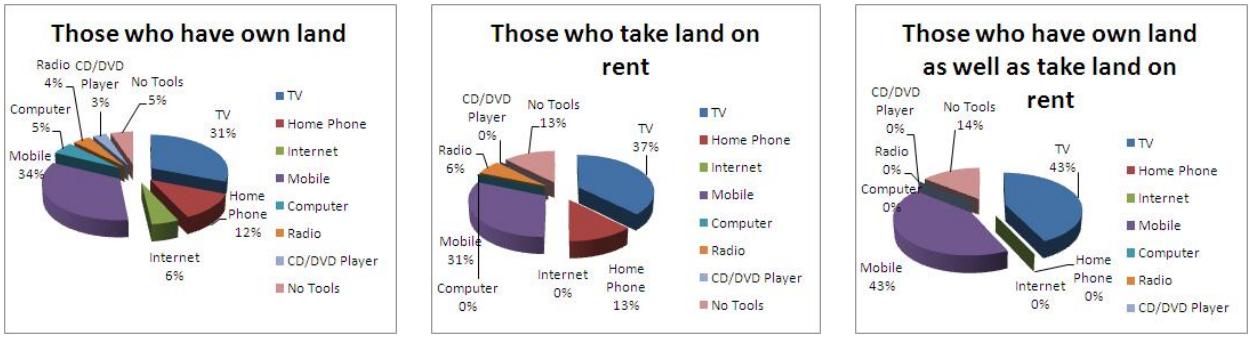

Fig. 2: The Use of ICT Tools Based on Land Ownership

farmers that owned their land compared. However it is those that owned their own land were more likely to use Internet and less likely to use no tools, This would suggest that the main factor to determine whether the farmers can access ICT tools is related to how much income they may have and land ownership would allow for great propensity to earn greater income to use for such purchases of ICT tools.

3.2.3 *Correlation between Preference of ICT Tool and Usage of ICT Tool*

An examination of the relationship between preference to use ICT tools and the actual usage of these tools is displayed in Figure 3. It was found that 87% of the respondents are having their own (one or more) ICT tool with 13% of the respondents not having any ICT tool and thereby not using these for their agricultural practices. However, it was evident that the farmers in low scale except for TV and mobile phone are currently using all the ICT tools. However, famers differed in their actual preference for some of the other tools such as Internet and use of computer.

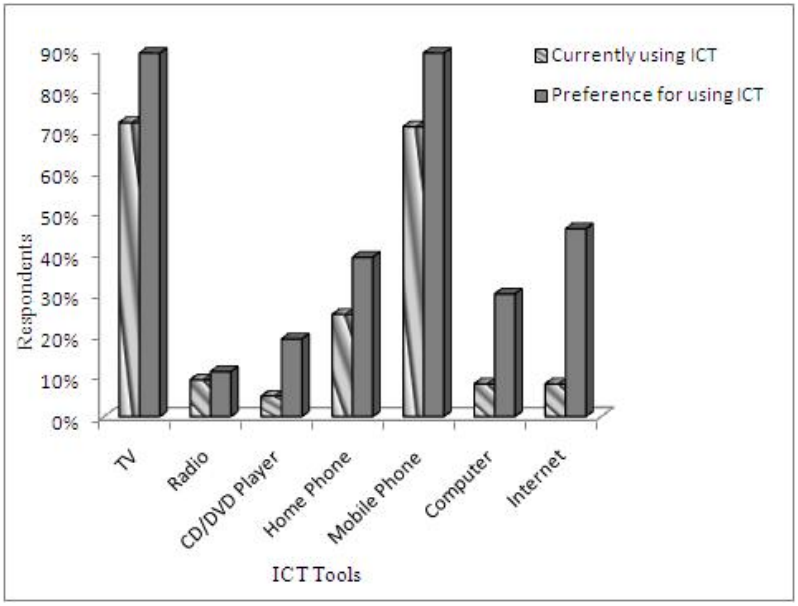

Fig. 3: Preference of ICT tool with Respect to Usage of ICT Tool

4. DISCUSSION AND CONCLUSION

The use of ICT tools in agriculture sector for rural farmers while emerging as a potential for improving the livelihoods of farmers is still not been adopted fully by all farmers in the Ratnagiri district. However, results from this case reported earlier (Armstrong *et al.,* 2012b) and this paper's results show that there is an immense opportunity to enhance the broadcasting of agricultural information that farmers receives from government officers, fellow farmers and relatives. Most of the farmers were found to use TV and mobile phone to collect agricultural information, which suggests that farmers are better equipped to access agricultural information and implement better practices to improve agricultural production. This ultimately has a positive impact on the agricultural production at a regional level. The study suggested that a number of factors are constraining the spread of ICT technology, which include the gap between the currently used technology and the technology preference. Other factors such as gender and land ownership did not significantly affect the use of ICT tools. Hence, we can conclude that effective use of technology is a necessary prerequisite for the successful use of ICT by the farmers. Providing these facilities in regional languages through innovative production of affordable but efficient ICT would enhance their use by rural farmers (Armstrong *et al.*, 2012b). Strengthening and motivating farmers' groups to use the technologies such as internet, home phone is important to facilitate access for ICT facilities. The government should promote private and community provision of broadcasting services through widening access to internet and establishing training centres so that they can effectively play this intermediary role. IT education to the farmers and establishing IT based information centres in rural areas could boost access to market information.

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