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Use of Information and Communications Technology (ICT) Tools in Increasing Income of Tribal Farmers of Karnataka

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Authors' contributions

This work was carried out in collaboration among all authors. Author HR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author MS managed the analyses of the study. Author HBN managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Information and Communications Technology (ICT) tools play a vital role in accessing the information on agriculture and allied activities most of the tribal farmers of Uttara Kannada district are accessing the information via mobile phones, television and radio. They express their views on ICT tools helps in getting the information on agriculture especially agriculture inputs, fertilizers, use of bioagents, insecticides and also management of pest an diseases in rice, chilli, areca nut and other vegetables, vermicomposting, value addition etc. The study has shown that poor finance facility in buying the ICT tools, lack of confidence in operating, lack of power supply, low network connectivity, lack of awareness of benefits of ICTs, lack of skill in handling ICTs, low ICT literacy, lack of repairing facilities, attitudinal barriers towards ICTs, lack of training and practical exposure, high cost of repairing ICTs and insufficient regional language were the major constraints faced by the farmers in the effective use of ICTs. Since there is an increased penetration in the level of

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availability and accessibility of ICTs among the farmers of the state, there is a need to ensure that the problems of the farmers are being met in order to enable the farming community derive maximum benefits on better access to information services through the use of ICTs for agriculture and other developmental purposes. This study seems to be the first report on usage of ICT tools by Tribal farmers in Karnataka.

Keywords: Information and Communications Technology (ICT) tools; tribal farmers; income.

1. INTRODUCTION

Uttara Kannada is located between13^0 and 15^0 North latitude and between 74^0 and 76^0 East longitude in the Western Ghats section of Karnataka. Its high rainfall supports lush forests, which cover approximately 70% of the district. The district has a tropical climate. It has a well-defined rainy season of about five months distributed between June and November when the south west monsoon brings most of the rainfall and the climate remains hot and humid. The major crops grown in the district are rice and areca nut along with a great diversity of other crops *viz*., coconut, sugarcane, cocoa, cashew, mango, banana, pineapple, sapota; vegetables include onion, radish, cucumber, cauliflower, brinjal, sweet potato, amaranth; spices include pepper, cardamom, ginger and nutmeg.

The district has total population of 14.37 lakhs (1,437,169) with total of 369 families live on road side or without any roof cover in Uttara Kannada district of Karnataka. The literacy rate of the district is 84.06 per cent

Yellapur is a Town Panchayat city in district of Uttara Kannada, Karnataka. The Yellapur Town Panchayat has population of 20,452 of which 10,250 are males while 10,202 are females. The literacy rate of Yellapur city is 89.56 per cent higher than the state average of 75.36 per cent. In Yellapur, male literacy is around 93.34 per cent while female literacy rate is 85.80 per cent Yellapur Town Panchayat has total administration over 4,805 houses to which it supplies basic amenities like water and sewerage facilities. It also authorized to build roads within Town Panchayat limits and impose taxes on properties coming under its jurisdiction.

The tribals are socio-economically backward as compared to the non-tribals. A tribe is a social group usually with a definite area, dialect, cultural homogeneity and unifying social organization [1]. [2] Rightly specified that tribes in India are not a homogeneous category because of dissimilarities among themselves in respect of the regions, languages, physical features habit and habitats etc.

Under Tribal Sub Plan (TSP) Project study was conducted in Uttara Kannada district of Karnataka where lives an ethnic group of tribal people having distinct physical features resembling with 'Negroid' race showing that these were once African Negroes called as "*Siddis*" [3]. [4] Classified Sidamo tribes of Ethiopia into 7 groups, Siddis belongs to one of the major groups called Ometo.

According to [5] the *'Siddis* are the descendents of African Negroes, brought to India by voyagers like the Arabs, the Portuguese and the Dutch. [6] Conducted a genomic study to understand the population history of the *Siddis*, showed their link with Africans, Indians and Europeans (Portuguese), confirming the belief about their origin. As per the assessment of [7] the *Siddis* population in India is about 50,000 of which 10,477 are located around Yellapura, Haliyal, Ankola, Joida, Mundgod and Sirsi taluks of Uttra Kannada district and in Khanapur of Belgaum district and Kalghatgi of Darwaad district in Karanataka. Shivamogga district is to the South East of Uttar Kannada district. Most of the *Siddis'*s settlements are found either on the slopes of the Western Ghats, having thick forests and valleys crowded with spice and areca nut plantations on the undulating plateau situated to the East of the Ghats [3]. Most of *Siddis* have settled homes in the forest. Yellapur taluk has maximum number of *Siddis* settlements. Each settlement has minimum of 5 houses and maximum number is about 40 houses. A group of 8 to 10 such settlement within the range of 10 km. form a village Sangha and these 3 to 4 village Sanghas constitute a cluster Sangha. Presently, there are 9 clusters comprising 28 village Sanghas. Out of 9 Clusters, 5 clusters are present in Yellapura taluk namely, 1. Idagundi cluster in Yellapura taluk, 2. Kotemane cluster in Yellapura taluk 3. Gunjavati cluster in Yellapura and Kalghatgi taluks 4.Arbail cluster in Yellapura, Mundgod

talukas 5. Arbail cluster in Yellapura, Ankola and Sirsi taluks. Generally, the *Siddis* of Yellapura and Ankola are speaking Kannada and Konkani language. Main resources of livelihood of Tribal of Yellapur taluka is agriculture and secondary occupations are forest labour and honey collection. Majority of the Siddis live in rural areas and doing agriculture. To enhance their income, they are also working in arecanut gardens and cutting trees for forest contractors.

The concept of Tribal sub Plan (TSP) and its counterpart, the Special Component Plan (SCP) emerged in National Fifth Five year plan [8] with objectives of poverty alleviation, protection of tribal culture, education, health care and providing basic minimum infrastructure. Poverty alleviation includes programme in agriculture, animal husbandry, sericulture, horticulture and small industries as well as all employment generating schemes. The study area was selected where majority of tribal farmers were residing and their livelihood based on agriculture. The present study was focused on collection of information regarding usage of ICT tools in agriculture and increasing income of tribal farmers residing in the forest area. ICT is an important pillar that strengthens the extension activities in the current scenario and will bring new information services to rural and farmers which will commence greater control than ever over current information channels. Access to such new information sources is a crucial requirement for the sustainable development of the farming systems. ICT when applied to the rural and agricultural conditions can improve the linkages between research sub-system and farmer sub-system. In this backdrop a study was conducted to know the usage of ICT tolls by tribal farmers in agriculture.

2. MATERIALS AND METHODS

The study was conducted with a total of 150 farmers of four different villages of Yallapura taluk of Uttara kannada district. The investigation was carried out with various ICT tools used by the tribal farmers in Savane, Hadlikere, Honnahalli and Bachanhalli villages of the Yallapura taluk (Fig. 1). The base line information of tribal villages were collected (Table 1) then the data were collected by personal interview method for the usage of ICT tools in enhancing agricultural income of the tribal farmers.

The collected baseline data were analysed to know the usage of ICT tools by tribal farmers about different extension services of agriculture, pest and diseases and their management of cultivated crops like paddy, chilies, arecanut and brinjal and also marketing facility.

With regard to agriculture and rural development occupying an important place in the economy of Karnataka, the present study attempted to know the level of accessibility, availability, usage of ICTs and also the problems faced by the farmers in accessing ICTs. In fact, there is a need to realize that in order to reach the farming and tribal development community in an efficient manner, it is important to study the type of communication media and ICTs owned and accessed by the farmers, their frequency of usage as well as the degree of usefulness of various ICTs as knowledge of the use of different ICTs will be helpful in drawing a suitable extension strategy as well as to provide improved ICT extension services to uplift the socio-economic status of the tribal farmers. It is in this context that the objectives of the study were designed as follows:

1. To measure the level of access, availability and usage of ICTs among tribal farmers.
2. To find out the constraints in the use of ICTs among the farmers.

2.1 Use of ICTs

It is operationally defined as the degree of frequency and purpose of use of ICTs by the individual respondents for agriculture and Socio-economic development at the time of investigation. The various dimensions to study the usage of ICTs among the individual respondents under tribals development were Agriculture, Health, Education and Governance *etc.* For frequency of usage, Very frequently is defined in terms of its usage of ICTs ‘hourly’ and ‘daily,’. Frequently in terms of its usage of ICTs ‘three times a week’ and ‘once a week’, Occasionally in terms of its usage of ICTs ‘once a month’, Rarely in terms of usage of ICTs ‘once in three months’ and ‘never’ in terms of using ICTs in terms of not using ICTs at all. For the purpose of usage of ICTs in agriculture and development, a scoring of 4,3,2 and 1 was given for Internet, Mobile phones, TV and radio in order to identify the type of traditional and modern ICTs being used by the farmers included in the study.

Table 1. Baseline information at Savane, Hadlikere Honnahalli and Bachanahalli village, Yellapura taluk

Sl. no	Component	Results			
		Savane village	**Hadlikere**	**Honnahalli**	**Bachanahalli**
1	Average population of the village	70	75	90	70
2	Total area of the village	50 acres	95	150	30 acres
3	Number of house holds	15	20	35	20
4	Average family structure	Nuclear - 72.3 % Joint - 27.7 %	Nuclear – 75.0 % Joint – 20.6 %	Nuclear – 60.1 % Joint – 32.6 %	Nuclear - 77.3 % Joint - 22.7 %
5	Average educational status of family members	Illiterate - 60 % High School - 30 % Graduate - 7 %	Illiterate - 70 % High School - 15 % Graduate - 5 %	Illiterate - 85 % High School - 10 % Graduate - 1 %	Illiterate - 60 % High School - 30 % Graduate - 7 %
6	Power supply for agriculture use	No	No	No	No
7	Power supply for commercial use	No	No	No	No
8	Power supply for home use	Yes	Yes	Yes	Yes
9	Source of Water for drinking	Ponds	Ponds Tap water	Ponds	Ponds
10	Mode of transportation	Carts driven by animals, Bus, Auto	Carts driven by animals Bus, Auto	Carts driven by animals, Bus, Auto	Carts driven by animals, Auto
11	Major land holdings	Landless-89.9% Small-10.1 %	Landless-95% Small-5 %	Landless-85% Small-15 %	Landless-85.00% Small-15.00 %
12	Source of irrigation	River end, ponds, Pools- 2.5 %	River end, ponds, Pools-2.5%, Tanks-1.5 %	River end, ponds, Pools- 5 %	River end, ponds, Pools- 3.5 %
13	Farm mechanization	Nil	Nil	Nil	Nil
14	Livestock	Cow	Cow	Cow	Cow, buffalow
15	Source of agricultural information	State Agriculture department (rarely) and relatives	State Agriculture department (rarely) and relatives	State Agriculture department (rarely) and relatives	State Agriculture department (rarely) and relatives
16	Sources of credit supply	Landlords	Landlords	Landlords	Landlords
17	Cropping pattern	Rice, Areca nut, Beetle vine, chilli	Rice, Areca nut, Beetle vine, chilli	Rice, Arecanut, Pine apple, Brinjal, Drumstick	Rice, Areca nut, tomato, chilli

Sl. no	Component	Results			
		Savane village	**Hadlikere**	**Honnahalli**	**Bachanahalli**
18	Plant protection	Unaware about use of Chemicals	Unaware about use of Chemicals	Unaware about use of Chemicals	Unaware about use of Chemicals
19	Marketing system of agricultural produce	Nil	Nil	Nil	Nil
20	Soil type	Laterite	Red sandy	Sandy loam	Laterite
21	Knowledge about IPM	2.6 %	3.0%	5.0%	2.00%

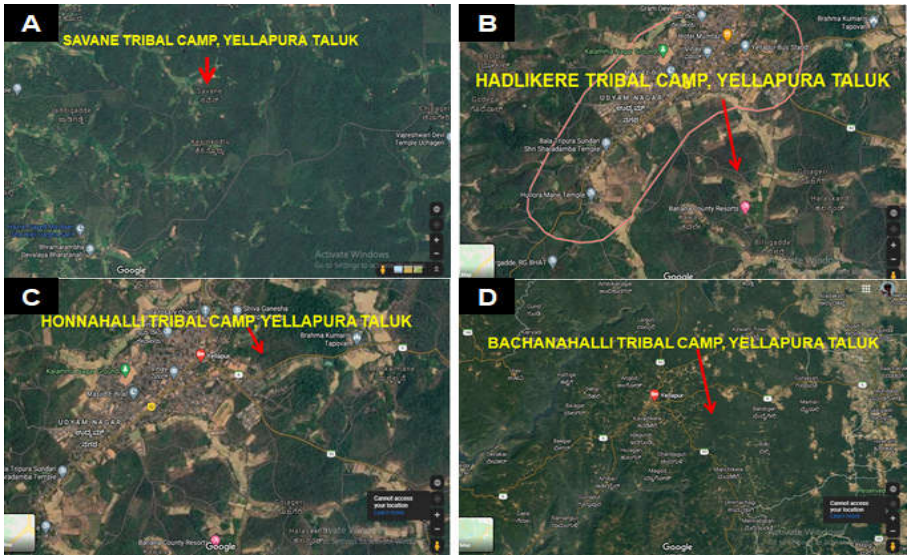

Fig. 1. Study area A) Savane, B) Hadlikere C) Honnahalli D) Bachanahalli village of Yellapura taluk

3. RESULTS AND DISCUSSION

The data for the level of availability and that of accessibility of ICTs among the tribal farmers surveyed were found to be similar. A survey on the availability and accessibility of ICTs represented in the Tables 1 and 2 and Figs. 1 & 2 among the farmers of four villages revealed that 70 per cent of the farmers had mobile phone s. And accessing the information related to agriculture in enhancing their income. Compared to other ICT tools mobile phone usage is high. Another reason why the accessibility of mobile phones is higher as compared to other ICT tools is that it is affordable, portable as well as useful during emergencies. This is in accordance with the findings of [9] and [10]. Besides mobile phones, television was also reported to have been accessed by 78 farmers out of 150 (52%) farmers are using television for accessing information. Radio was also found to be accessed by the 32 farmers (21.33%). This is also in line with the findings of [11,12 and 13]. It was also found that radio was accessed by the farmers. This indicated that the presence of radio applications in mobile phones could help in educating the farmers, especially if programmes on agriculture and development are broadcast as most of the farmers have access to radio via mobile phones. The availability of ATM was also reported, but it was accessed by only few of the farmers, most of the farmers did not have ATM cards. Moreover, since ATMs in the villages surveyed are not located in proximity to the study area, only few farmers had access to them. Further, as there are few young farmers who are educated, the level of access to internet and other web-based services such as Facebook and Youtube is also very low among the farmers of four villages of Yallapura taluk. The tribal farmers including young framers of tribal villages don't have knowledge on usage of computer, e-mail, CD/DVD and also e-books. Because of the lack of knowledge/education Fig. 2.

On an overall, mobile phone was regarded as the most frequently used ICT tool (61%) among the farmers using it very frequently. This is due to the reason that mobile phones are easily affordable and could be used by even illiterate farmers. The usage trend in mobile phones also indicated that it can offer huge scope in the future if appropriately use for the purpose of agriculture and other development purposes. Next to mobile phones, television was also used very frequently by the farmers (55.00%). It was also reported that the use of radio is lower (17.00%) as compared to mobile phones and television since the level of availability and accessibility of ICTs is also lower as compared to other ICTs. Internet and its applications are still being used rarely by few of the respondents who are young and educated these tribal farmers are using internet in their phones since mobile data are providing internet facility (10.80%). ATMs were also being used rarely (8.00%) by the few of the farmers when most needed (Table 3 & Fig. 3).

Table 2. Accessibility of ICTs among tribal farmers (n=150)

Sl. No	Particular	Number of tribal farmers	Per cent
1.	Mobile	105.00	70.00
2.	Television	78.00	52.00
3.	Radio	42.00	28.00
4.	ATM	32.00	21.33
5.	Internet	21.00	14.00
6.	Facebook	16.00	10.66
7.	Camera	10.00	6.66
8.	e-Mail	00.00	0.00
9.	Computer	00.00	0.00
10.	e-Books	00.00	0.00
11.	CD/DVD	00.00	0.00
12.	Youtube	4.00	2.66

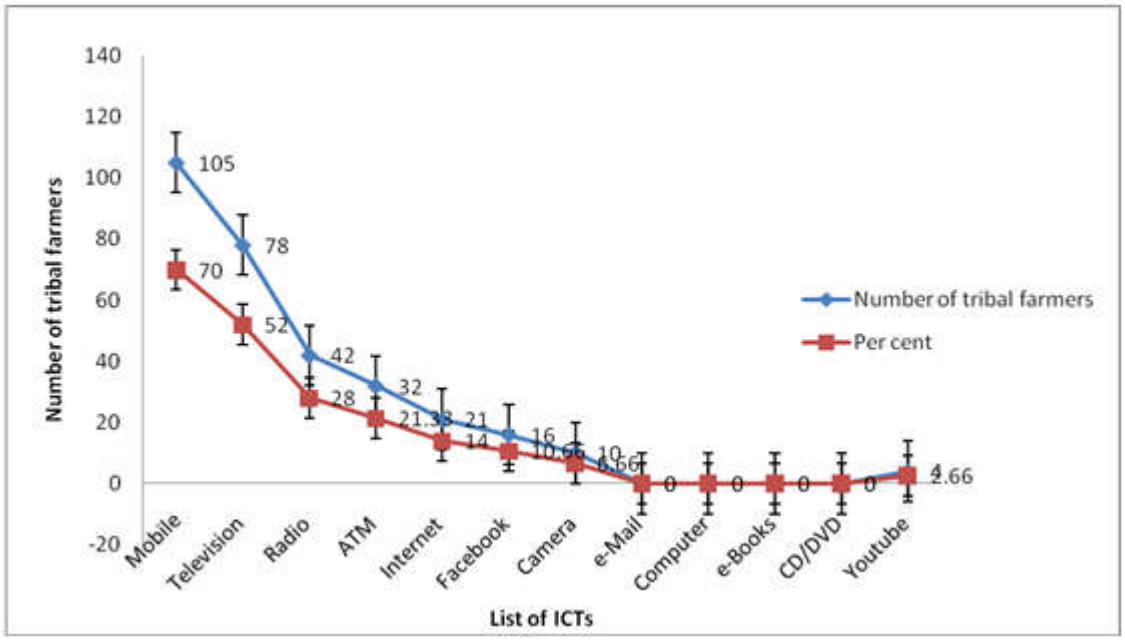

Fig. 2. Accessibility of ICTs among tribal farmers (n=150)

Table 3. Frequency of usage of ICTs (n=150)

Sl. No	List of ICTs	Frequency of usage			
		Very frequently per cent	Frequently per cent	Occasionally per cent	Rarely per cent
1.	Mobile phones	61.00	20.00	1.00	0.00
2.	T.V	55.00	10.00	2.50	0.00
3.	Radio	0.00	17.00	0.00	0.00
4.	A.T.M	0.00	0.00	0.00	8.00
5.	Internet	0.00	0.00	2.50	10.80
6.	Computer	0.00	0.00	0.00	0.00
7.	Facebook	0.00	5.00	0.83	4.16
8.	Camera	0.00	0.00	0.00	7.50
9.	e-Mail	0.00	0.00	0.00	0.00
10.	e-Books	0.00	0.00	0.00	0.00
11.	CD/DVD	0.00	0.00	0.00	0.00
12.	Youtube	0.00	0.00	0.83	0.83

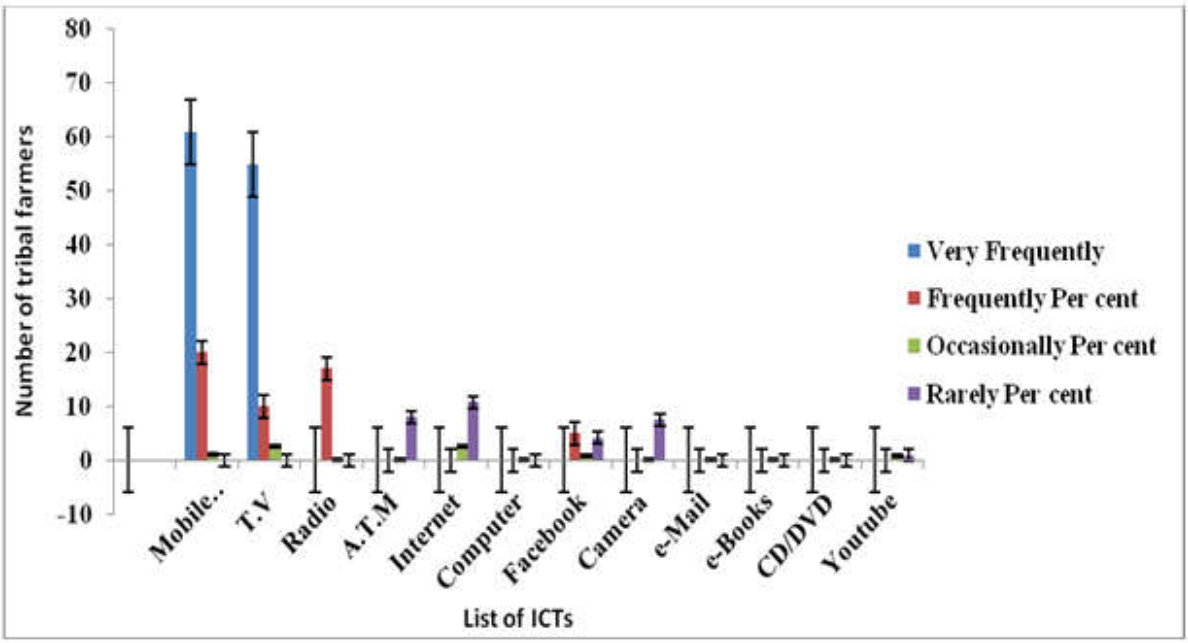

Fig. 3. Frequency of usage of ICTs (n=150)

3.1 Purpose of Usage of ICTs in Agriculture

Tribal famers are using the ICT tools in order to get the information on Availability of inputs, Marketing of produces, Pest and disease management in paddy, chilli, brinjal, tomato and arecanut. The usage of ICTs for availability of inputs was mainly through television followed by mobile phones and radio. The findings of the study indicated that farmers preferred to watch the television programmes broadcasted through Chandana TV channel at 6:30 p.m. to gather information services on availability of inputs. For quality of inputs among the farmers, mobile phones had maximum usage followed by radio and television. Mobile phones were also reported to be used by the farmers to contact experts/extension personnel to enquire about the recommended fertilizer dose in crops. Few farmers used ICTs for getting information on market price of inputs in which mobile phones and internet were used. Since majority of the farmers are unaware of usage of ICTs for getting market information on different commodities. The reports on maximum usage of ICTs by the farmers were found to be the highest for marketing of the produce. Mobile phone was regarded as the most widely used ICT tool used for the purpose of marketing of produce. This is in confirmity with the findings of [14,15] and [16].

3.2 Constraints in the Use of ICTs among Tribal Farmers

The constraint in the use of ICTs by tribal farmers was listed below.

1. Poor Finance
2. Low ICT literacy
3. Lack of awareness of benefits of ICTs
4. Lack of confidence in operating ICTs
5. Erratic power supply
6. Low Network connectivity
7. Lack of skill in handling ICTs
8. Insufficient regional specific language
9. Negative attitude towards ICTs
10. Lack of repairing facilities and centres
11. Lack of training and practical exposure towards

The major constraints faced by farmers were Poor Finance they unable to buy mobile phones, tv and radio, low literacy rate they don't know how to use and operate the tolls, lack of confidence in operating ICTs particularly mobile phone applications due to less exposure and lack of awareness of how to properly use ICTs in order to derive its benefits. Another problem faced by farmers in the use of ICTs was the difficulty in charging mobile phones due to erratic and fluctuating power supply. This however hindered most of the farmers in using ICTs for development. Connectivity is also one problem faced by the farmers in using mobile phones.

Farmers reported that the connectivity is very low and limited to only few networks. Due to this reason, farmers do not find the use of mobile phones as reliable and credible when the condition of low network connectivity is a barrier to their usage. Further, it was also reported that majority of the farmers are also unaware of the socio-economic benefits and stimulus that ICTs could bring to their lives except for personal communication. Due to the lack of demonstration, experience and practical exposure among farmers that ICTs could benefit them, it is difficult to advocate the impact of ICTs for development.

Farmers also expressed that they had difficulty in using mobile applications and internet due to the lack of skill in using it. This however is related with low level of ICT literacy. Some respondents said they cannot use most of the basic functions of the mobile phones, such as SMS, mainly because of illiteracy and lack of skill in using it. Farmers also express that there were lack of repairing centres and repairing facilities of ICTs for mobile phones and television in the villages. Due to this reason, farmers had to repair their items and take it to the town at a high cost incurring more expenses and more loss for the farmer. The attitudinal barriers by some of the old aged farmers also posed a constraint to the use of ICTs. Moreover lack of finance as a barrier in using ICT.

Some of the farmers opined that there was a lack of training and practical exposure to use mobile phone applications as well as internet and felt that they needed some training to educate and teach them how to use ICTs that could benefit them for agriculture and enhancing income of the farmers. Some of the farmers had difficulties with understanding the language. This is due to the reason that most mobile phones use English language menus. The study is also in line with the findings of [17,18,19,20,21] and [22].

4. CONCLUSION

Tribal farmers expressed their satisfaction regarding the usage of ICT tools in accessing the information on agriculture and allied activities most of the farmers are accessing the information via mobile phones, television and radio. They express their views on ICT tools helps in getting the information on agriculture especially agriculture inputs, fertilizers, use of bioagents, insecticides and also management of pest an diseases in rice, chilli, areca nut and other vegetables, vermicomposting, value addition etc.

However, Some farmers express their experience the use of ICT tools in agriculture extension services some of them expressed their un satisfaction. The study has shown that poor finance facility in buying the ICT tools, lack of confidence in operating, lack power supply, low network connectivity, lack of awareness of benefits of ICTs, lack of skill in handling ICTs, low ICT literacy, lack of repairing facilities, attitudinal barriers towards ICTs, lack of training and practical exposure, high cost of repairing ICTs and insufficient regional language were the major constraints faced by the farmers in the effective use of ICTs. Since there is an increased penetration in the level of availability and accessibility of ICTs among the farmers of the state, there is a need to ensure that the problems of the farmers are being met in order to enable the farming community derive maximum benefits on better access to information services through the use of ICTs for agriculture and other developmental purposes.

The information collected through survey of present study revealed that the livelihood and economic status of the tribals can be improved by taking following measures:

- Educational facilities should be provided for the tribal people.
- The government must make major moves to create permanent assets with tribal farmers and provide infrastructural support for meeting input, credit and marketing needs
- Dissemination of agriculture related information through radio programmes would be recommended.
- More awareness-cum-training programmes on ICTs should be encouraged among tribal farmers by agricultural state departments, research organizations and its allied departments in order to increase the confidence in using ICTs for development.
- Use of renewable energy such as solar panels would be recommended in order to overcome erratic and fluctuating power supply in the state particularly in rural areas.
- Vocational training for the youths on ICT infrastructure would be recommended.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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