Vanya Vartika Ram *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.7 Issue.8, August-2020, pg. 13-32 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

Effect of ICT Tools on the Knowledge and Attitude of Farmers Bilaspur District of CHHATTISGARH

Vanya Vartika Ram[1]*; Awantika Rai[2]; Jahanara[1]
[1]Department of Agricultural Extension & Communication, Sam Higginbottom Institute of Agricultural Technology & Sciences, Prayagraj (UP)
[2]Department of Agricultural Extension & Communication, Sam Higginbottom Institute of Agriculture Technology & Sciences, Prayagraj (UP)
*Corresponding Author E-mail Id.: reaamram1210@gmail.com

Abstract: A semi structured Questionnaire based field survey was conduct to access the knowledge and attitude of farmers using ICT tools in the randomly selected blocks of Bilaspur district of Chhattisgarh .This previous study was performed on the respondents on different age group education status, factors and other characteristics that information on INM, IPM, weather and crop insurance in their different blocks of Bilaspur district of Chhattisgarh
The current data conclude requirement of enhanced literacy rate social awareness and educated youth of early twenties with poorly educated elder farmers of their families These farmers involved knowledge of farmers can also focused on different socio-economic profits to the farmers and play as source of extra income generation for better livelihood and employment.
Keywords: age, gender, education, respondents, INM, IPM

INTRODUCTION

"Recent developments in the field of communication and information technology are indeed revolutionary in nature. Information and knowledge are expanding in quantity and accessibility. In such fields as agriculture, health, education, human resources and environmental management, the consequences really could be revolutionary. Communication and information technology have enormous potential especially for developing countries and furthering sustainable development"-Annan (1997). The agriculture information is vast, interdisciplinary, and specific to different agro-climatic zones and needs a proper information dissemination system for its effective use. Hence, agriculture information resources should be significantly organized and processed to disseminate right information to the right user at the right time. Communication is recognized as an important

input for development to disseminate and create dialogue among different stakeholders about the technologies and issues of agriculture, environment and sustainable development.

Concept of ICT

ICTs are technologies offering new ways for communicating and exchanging information and knowledge. The phrase ICT was coined by Stevenson in 1997. Information communication technology is a term which is currently used to denote a wide range of services, applications and technologies using various types of equipment and software, often running over telecommunication network. ICT can be broadly understood as the technologies that facilitate communication, processing and transmission of communication by electronic means. It includes a range of technologies starting from radio, television, telephone up to modern technologies like mobile phone, multimedia, internet and satellite bas communication systems. Information refers to the patterned matter energy that affects the probabilities available to an individual making decision. It is one of the most aspired fields in today's world. In recent years there is a visible shift from the old ways of delivering information to the modern ways of information delivery systems, while ICT is gaining prominence as an engine for economic growth. It also promises to have far reaching potential for the delivery of social services, enhancing the effectiveness of government administration. India has surfaced as a country with a sound foothold in the field of ICT. Large scale investments are being made to enhance the potential of ICT sector in India. Such investments would prove most cost effective if the resources of the information technology sector are blended with that of the agricultural sector in India there by making the two ends of the thread meet. The importance of ICT is not the technology as such, but it's enabling function in access to knowledge, information and communications, which are important elements in today's economic and social interactions. ICT, particularly the internet are transforming all human activities dependent on information, including rural development and in other areas. Internet is cost effective, powerful, decentralized and it is in the hands of civil society who can share knowledge and produce information. The farmers are least equipped with proper tools for knowledge and information access to operate efficiently in a dynamic global environment. Strong dependence of agriculture on monsoon makes this sector yet more vulnerable to the vagaries of the climate change. Moreover, globalization of agriculture would demand existing systems to be more efficient and effective in harnessing the latest technologies.

Also, the dynamics of market forces affecting agriculture is expected to become more and more significant in future. Therefore, immediate efforts to overcome the concerns of digital divide, The existing transfer of technology mechanisms and extension programs mostly government run are either slow or ineffective in bridging the linkages between the research community and the farmers. This is partly due to inadequate exploitation of new means of knowledge and information dissemination by these agencies. To partially fill the gap, lately some private initiatives have come up, however, the primary motivation behind these initiatives is mostly the facilitation of commercial transactions in rural areas rather than knowledge/technology dissemination. ICT can't only strengthen the traditional channels of information dissemination but also create new ones that allow localization of content-rich information products and services and their real-time delivery through multiple channels.

However, like any other technology, ICT has a cost associated with it such as the cost of building infrastructure-modems, connectivity, bandwidth and user training, the cost of developing the technology, the cost of maintaining the systems and of course the problem of obsolescence. It needs to be deliberated as to whether the ICT is sustainable for the rural development and for the resource poor common man. Novel partnerships of various players, who can complement each other, are needed to develop and disseminate information products and services in an economically sustainable and effective manner. Some of the relevant agencies represented by these players include agriculture research institutes, cooperatives, the private sector, NGO's, foundations, and concerned government departments at national and state levels.

The cyber extension is not for replacing the existing systems of e- communication. ICTs will augment in big way, the reach and two-way interaction among the key stakeholders. The new technology offers new opportunities like it will add more interactivity, speed, two-way communication widening age and also more in-depth messaging, widening the scope of extension and also improve quality. It will subtract costs and reduce time. It will reduce dependency on so many actors in the chain of extension system, and likely to change the whole method of extension in coming decade. The continuing rapid development of telecommunications and computer-based information technology (IT) is probably the biggest

factor for change in extension, one which will facilitate and reinforce other changes. There are many possibilities for the potential applications of the technology in agricultural extension (Zijp, 1994).

Information technology (IT) will bring new information services to rural areas which farmers as users, will have much greater control than over current information channels. Even if every farmer does not have a computer terminal, these could become readily available at local information resource centers, with computers carrying expert systems to help farmers to make decisions. However, it will not make extension worker redundant. Rather, they will be able to concentrate on tasks and services where human interaction is essential–in helping farmers individually and in small groups to diagnose problems, to interpret data and to apply their meaning. The packaging of research recommendation has to be done in more participative way with the help of information & communication technology. The extension functionaries at district level could be taken in to confidence before final packaging of the "Practices" or “Technologies” for each crop. The experiences and results of various trails could also be indicated in the proposed package of practices. The extension functionaries may then keep the concerned researchers informed on the field feedback electronically. This way the ICTs will help both- the researchers and farming community to talk to each other on regular basis. Advancement in scientific research has given rise to the most sophisticated new technology in information and communication fields that are now drastically changing the concept of a large size, diversified world to a global village. Internet plays a vital role in exchanging the information through e-mail, chat etc. Farmers can get the improved information services through the creative use of the information technology. Agricultural issues are being covered by national media like Radio, TV and Newspapers only at macro level due to time constraint. But internet can go an extra mile by providing the information round the clock in local language. In a developed country like U.S.A. most of the big farmers are using the internet to get information, to communicate and for buying inputs or selling outputs.

Efforts are required to focus on internet, which can provide agricultural information through portals. Thus by providing information through rural portal, farmer can get answers about

cropping strategies appropriate to their fields, based on integrated information on soil, weather, fertilizers and management of pests. They can also be informed where to get the proper seeds or nursery plants. There are some of the Agri portals, which are providing information about these free of cost. But some portals have redefined the business of agriculture through e-commerce that would be useful for trading community. Some Agri portals have struck several alliances to offer a broad spectrum of services to the trading community. Those sites would not completely weed out the middlemen but would cut down the numbers from the existing 7 or 8 stages to about 2 levels. Due to fluctuations in commodity prices day to day, some of the agri-business portals have been started to impart quality market information and analysis to trade participants to enhance their decision taking abilities. These portals provide information on commodity prices in various national and international markets, details about the freight market, agricultural commodity news, varieties and their agronomic operations, news about pests and diseases and weather news etc. Very few private portals are also providing service on business. Consulting by assisting clients with a comprehensive understanding of the likely future in trade for any agricultural commodity, guidance on broker selection, shipping, handling insurance and regulatory factors in order to facilitate market entry, providing clients' strategies for entering and expanding markets for food and agricultural products, through e- mail. These portals are used through by passing various intermediaries in the agri-business that would hope to pass on the cost benefits to end users.

Indian scenario

India has not lagged behind in the use of ICT to provide the required information to the farmers. A beginning was made in the use of ICT with the designing of Financial Accounting Information System in 1971 by Jute Corporation of India covering seven states viz., Andhra Pradesh, Assam, Bihar, Meghalaya, Orissa, Tripura and West Bengal. Later many projects like Information village centre, Gyanadoot project, e- choupal, e-grama etc came into existence. Information village centre project started by M.S. Swaminathan Research Foundation in 1998 covered 12 villages in Pondicherry region serving rural families particularly marginal farmers, fishermen and asset less. Gyanadpoot is a community-owned, self-sustainable and low cost rural intranet project, initiated on January 1st, 2000, at Dhar district. Eleven centers were started

on a pilot basis and they were called 'soochanalayas' (information kiosks), which provided user-charge-based services to the rural people. Warana wired project, started by National Informatics Centre (NIC) and Maharashtra Government covers 70 villages in Kolhapur and Sangli districts. Ten public service centers have been induced to facilitate sugarcane procurement and to provide market information.

Today it is possible to find a solution to present problems of farmers by using the potential of information and communication technologies to meet the location specific information needs of the farmers. The information and communication networks are expanding very fast. The number of internet connections in India has crossed the two million mark and the number of telephone connections is over 22 million. It is time to examine the extent of its utility in farm sector. The Internet connectivity has touched almost all the districts in the country and is moving down to the block and Mandal levels. The developed nations are using laser technology instead of tractors to plough lands. This helps in optimizing the use of various inputs such as water, seeds, fertilizers, etc. The problem is that Indian farmers cannot afford this technology and unless government comes in support for agricultural infrastructure.

Materials and Methods

Description of Bilaspur district

Bilaspur district is situated between 21°47' and 23°8' north latitudes and 81°14' and 83°15' east longitudes. The district is bounded by Korriya on the north, Anuppur District and Dindori District of Madhya Pradesh state on the west, Kawardha on the southwest, Durg and Raipur on the south and Korba and Janjgir-Champa on the east. The area of the district is 6377 km². Bilaspur is officially the judicial and cultural capital of Chhattisgarh and also boosts various cultural and social events. The district is also an important educational and medical hub of Chhattisgarh due to several world class hospitals for example: Apollo Hospital. Education at the primary and higher level has been considerably improving in the past decade due to the opening of several international standard schools ranging from D.A.V. Public School, Delhi Public School, San Francis H/S School, St. Xavier's H/S School, Maharishi Vidya Mandir and The Jain International School). The city has been also witnessing high rate of infrastructural growth for past few years due to the several initiatives taken by the state government to improve the basic infrastructure of the city. Today, the city has two

developed shopping malls (Rama Magneto Mall and 36 City Mall) which attract a large number of crowd especially the youth from all over the state.

Sampling procedure from selected area

The present study was conducted in 7 blocks of Bilaspur district, Chhattisgarh. Study area includes 7 randomly selected blocks of Bilaspur and 100 randomly selected farmers of selected blocks for personal interview. Collection of data was done with the help of well-structured questionnaire in each of the study location. farmers were randomly selected through stratified sampling procedure and individually interviewed. Farmers from different villages were interviewed using well structure questionnaire which covered information regarding gender, age, education of the respondents including INM, IPM, weather and crop insurance in their different blocks of Bilaspur district of Chhattisgarh

Results and Discussion

Research design

Research design is the plan, structure and strategy of investigation concerned so as to obtain answers to research questions and to control variance. Information communication technology and its application in agriculture is an emerging topic. There are only few formal studies regarding use of ICTs in agriculture development in Chhattisgarh. The research design adopted for this study was ex-post-facto technique, since the phenomenon has already started and is continuing. Ex-post-facto research is a systematic empirical enquiry in which the scientist does not have direct control over independent variables because their manifestations have already occurred or because they are inherently not manipulatable. Inferences about relations among variables are made, without direct intervention from associated variation of independent and dependent variables **(Kerlinger, 2010).**

Locale of the study

The present study has been carried out in the Bilaspur district of CHHATTISGARH. Out of 27 districts in Chhattisgarh, Bilaspur district was selected purposively. Altogether there are 7 blocks in Bilaspur district, out of which one blocks namely Bilha was selected purposively based on the assumption that Barrister Thakur Chhedilal College of Agriculture & Reseach Station, Bilaspur, is well connected center for transfer of latest agricultural technology, is situated in the district Bilaspur.

Geographical area	**5,815.87 km2**
Cultivable Land	2890.002 km2
Non-cultivable Land	100.004km2
Number of Blocks	7
Number of Gram Panchayats	645
Number of Nagar Panchayats	08
Number of Villages	909
TOTAL POPULATION	**26.64 Lakhs**
Male population	1,351,574
Female population	1,312,055
Sex Ratio	971
LITERACY RATE	**70.78%**
Male literacy	81.54%
Female literacy	59.71%

Sampling Plan:
A Random sampling technique was applied to draw the sample for the study.

Selection of the District:
The study was conducted in Bilaspur district because the person working on this thesis belongs to this district. The main occupation of people of this area is mainly agriculture and more than half of the population depends on this for their livelihood.

Selection of Blocks:
There are 07 blocks in Bilaspur district, out of which 1 block was randomly selected for the study.

 ISSN: 2348-1358
Impact Factor: 6.057
NAAS Rating: 3.77

The demographic profiles of the block are:

BLOCK	BILHA
Geographical area	830.83 square km
Cultivated land	412.85 ha
Non-cultivated land	14.286 ha
No. of Panchayats	108
No. Of villages	85
Total population	8992
Male population	51%
Female population	49%

BILHA BLOCK

BILHA is a Block and a municipality in Bilaspur district in the Indian state of CHHATTISGARH. It is the administrative headquarters of Bilaspur district. At the 2011 census, Bilha had a population of 8,992. Males constitute 51% of the population and females 49%. Bilha has an average literacy rate of 61%. Male literacy is 70% and female literacy is 51%. In Bilha, 17% of the population is under 6 years of age.

Selection of respondents

In each of the selected villages, initially a list of 120 farmers was prepared based on the farmers getting multi message services, attended video conference programmes and using other ICT tools to get farm information.

Selection of ICT tools for the study

TV, mobile, radio, video conference, telephone and internet were selected for the study which are being used by the respondents for obtaining farm information either individually or in combination.

Dependent variables and their measurement

Sl. No	Variables	Empirical measurement
	Dependent variables	
1	Knowledge	Procedure followed by Narayana Swamy (1995) with suitable modification
2	Attitude	Scale developed by Joy Mathews and Nagireddy(1989) with suitable modification

Independent variables and their measurement

1	Age	Procedure followed by Karpagam (2000) with slight modification
2	Education	Scale developed by Trivedi (1963) with slight modification
3	Land holding	Procedure followed by Hosamani (1993) with slight modification
4	Family type	Procedure followed by Arulprakash (2004) with slight modification
5	Farming experience	Procedure followed by Lakshminarayana (1997) with slight modification
6	Material possession	Procedure followed by Hiremath (2000) with slight modification
7	Annual income	Procedure followed by Hanchinal (1999)

		with slight modification
8	Innovativeness	Scale developed by Feaster (1968) with suitable modification
9	Social participation	Procedure followed by Trivedi (1963) with suitable modification
10	Extension participation	Procedure followed by Bhemappa (1987) with suitable modification
11	Mass media exposure	Procedures used by Lalitha (1986) with suitable modification
12	Economic motivation	Procedure developed by Supe (1969) with suitable modification
13	Risk orientation	Scale developed by Supe (1969) with suitable modification
14	Scientific orientation	Scale developed by Supe (1969) with suitable modification
15	Cosmopoliteness	Procedure suggested by Ravishankar (1979) with suitable modification

Knowledge about ICT

It is operationally defined as the level of knowledge of respondents regarding various information communication technology tools. The procedure followed by Narayana Swamy (1995) with slight modification was used to assess the knowledge about ICT. Seventeen statements were listed. For 'known' statements score one was given and for 'unknown' statements score zero was given. The maximum possible score was 17 and minimum possible score was zero.

The respondents were grouped into three categories based on their knowledge about ICT by taking mean and standard deviation as a measure of check.

CATEGORY	CRITERIA	SCORE
LOW	<(mean - ½ SD)	<11.14
MEDIUM	(mean ± ½ SD)	11.14-15.85
HIGH	>(mean + ½ SD)	>15.85

Attitude towards ICT

Attitude is the degree of positive or negative affect with some psychological objects like symbol, phrase, slogan, person, institutions, idea towards which people can differ in varying degrees from the point of view of social psychology. It is the preparedness of people to respond in a certain way towards social object or phenomena. Further, the variable was operationalised as the positive or negative mental predisposition of respondents towards use in farm communication ICT. The respondent's attitude was measured using the scale developed by Joy Mathews and Nagireddy (1989) with slight modification which suits to the objectives of the study. Twenty one statements were selected and rated on a three point continuum 'Agree', 'Undecided', 'Disagree', with scores of 3,2,1 respectively for positive statements and the reverse for negative statements. Respondents were asked to choose from this three point continuum. The maximum possible score was 84 and minimum possible score was 21.

The respondents were grouped into three categories based on their attitude towards ICT tools by taking mean and standard deviation as a measure of check.

CATEGORY	CRITERIA	SCORE
LEAST FAVOURABLE	<(mean - ½ SD)	<58.29
FAVOURABLE	(mean ± ½ SD)	58.29-60.82
MOST FAVOURABLE	>(mean + ½ SD)	>60.82

Independent Variables and their measurement

1.Age

It is referred to the chronological age of the respondent at the time of investigation. The age of respondents was recorded as mentioned by them in completed years. The respondents were categorized into three age groups based on the procedure followed by Karpagam (2000).

CATEGORY	AGE IN YEARS
Young	< 35
Middle	35 to 50
Old	> 50

2. Education

Education referred to the formal educational qualification of the respondents. The respondents were categorized based on their education level attained as below. The procedure followed by Trivedi (1963) was used with slight modification.

CATEGORIES	SCORE
Illiterate	0
Can read and write	1
Primary school	2
Middle school	3
High school	4
College	5
Degree	6

Statistical tools used

The statistical tools and tests such as frequency, percentage, mean, multiple regression and correlation coefficient were used and the data was analyzed systematically to draw valid inferences.

(I) Frequency

A frequency distribution was used to quantify the different personal and socio-psychological characteristic of the farmers using ICT tools. It was also used in the response analysis of knowledge and attitude statements.

(II) Percentage

Percentage was used for simple comparison.

(III) Mean and Standard Deviation

Mean and standard deviation were computed to classify the respondents into different categories.

Low = Mean -SD/2 Medium=Mean

±SD/2High =Mean+ SD/2

(I) Correlation

Simple correlation test was used to find out the nature of relationship between independent variables and dependent variables.

(II) Multiple regression

This test was used to find out the amount of contribution made by the independent variables in explaining the variation in the dependent variable.

Result and Discussion

Knowledge of farmers about ICT tools

Statement wise analysis of knowledge of farmers about ICT tools

A perusal of Table 1 presents the data obtained regarding knowledge of farmers about ICT tools.

ICT tools are radio, TV, telephone, mobile, internet, video conferencing, DVD's which provide agricultural information

A great majority (85.00%) of the respondents knew that TV provides information regarding agriculture and 15.00 per cent did not know that TV providing information regarding agriculture. More than three-fourth (80.00%) of respondents knew that through mobile agricultural information can get and 20 per cent of the respondents didn't know about it. Large number (66.67%) of farmers didn't know that agricultural information broadcasting through radio whereas 33.33 per cent of the respondents knew about it. Maximum number (96.67%) of the respondents didn't know internet provides agricultural information and 3.33 per cent of respondents had knowledge about it. Further, 58.33 per cent of respondents did not know videoconferencing provides agricultural information and 41.67 per cent of respondents knew it. More than three- fourth (76.67%) of respondents had knowledge on DVDs/CDs provides information regarding agriculture and 23.33 per cent of the respondents did not know about DVDs/CDs providing agriculture information and more than two-fifth (41.67%) of the respondents knew that agricultural information can get through telephone.

Table 1: Statement wise analysis of knowledge of farmers about ICT tools (n=120)

Sl. No	Statements	Know		Don't know	
		No.	%	No.	%
1	Television provides agricultural information	102	85.00	18	15.00
2	Mobile provides agricultural information	96	80.00	24	20.00

3	Radio provides agricultural information	40	33.33	80	66.67
4	Internet provides agricultural information	4	3.33	116	96.67
5	Video conference provides agricultural information	50	41.67	70	58.33
6	DVDs/CDs provides agricultural information	28	23.33	92	76.67
7	Telephone provides agricultural information	50	41.67	70	58.33
8	Videoconferencing is a two way communication.	50	41.67	70	58.33
9	DVD's/CD's documentaries provide detailed information with audio and video.	28	23.33	92	76.67
10	ICT tools provide retrievable information.	28	23.33	92	76.67
11	ICT tools provide information regarding crop production, protection, post-harvest technologies and other allied activities.	92	76.67	28	23.33
12	ICT tools provide marketing and storage information of agriculture.	92	76.67	28	23.33
13	ICT is the quick mode of communication.	92	76.67	28	23.33
14	ICT provides weather information.	68	56.67	52	43.33
15	ICT tools provide information on crop insurance and other government programs.	67	55.83	53	44.17
16	ICT tools are user friendly.	65	54.17	55	45.83
17	To use ICT tools minimum knowledge is required.	82	68.33	38	31.67

Knowledge of farmers about ICT tools

It could be noticed from Table 2 that 35.00 per cent of farmers had medium level of knowledge about ICT tools followed by high (34.17 %) and low (30.83%) level of knowledge about ICT tools.

A considerable percentage (35%) of the respondents had medium level of knowledge about ICT tools, as they possess few important ICT tools and using regularly. The present era of globalization and liberalization have brought in competitiveness in agriculture production through adoption of improved technologies by the farmers. A considerable percentage of the respondents know that it is possible to get timely information through ICT tools specially information needed at critical stages of production and marketing information. Another possible reason could be cheap unit cost and portability of ICT tools like mobiles in recent days. As indicated in results majority of the respondents educated and had medium level of mass media exposure and medium level of extension participation influenced them to some extent. Further, majority (96.675%) of the respondents did not know about internet and it's utility because it is a new tool, less awareness, lack of skills in using these tools and high cost. This finding is in agreement with the findings of Raghavendra (1997).

Table 2: Overall Knowledge level of the respondents about ICT tools (n=120)

Category	Score	Frequency	Percentage
Low	<11.14	37	30.83
Medium	11.14-15.85	42	35.00
High	>15.85	41	34.17
	Total	**120**	**100.00**

References

[1]. **ARUN BABU, A., 2005,** A comparative analysis of e-readiness and perception of Information Communication Technology (ICT) beneficiaries in Kerala, *M.Sc. (Agri.) Thesis (unpub.)*, University of Agricultural Sciences, Bangalore.

[2]. **ASHRAF, T., 2003**, Proceedings of the regional workshop on role of ICT for poverty alleviation through agriculture development in SAARC countries: country paper Pakistan. Role of ICT for poverty alleviation through agriculture development in SAARC countries held at Dhaka, Bangladesh, pp: 78-100.

[3]. **AVGEROU, C., 2000,** Recognizing alternative rationalities in the development of information systems. *The Electronic Journal of Information Systems*, **3**.Retrieved from: http://www.is.cityuu. edu. hk/research/ejisdc/vol3/v317.pdf

[4]. **BABANNA, T., 2001**, Information Source Consultancy and Training Needs of Farmers in Arecanut Cultivation under Tungabhadra Command Area in Shimoga District. *M.Sc.(Agri.) Thesis*, (Unpub.) University of Agricultural Sciences, Dharwad.

[5]. **BALASELVAKUMAR, S., 2001**, GIS and Integrated development. *Kisan world*, **27**: 53-54.

[6]. **BASAVARAJ, F. K., 2010**, Agro info beeps in to farmers' cell phones. *The Times of India daily newspaper* dated 27.09. 2010.

[7]. **BHAGAT, G.R., NAIN, M.S. AND RAKESH NARDA., 2004.** Information communication technologies for developing better management skills in agriculture and allied sectors, *Agricultural Extension Review*, pp: 33-38.

[8]. **BHATNAGAR, S., 2000,** Social implications of information and Communication Technology in Developing Countries: Lessons from Asian Success Stories. *The Electronic Journal of Information Systems*, **3**: 1-9.

[9]. **BHATNAGAR, S. AND VYAS, N., 2001**, Gyandoot: Community-owned rural internet kiosks, E-Government Case Studies. World Bank, Washington. Retrieved from www.worldbank.org/publicsector/egov/gyandootcs

[10]. **BHEMAPPA, 1987,** Impact of integrated rural development programme on beneficiaries of dairy project on Dharwad taluk (Karnataka). *M.Sc. (Agri.) Thesis (unpub.)*, University of Agricultural Sciences, Dharwad.

[11]. **BHOPLE, R.S., KUDE, N.R. AND DHANDKAR, C.R., 1997**, A study on cultivation practices and production constraints in rabi sorghum, *Maharashtra Journal of Extension Education*, **16**: 62-64.

[12]. **BIRADAR SOMSHEKHAR, R., 1999**, A study on knowledge and adoption behavior of grape growing member farmer of Maharashtra Rajya Draksha Bagitdar Sangh, Solapur. *M.Sc. (Agri.) Thesis (unpub.)*, University of Agricultural Sciences, Dharwad.

[13]. **BONZON, S., 1981**, Rural radio in Mindanao, Agricultural Information Development Bulletin, **3**(3): 23-26.

[14]. **BRASON, F, F., AND DAVIS, S.M., 1985**, How closed circuit TV works for extension old and new audience are attracted and learn. *J.Extn.Edn.*, **23**(spring).

[15]. **BRAJ MOHAN AND KHUSHYAL SINGH, 2007**, Role of information communication technologies for developing better management skills in agriculture and allied sectors. *Agricultural Extension Review*, pp.33-38.

[16]. **CECCHINI, S., 2003,** Tapping ICT to Reduce Poverty in Rural India. IEEE Technology and Society, Magazine, **22**: 2.

[17]. **CECCHINI, S. AND RAINA, M., 2003**, Electronic government and the rural poor: The Case of Gyandoot, Information Technology in developing Countries, **13**: 2.

[18]. **CIESLIKOWSK, D.A., HALEWOOD, N.J., KIMURA, K. AND ZHEN-WEI QIANG, C., 2009**, Information and communication technology for rural farmers market access in Tanzania. *Journal of Information Technology*, **10**(2): 111-128.

[19]. **COMEAU, G. AND GOIT, J., 1988,** Report on project FPO8: Knowledge based systems in crop production. Report based on the DLG congress for Computer

Technology Conference, Frankfurt, West Germany.

[20].DAS, P., 2004, Application of ICT in Agriculture for Poverty Reduction in India, Proceedings of the regional workshop on attempts and success of ICT roadmap to villages in the SAARC countries, held at Dhaka, Bangladesh, pp:102-141.

[21].DEVRAJ AND CHATURVEDI, K. K., 2003, Internet for transfer of agriculture technology. *Agriculture extension review*, **15**(2):3-6.

[22].DHAKA, B. L. AND CHAYAL, K., 2010, Farmers' experience with ICTs on transfer of technology in changing agri-rural environment. *Indian Res. J. Ext. Edu*, **10** (3): 114-118.

[23].DJANKOV, S., MCLEISH, C., NENOVA, T. AND SHEIFER, A., 2001, Who owns the media? *Journal of Law and Economics*, **46** (2)*:* 46-53.

[24].DURGA P. KANNA, 2004, Farmers' help line-A new dimension. *Kisan world*, **31** (12): 25-26.

[25].FEASTER, G., 1968, Measurement and determinants of innovativeness among primitive agriculturists, *Rural sociology*, **33**(3): 339-348.

[26].FREMPONG, F.A., KWARTENG, J., AGUNGA, R AND ZINNAH, M.M.,2006, Challenges of infusing information and communication technologies in Extension for Agricultural and rural development in Ghana. *J.Extn. System*, **22**: 69-82.

[27].FLOOR, A. G., 2001, ICT and poverty: the indisputable link. Regional Economic Cooperation in Asia and the Pacific: Bangkok.

[28].GAUTAM, U.S. AND PALIWAL, D.K., 2006, Role of Information and Communication Technology in agricultural development, paper presented in the National seminar on *Information and communication Technology: Opportunities and Challenges for Revitalizing Extension System* held from Dec.27-29, 2006. Navasari (Gujarat).

