Extension Research

Impact of Information and Communication Technology on Agricultural Sector in Karnataka: A Case Study of Hassan District

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Abstract

Agriculture sector is considered to be the most predominant sector of Indian economy. From the last few decades of research, extension and farmers efforts have all contributed significantly to enhancing food production from 50 million tonnes in 1950-51to a land mark achievement of an estimated 265.04 million tonnes in 2014-15. The total demand for food production is estimated to reach 280 million tonnes by the year 2020 -21. Meeting this demand necessitates a growth rate of nearly 2 percent per annum in food grain production and the agriculture sector has to grow at a minimum targeted four percent per annum.. Given the challenges, the arrival of Information Communication Technology (ICT) is well timed. The benefits of the green revolution greatly improved agricultural productivity. Importance of ICT in the process of agriculture and economic development of India and to improve the farmer's knowledge and crop yield is recognised. At present, a network of ICAR Institutes, State Agricultural Universities, Krishi Vigyan Kendras and Kissan Call Centres are spread across the country are responsible for developing, refining and disseminating innovative and latest technologies to reach the farmers. This study is based on a primary survey of 400 farmers belonging to four taluks of Hassan district of Karnataka. An enumerator- based questionnaire was used to collect information. The interview method was adopted to collect data from farmers who were involved in farming activities. According to the sample size determination method sample size is 384, but study has taken 400 samples for data collection to reduce some error values. The data is analysed using SPSS 20.0 and Excel. Along with simple table and charts, independent t-test is used to identify the differences between ICT users and non ICT users in the returns of agricultural commodities of paddy, maize, and potato.

Keywords : Information, Technology, Users, Agriculture, Farmers, Knowledge, ICT

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INTRODUCTION

Agriculture sector is considered to be the most predominant sector of Indian economy. "From last few decades' research, extension and farmers efforts have all contributed significantly in enhancing food production from 50 million tons in 1950-51to a land mark achievement of an estimated 265.04 million tons in 2014-15" (India 2016). The total demand for food production is estimated to reach 280 million tons by the year 2020-21. "Meeting this demand necessitates a growth rate of nearly 2 percent per annum in food grain production" (Singh 2011) and the agriculture sector has to grow at a minimum targeted four percent per annum. Approaching paper on the India's 12th five year plan (2012-17) states that the "weakness in the economic performance thus far is that growth in the farm sector" and the average annual growth rates of GDP in agriculture and allied sectors during the 11th plan period (2007-12) was 3.3 percent (GoI, 2013). So, there is a quick need of vibrant, innovative and dynamic approach to be adopted for agricultural development in order to serve farmers better and achieve target rate. Further, land and water resources are almost reaching their limits; hence, achieving food security heavily relies on "Knowledge Resource." Therefore, ICT dissemination of adequate and accurate information is very essential to sustain agriculture.

Information and Communication Technology (ICT) consists of three main technologies, namely, Computer Technology, Communication Technology and Information Management Technology. These technologies are applied for processing, exchanging and managing data, information and knowledge. ICT is technology that supports activities involving information such as gathering, processing, storing and presenting data. Increasingly, these activities are collaboratative and communicative. Hence, IT has become ICT integrating Information and Communication Technology. ICT is a field of work and study that "Includes technologies such as desktop and laptop computers, software, peripherals, and connections to the internet that are intended to fulfill information processing communications functions"(Statistics Canada,2008).

Information and communication technologies facilitate the processing and transfer of information, i.e. communication by electronic means. ICT generally links Information processing devices like computers with telecommunication technologies like telephones, wired or wireless networks. ICT is a range of electronic technologies which when converged in new configurations are flexible, adaptable, enabling and capable of transforming organizations and redefining social relations. “The range of technologies is increasing all the time and there is a convergence between the new technologies and conventional media” **(**Michiels and Van Crowder, 2001**).**

Regarding special features are concerned, speed is one of them that has bridged the infinite distance. ICT is an astounding storehouse of information, which enhances the knowledge of people and disseminates innovations to the people. ICT intervention in agriculture indicates the diffusion of innovations to farmers widening horizon of knowledge of farmers. The technology of virtual reality is helping areas of research in certain disciplines. The information is available instantaneously covering the information void in the rural areas, which were not privy to relevant information. Interactive technology provides space for farmers prioritizing participation. ICT has changed the dynamics of human communication causing paradigm shift in extension education.

Improving Information Availability and Delivery of Services’ for sustainable agricultural growth and livelihood are the main aims of providing ICT services to the farming community. The well accessed information by the ICT is presumed to increase productivity thereby increasing sustainability of agriculture. The importance of ICTs application is based on following factors:

- Improved information access and delivery of services to the farming community;
- Improved productivity and profitability of farmers through better advisory systems;
- Efficient and Increased utilization of information by stakeholders for their decision making;
- Faster and efficient redressal of farmers’ grievances;
- Better monitoring of government schemes, which directly impact the farmers;
- Improved transparency and accountability;
- Direct feedback from farming community to the decision makers in the state;

- Efficient management (Development, Conservation, Allocation and Utilisation) of resources

ICT can affect agricultural sector in five significant ways:

- Raise long-term growth potential through increased productivity and resultant improvement in overall individual competitiveness. The competiveness is increased by exchange of firsthand information from one farmer to other wherein, the knowledge on crop cultivation and cropping pattern increases, which may result in better yield.
- Create employment opportunities (both high skilled and low skilled). This not only helps in exchange of information but also improves the skills of farmer towards adapting to new crops and allied activities. This also generates employment; the government operated *Raitha Samparka Kendra*, *Kissan* Call Centre and other information kiosks manned by personnel who provide employment opportunity and links unskilled, low skilled and skilled under one umbrella.
- Spread education and literacy. The literacy is not literacy in mere sense of reading and writing; literacy refers to enhanced knowledge and awareness of new things and technology. The ICT brings in new information and thereby educates farmers on new inventions and innovations in the field.
- Provide universal information services. For example, a farmer in a remote village of India can connect with a farmer in a remote village in China. Thanks to technology, that has made this possible. This paves way for universalisation of knowledge.
- Deliver e-Governance (leading to transparency and better accountability). Of late, all agricultural data and information are digitised. This provides free access to these e-resources from anywhere and at any point of time. This has in a way brought in checks and balances in the system creating transparency. Going by one example of 'FORTNET' a national government website, which gives detailed information on fertilizer supply to each state and to the respective district. This definitely increases transparency and brings in accountability.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The theoretical conceptualisation of technology in economics can be traced back to neoclassical who considered technology to be an exogenous variable to the economic system and this is formally modeled by Solow in the year 1956. They considered technology to be an exogenous variable to the economic system. However, later economists like Kenneth Arrow, Paul Romar considered technology as an endogenous factor into the growth process and formulated a new set of theories called New Growth Theories. From 1984 onwards lot of research has been done on this topic and the Noble Prize for the year 2001 was awarded to the research on ‘asymmetric information’. Many of the central theories and principles of economics are based on assumptions about perfect information. Starting from Adam Smith many economists have laid emphasis on the subject either directly or indirectly. Economists like Schumpeter, Kenneth J Arrow, Fredrick Von Hayek, George A Akerlof, Michael A Spence, and Josesph E Stigtliz have made notable contribution to this subject.

Access to right information and its proper utilisation for the farming community is the order of the day which needs to be practiced says Mahapatra (2012), in the work entitled, "Role of Information in Agricultural Development of Odisha" which aims to discuss information needs of various stakeholders in agricultural sector in developing states like Odisha. The role of information technology to develop agricultural research, education and extension to improve quality of life in rural area is well established which requires facilitating farmers in improving the efficiency and productivity of agriculture and allied activities. The potential of IT lies in bringing about an overall qualitative improvement in life by providing timely and quality information inputs for decision making suggests, Pinjar et. al., (2012), in their work entitled, "Information technology in agriculture development - Need and scope”, the need for narrowing down the enormous gap between the researchers and farmers is highlighted. Stressing upon the same fact that, on winning the confidence of the poor farmers and make them aware of the benefits of ICT in agriculture Deepak Kumar (2005), in his work entitled "information and communication technology in Indian agriculture,” argues that, Indian agriculture sector is leveraging the information and communication technologies to disseminate the right information at the right time. The cost factor in face-to-face information dissemination and the difficulties in reaching the target audience have necessitated the introduction of ICT in agriculture.

OBJECTIVES

The present study forms part of agricultural economics by emphasising the primary sector growth and development. Services and facilities available for farmers to become efficient and smart to enhance their agriculture production particularly. Information and Communication

Technology is of utmost importance, which determines the effectiveness and utilization of services and facilities to improve both farmer and nation at macro and micro level. In particular, the agricultural production of the nations and farmers cultivation method and knowledge depends on innovation technology as well as information technology. Thereby, Information and Communication Technology is a very important variable in determining agricultural production and farmers' efficiency in farming activities. So present study focuses on how ICT is emphasised in agriculture sector to create awareness and influence the farmers.

- To compare the agricultural returns of ICT users and non ICT users.

Hypothesis for the Study

H_1 There is significant difference in the agricultural returns of ICT users and non-ICT users.

METHODOLOGY

The study was carried out in Hassan district of Karnataka state. Four taluks viz. Arkalgud, Holenarasipura, Hassan and Belur were selected for the study. In each taluk 100 respondents were selected based on simple random sampling method. Totally, the sample includes 400 small and marginal farmers. This study mainly focuses on the farmers cultivating Maize, Paddy and Potato. Keeping in view the objectives of the study survey method was found appropriate for this study. Structured questionnaire was used as a tool of data collection. The questionnaire included questions on socio economic demographic profile besides measuring the impact of ICT before and after adoption of ICT. Collected data was tabulated using SPSS and analyzed accordingly. The data is analysed using SPSS 20.0 and Excel. Along with simple table and charts, statistical and economic techniques used to test the hypothesis. Independent t-test used to identify the difference between ICT users and non-ICT users based on income of farmers from growing crops of paddy, maize, and potato.

ANALYSIS

Demographic Profile of the Respondents

Table 1.1: Caste Representation of the Respondents

Caste	No. of Respondents	Percent (%)

SC	61	15.2
ST	49	12.2
OBC	274	68.5
GM	16	4.0
Total	**400**	**100.0**

As in Table-1.1, 68.2 percent of the respondent farmers belong to OBC category while 15.2 percent to SC category. Respondents from ST category constitute 12.2 percent and 4.0 percent belong to general category.

Table 1.2: Age Group of the Respondents

Age	No. of Respondents	Percent
20-30	16	4.0
31-40	88	22.0
41-50	142	35.5
51-60	87	21.8
61>	67	16.8
Total	400	100.0

Regarding the age group of respondents¸ it is observed from Table-1.2 that the highest (35.5) percent of respondents are in the age group of 41 - 50 years followed by 22 percent in the age group of 31 - 40 years. Over 21.8 percent of respondents are in the age group of 51 to 60 years and 16.8 percent of respondents are 61 years and above.

Table 1.3 : Education Status of the Respondents

Education	No. of Respondents	Percent (%)
Illiterate	98	24.5
Primary	116	29.0
High School	108	27.0
PUC	58	14.5
Degree	9	2.2
PG	8	2.0
Others	3	.8
Total	400	100.0

Furthermore, on the academic aspect, it is observed from Table-1.3 that farmers are less educated and the highest of them (29 percent) have studied up to primary education followed by 27 percent of respondents have studied higher primary. The third largest group are illiterates (24.5 percent). First level of College education has been completed by 14.5 percent of respondent farmers. Cumulatively only about five percent of respondents are graduates indicating the low education profile of the sample.

Table 1.4 : Annual Income Level of the Respondents

Income in Rs	No. of Respondents	Percent (%)
<25000	44	11.0
25001-50000	150	37.5
50001-100000	136	34.0
100001-500000	70	17.5
Total	400	100.0

The data on annual income of the respondents is provided in table 1.4. The figures include sum total of income of all the earning members in the family. Accordingly, 37.5 percent of the respondents acknowledged that their total annual earning is less than Rs 50,000 followed by 34 percent of respondents in income bracket between Rs 50,000 to Rs 100,000 annually. About 18 percent of respondents are in the family income category between one lakh to 1.5 lakhs annually. Over 11.0 percent have an income less than Rs.25,000 indicating low income profile of the farmers.

Usage and Utilization of ICT

This section describes the views of the respondents about the usage of ICT which is critical for the present study. Firstly, when asked whether they are using ICT in agriculture, it is observed from Fig 1.1 that 67 percent of the respondents were not using the ICT in agriculture while only one third (33 percent) of the respondents use ICT in agriculture. This clearly indicates that many respondents are not familiar or not aware of usage of ICT in agriculture.

Fig 1.1: Usage of ICT in Agriculture

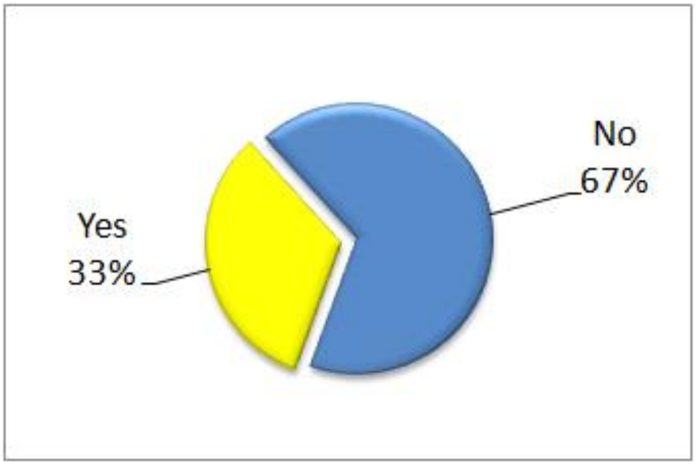
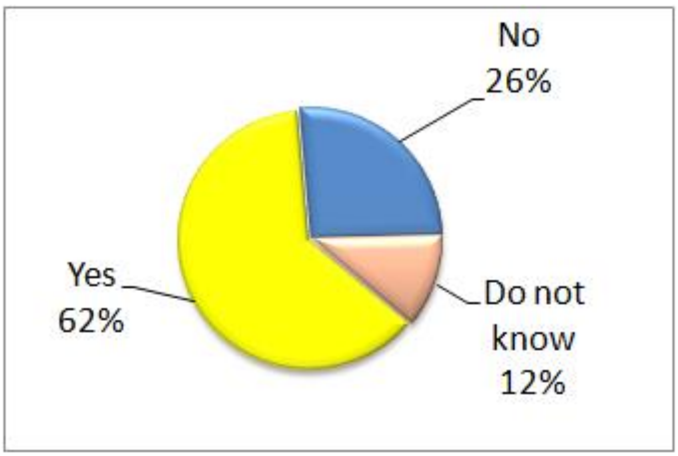


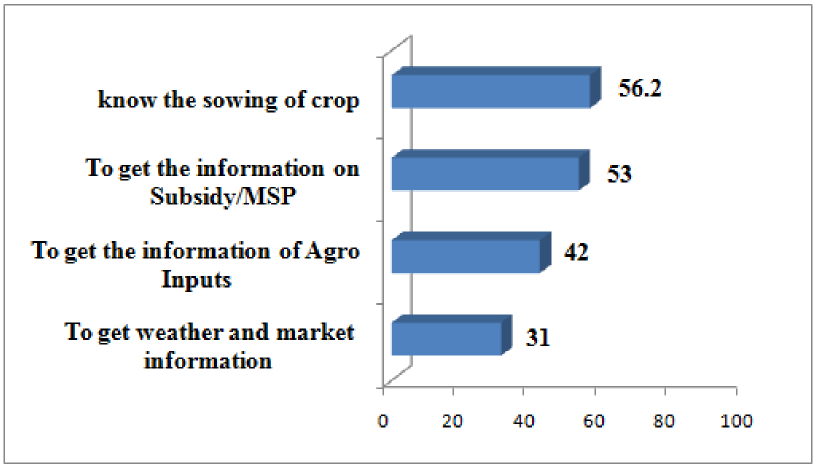
Fig 1.2: Is ICT Necessary for Agriculture



Data N = 400

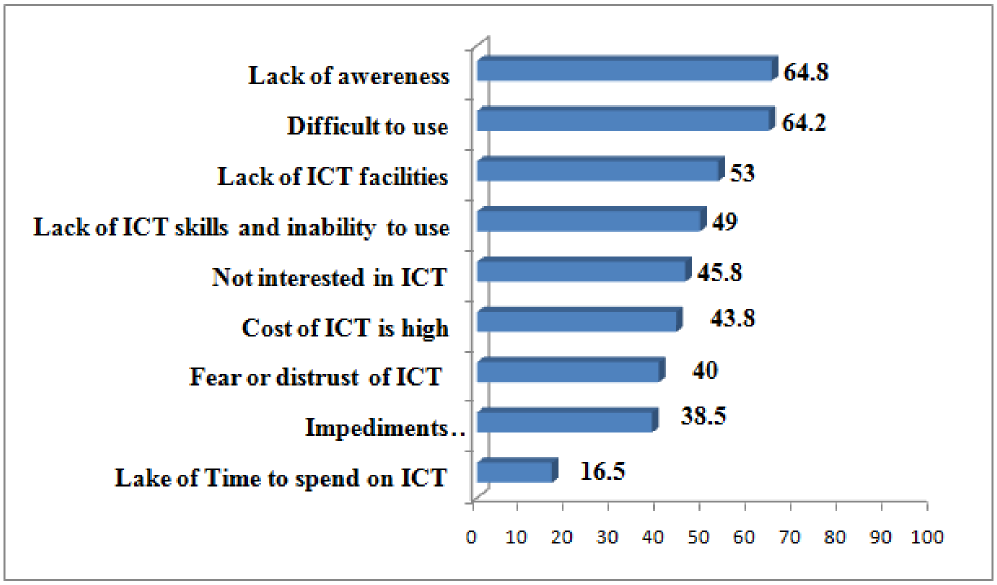
Further, when asked on whether ICT is necessary for agriculture activities, 62 percent (Fig: 1.2) replied affirmatively that it is indeed essential while nearly one fourth (26 percent) of them categorically rejected usage of ICT as a necessity for agriculture. Nearly 12 percent of respondents were unable to make a decision.

Fig: 1.3 : Purpose of Adopting ICT in Agriculture



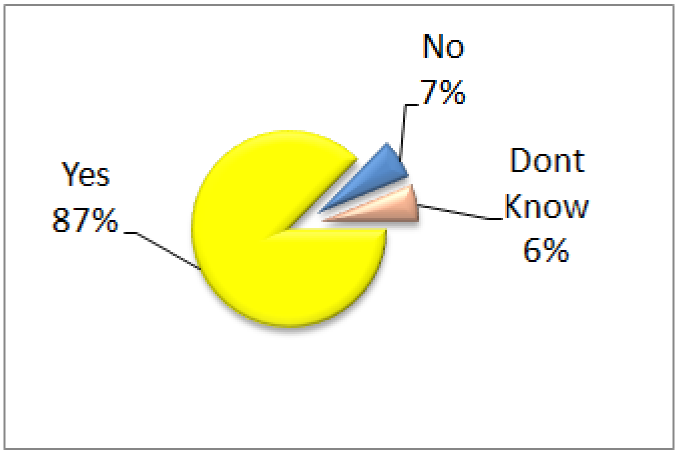
The query about the purpose of adopting the ICT tools in agriculture was posed to those respondents using ICT tools for agriculture purpose. Accordingly, 56.2 percent (Chart 1.3) of the respondents stated that they use ICT tools to know the method of sowing crops scientifically and another 53 percent of the respondents were keen to get information on subsidy/MSP about the agricultural products. Likewise, 42 percent of the respondents stated that they use ICT tools exclusively for getting information regarding the correct agro inputs for cultivation and another 31 percent of the respondents disclosed that they seek the help of ICT tools for weather and market updates and so on.

Fig; 1. 4: Reasons for Not Adopting the ICT in Agriculture



On the contrary, when asked the reasons to those respondents not interested in using ICT Tools in agriculture, a few reasons were provided and the same is depicted in Fig; 1.4. Accordingly, the primary reason in case of 64.8 percent (see Fig; 1.4) of the respondents is the lack of awareness regarding the ICT technology. Similarly, other reasons included were difficulty in using the technology (64.2 percent), Lack of ICT facilities (53 percent), Lack of ICT skill and inability to use (49 percent), Not interested in ICT (45.8 percent), Cost of ICT is high (43.8 percent), Fear or distrust of ICT (38.5 percent), Impediments like age, knowledge, language etc. (38.5 percent) and lack of time to spend on learning ICT tools (16.5 percent). All these reasons have led them to become pessimistic about ICT tools.

Fig: 1.5: ICT Help for Increasing Agricultural Production



Finally, answering to the query on whether ICT has really helped in increasing the agriculture production, it is observed from Fig; 1.5 that an overwhelming 87 percent of the respondents agree that ICT tools are really helping them in increasing their agricultural productive while only seven percent of them giving a negative opinion about the usefulness of ICT tools in agriculture and another six percent failed to provide any opinion regarding the helpfulness of the ICT tools in agriculture.

Hypothesis Testing:

Following hypothesis was tested using appropriate techniques and results are accordingly interpreted.

Independent t-test is used to identify the difference between ICT users and non ICT users in the returns of agricultural commodities of paddy, maize, and potato.

Here the study considers the difference between ICT users and non ICT users; ICT users are those respondents who are using ICT tools like TV, Radio and Mobile phones to get agriculture related information and; Non ICT users are those respondents who are not using any ICT tools like TV, Radio and Mobile phones to receive agricultural information.

The returns earned by the respondents in this context means the net income earned by them subtracting the expenditure considering only three commodities which are paddy, maize and potato. The returns are considered per acre of land.

H_0; There is no significant difference in the total agricultural returns of ICT users and non-ICT users.

Independent t-test[1] result:

Table 1: Independent t- test Result

Variable	N		Mean	SD	T-value	P-value
Agricultural Returns (in Rs)	ICT user	131	105561	31743.7	10.324	0.000*
	Non ICT user	269	78224	20863.7		

*** Significant at 5 % level.**

[1]The independent t-test, also called the two sample t-test, independent-samples t-test, is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups.

Independent t-test result in Table -1 indicates that as the p-value (0.000) is less than the significance level of 0.01(at 99% confidence level) the null hypothesis is rejected. In other words, we conclude that there is a significant difference in mean total agriculture returns of those respondents using ICT tools and not using the ICT tools for agricultural purposes. In essence, there is a statistical evidence to conclude that farmers adopting ICT in agricultural related activities are earning more than those sample farmers not using ICT tools. This is evident from the fact that the mean agricultural returns of farmers using ICT tools is Rs. 1,05,561 which is higher than the mean returns Rs. 78,224 of non ICT usage farmers in sample study.

CONCLUSION

The study comes out with clear output that, the use of ICT in agriculture is beneficial and have resulted in increased income for small and marginal farmers. The researchers are of the opinion that, more publicity materials should be brought out to create the awareness on the uses and benefits of ICT. Government should come up with a policy frame work exclusively for ICT use in agriculture. This will help in strengthening the working of ICT and also benefit more number of small and marginal farmers as exclusive programs focusing on agriculture can be formulated. In addition, ICT kiosks can be established for easy and speedy redressal of agriculture and related quires so that we can walk in the path of sustainable development. Since, ICT believes in participatory approach the more the use the more it will empower. The whole idea is to develop better visioning and empowering the farmers with latest technology and farming practices through the ICT.

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