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Is ICT Infrastructure Capable Enough to Access Agricultural Extension Services in a Situation like Covid 19: A Case Study of Western Uttar Pradesh, India

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ABSTRACT

This paper examines the current scenario of ICT based services among the farming community in western Uttar Pradesh. It also attempts to identify what factors hinder the access to and use of ICT services for agricultural extension and advisory services (EAS). A descriptive statistical analysis approach was used to analyse the data of the 360 sample households based on a primary survey conducted in western Uttar Pradesh, India. The data was collected through semi-structured interview scheduled during January-March 2020. The results show that around 87% farmers have access to the any of the ICT tools but only around 44% are using them as a source of agricultural extension. Around 39% farmers responded that lack of awareness is the main reason for poor use of ICT tools followed by lack of trust (38.05%) and lack of training (18.33%). It is found that present scenario related to ICT in rural areas is not capable enough to tackle the situation like Covid pandemic. Study recommends rigorous awareness campaigns about the uses of ICT tools for accessing the agricultural related information and regular follow ups by the extension department for building the trust among the farming community. Financial resources need to be targeted for technically equipping and training the agriculture extension agents so that they can provide up-to-date information through different ICT mediums to the stakeholders.

Key words: Advisory services, Awareness, Farmers, Information and communication Technology, Mobile phones

Covid 19 pandemic has posed a severe challenge on the survival and growth of majority of sectors of the global economy. Undoubtedly, even the demand and supply chain of essential commodities like food grains and perishables from agricultural sector witnessed a heavy toll [1]. Some of the key challenges faced by agrarian sector are logistics, labour, transportation and marketing of the perishable and fresh farm produce, lack of awareness about the market prices, value addition, and storage facilities, poor management of livestock, etc. [2-4]. The mobility restrictions resulted in limited or no availability of labour inputs on field and difficulty in transporting the produce to intra and inter-state markets, resulting in massive wastage of food grains and perishables on one hand and spike in prices on the other [5-7]. In order to combat these challenges, the role of digital agriculture has become pivotal, whereby, the two-way communication between the stakeholders of the agricultural system is feasible without any physical contact [8].

Virtual engagement is the key source of acquiring information, education and skills during the Covid pandemic times. For agricultural extension and advisory services (EAS), FAO [9] recommends going digital by using digital tools and technologies that enable information flow in spite of physical distancing and mobility constraints, exploring simple, available and accessible, and easy to implement Information and Communication Technologies (ICT) solutions such as short message service (SMS), Interactive Voice Response (IVR), radio and TV, drones, online marketing, e-extension platforms, social media, etc. Moreover, timely availability of the information through ICT can enhance the accessibility of agricultural extension and advisory services (EAS) by farmers and support them in maintaining the agricultural productivity [10]. The role of agricultural extension services (AES) becomes pivotal in the current scenario since they are first in line to connect with the farmers for agricultural related advice. There is an urgent need for agricultural extension and advisory services (EAS) to alter their way of working for addressing the prevailing situation [9-10]. FAO 2020 states that AES can become more instrumental in the rural economy by providing the trust worthy information on input dealers, market access, credit support and transportation services in the present scenario.

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Prior to pandemic, a reasonable number of studies have documented that access to ICT has a significant impact on the access and adoption of information broadcasted by extension agents or institutions [11-13]. Agriculture, that is, information dissemination about agriculture through mobile phones can provide a better, wider and regionally customized information to farmers. It can enhance productivity and farm income thereof by providing effective and timely information. Majority of farmers, irrespective of their farm size, using mobile phones for information related to agricultural activity benefitted from the communication related to input availability and market prices, which further ensures high yield and revenue [14]. The studies also confirm the customization and convenience as the major benefits of the agriculture extension services through mobile phones [13-14]. Furthermore, agricultural incentives and agricultural professional advice delivered through the mass media also increases the likelihood of using agricultural extension services [15-16]. KVKs in India have adopted several ICT tools like Facebook live, WhatsApp, Telegram, conferencing, phone calls, mobile applications, audio-visual aids, and the tele-training, in order to connect with the farming community for providing information and training for combating the challenges posed by movement restrictions [17]. However, these initiatives by the respective authorities cannot be fructified until it is prior known that farmers are accessing the ICT tools for agricultural EAS and adopting them thereof.

In the present scenario, it becomes inevitable to assess if our rural economy is well equipped with the ICT tools and techniques to access the agriculture technical advisory. In this backdrop, the present study explores the preparedness of the Indian agriculture to combat with the Covid pandemic through ICT by analyzing the level of awareness, access and frequency of use of ICT tools by farmers for accessing the agriculture related technical services. The study also examines the key factors that hinder the usage of ICT tools for agricultural purpose.

MATERIALS AND METHODS

The present study is based on primary data collected from two districts of Western Uttar Pradesh (UP), Meerut and Muzaffarnagar during January-March 2020. The western UP is the key agrarian region of northern India. A multistage sampling method has been used to pin down the 360 agricultural households surveyed. The sampling structure has been sketched in (Fig 1). At the first stage two districts are selected on the basis that they closely represent the western UP from socio-economic, culture and demographic perspective. In the second stage three blocks from each district and two villages from each block were selected randomly. The primary data has been collected using a semi-structured interview schedule, covering information related to “personal and household characteristics”, “information, application and perception” about the ICT tools and “factors hindering the usage of ICT tools” for agricultural extension and advisory services. The survey collected the data from the “decision maker of agricultural activities” instead of household head since in the study area the eldest family member is considered as the household head, who may or may not be the decision maker in agricultural activities in the family. The study employs STATA software to extract descriptive statistics of relevant variables from the primary data to assess the present scenario of ICT usage by the farming community for accessing the extension services.

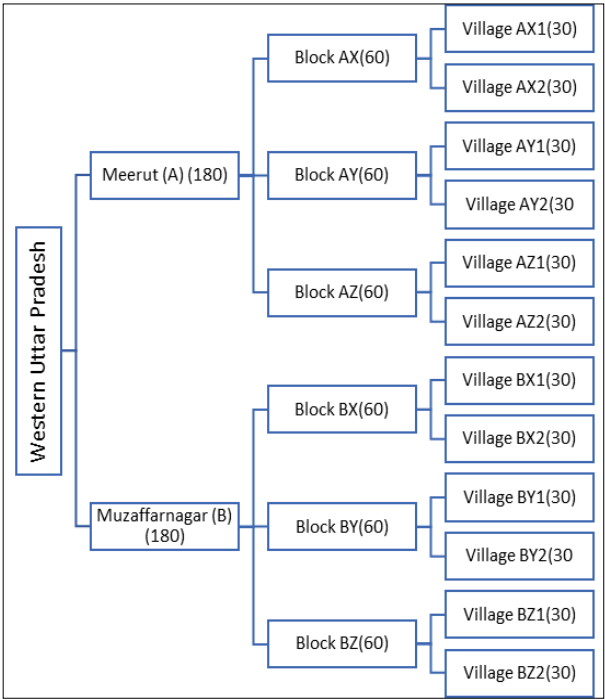


Fig 1 Sampling structure of the study

Table 1 Socio-economic and demographic profile of the respondents

Variable	F	%	Mean
Farm size (ha)	360		2.31 (2.1)
Marginal (up to 1)	120	33.33	
Small (1-2)	82	22.78	
Medium (2-4)	99	27.50	
Large (4 & above)	59	16.39	
Education (year of schooling)	360		9.54 (4.24)
Illiterate	23	6.39	
Just literate (1-4)	22	6.11	
Primary to middle (5-9)	95	26.39	
Secondary to hr. sec (10-12)	161	44.72	
Graduate and above	59	16.39	
Age (in years)	360		46.37 (12.55)
15-29	35	9.72	
30-44	114	31.67	
45-59	147	40.83	
60 and above	64	17.78	
Household size	360		7.69 (3.95)
Social group	360		
Scheduled caste	40	11.11	
Other backward castes	257	71.39	
Other	63	17.50	
Religion	360		
Hindus	314	87.22	
Muslims	46	12.78	

In column four, digit in parenthesis is the standard deviation

Socio-economic and demographic profile of the respondents

The socio-economic and demographic profile of the respondents is presented in table 1. In the sample, around 33 percent farmers are from marginal category, followed by medium (27.50 percent), small (22.78 percent) and large (16.39 percent) categories. The distribution of sample by education group shows that more than 44 percent farmers are from secondary to higher secondary education category followed by primary to middle category (26.39 percent). The

majority of the respondents (40.83 percent) are from 44-59 years age group. The mean age of 46.37 years of the farmers is indicating a serious issue of ageing in agriculture and also diversion of the young generation towards other occupation. The mean of the household size is 7.69 members. In the social group, Other Backward Class (OBC) has the highest share (71.39) followed by others (17.50). Among the religious category, the Hindus and Muslims constitutes 87.22 percent and 12.7 percent of the sample population.

RESULTS AND DISCUSSION

With respect to the usage of ICT tools, (Table 1) shows that most of the households have televisions and mobile phones but only around 34 and 40 percent of the households use the respective mediums for accessing the extension services. According to telecom regulatory authority of India (TRAI) (2020), rural tele-density for wireless subscribers, that is, registered telephone connections per 100 persons is

58.72 and rural internet subscribers per 100 population is 33. Although the primary result in context of wireless connections is more than national average but the number of internet subscribers, which can be attributed to smart phone users, is in sync with the national average. The small percentage of access and usage of radio indicates the changing mode of information source in the rural areas as radio was considered as “established rural media” [18] and ideal agricultural extension tool. National Sample Survey Organization (NSSO), 2003 data shows that in comparison to other sources of mass media for dissemination of agricultural technical advice, radio ranked first with 13 percent of households, followed by television (9.7 percent) and newspaper (7 percent). A primary study in Uttar Pradesh [19] finds that only 22 percent of the vegetable growers used mass media for accessing the information related to modern agricultural technologies. Further, it is identified that computer technology is still not that common in the rural areas.

Table 2 Summary of ICT tools accessed by the respondents (Percentage)

ICT tool		Percentage of households having access		Percentage of households using for AES
Radio		5.28		2.5
Television (TV)		80.56		33.88
Mobile phones	Feature phone	55.83	86.11	40.56
	Smart phone	31.39		
Computers		9.17		2.5
Any of the above		86.94		43.89

In case of access of ICT tools, we also enquired about the frequency of usage of the respective tools for agricultural EAS. The frequency has been assessed on the basis of six categories, that is, daily, weekly, monthly, need-based, casually and never accessed. Although (Fig 2) shows that a majority of the respondents never access the ICT tools for agricultural extension and advisory services in the study region, some of the key results can still be observed for other categories. Mobile phone is the most frequently accessed tool,

specifically in case of need-based access (around 30%). In case of daily and weekly usage, both TV and mobile phones have similar access which is around 8% for each category. However, television is mostly accessed casually which explains that farmers do not watch agriculture information related channels purposively on regular basis. A miniscule size of sample access radio and computers in each of the categories. Farmers having computers mostly access it for agricultural EAS either during any specific need or casually.

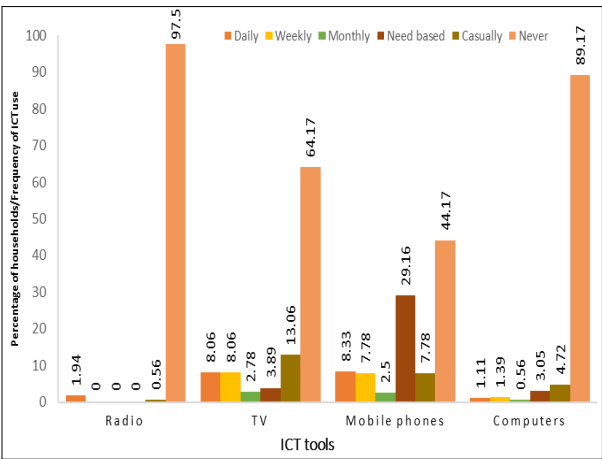


Fig 2 Frequency of ICT tools usage for Agricultural EAS by the respondents

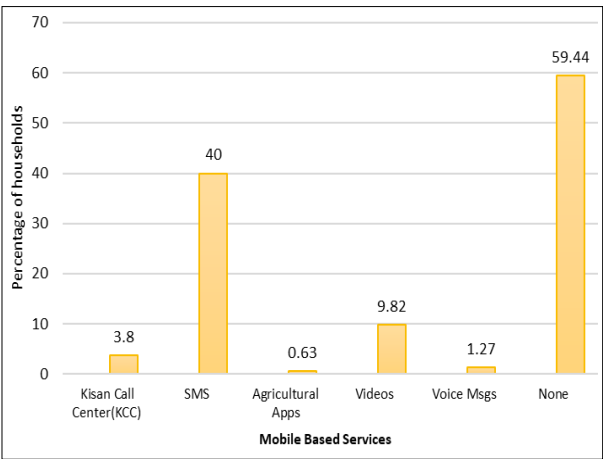


Fig 3 Summary of different mobile-based agricultural EAS used by the respondents

Mobile phone as an ICT tool

Since a major chunk of sample households are using the mobile phones (40.56 percent) for accessing the agricultural EAS, we further explored the share of mobile based services and the social media applications. The

summary statistics (Fig 3) are very much in line with the results of (Table 1). Since a majority of respondents have access to feature phones, they mainly rely on SMS based services received from the local agricultural institutions like KVKs, block office and weather department. Only 9.82

percent share of videos shows that although 31.39 percent of respondents have the smart phones but they are not much used for the agricultural based services. It is recorded that most of the farmers are not comfortable and trained in using smart phones to access extension services. Further, it is also observed during the field survey that smartphones are more of a status symbol than a source of agricultural information. Despite the hue and cry about the smart phone based agricultural applications in the present times, only 0.63 percent of sample households access the agricultural EAS through these applications. Although farmers access information through the modern information technology but they still trust the traditional sources like other farmers or face-to-face communication [20].

Further, it is indicated by (Table 2) that a very less percentage of respondents are using social media for

agricultural EAS. Although a significant percentage of households are aware of the social media applications but only around 9 percent and 8 percent of the respondents are using WhatsApp and YouTube respectively for accessing the agricultural EAS. It is reported during the survey that some farmers using the WhatsApp receive and share the information on the official WhatsApp groups formed by Krishi Vigyan Kendra (KVK) and extension agents. Also, some farmers actively shared information on WhatsApp groups formed by the local village members. Further, YouTube provides the wide range of information as per the need of the farmers. This shows that although not many farmers are accessing WhatsApp and YouTube for agricultural EAS but there is scope of higher outreach through these mediums if the farmers are enlightened about their benefits.

Table 3 Percentage of households using social media through mobile phone for agricultural EAS

Mobile Applications (Social media)	Aware of the social media	Have the applications	Using for agricultural information
WhatsApp	47.5	25	9.44
Facebook	36.94	17.77	2.22
YouTube	38.05	30	8.33
Instagram/Twitter	5.28	1.94	0
All	5.28	1.94	0

Kisan call centre (KCC)

While examining the role of mobile phone in agriculture EAS, discussion is incomplete without assessing a very crucial service initiated by the government of India, which is known as Kisan Call Center. In order to harness the potential of ICT in Agriculture, the government of India launched Kisan Call Centers (KCCs) in 2004. These call centers aim to answer the farmers’ queries from 6.00 am to 10.00 pm on all seven days of the week on a toll-free number in their own dialect. KCC agents are known as Farm Tele Advisors (FTAs). It was expected that this move will be path breaking in terms of information dissemination to farmers. The studies suggest that farmers who are aware of KCC and have accessed it for agricultural advisory and services have positive perception about usefulness of the information provided by KCC [21-23]. Farmers who accessed KCC, gained knowledge about their problems and thus, yielded higher output in comparison to farmers who did not utilize KCC facility [24]. However, the ground reality is highly dismal since only 21.67 percent farmers are aware of the KCC, only 11.67 percent are aware of its toll-free number and only 8.89 percent ever called to Kisan Call Center. Low level of awareness of KCC among farmers but majority of the farmers using KCC facility are highly satisfied with it [25]. This explains that if the farmers are aware of KCC and access it for their queries, they might yield some beneficial output.

Table 4 Particulars about the Kisan Call Centre

Particulars	Percentage
Aware of KCC	21.67
Know about the toll-free number of KCC	11.67
Ever call to KCC	8.89

Television (TV) as an ICT tool

(Table 5) shows the results on the television as a tool for accessing information related to agricultural EAS in the study area. Television is an important source of information dissemination in rural India. According to the survey, around 80.56 percent respondents have access to the TV, but only

33.88 percent are using it as a source of agricultural information. This fact indicates the underutilization of this very useful source of information.

Table 5 Particulars about the television programmes and channels for agricultural information

Particulars		Percentage
Have TV at home		80.56
Get information about agriculture from TV		33.88
Aware of DD Kisan channel		59.17
Watch DD Kisan Channel		27.77
Frequency of watching DD kisan channel	Daily	2.5
	Weekly	9.17
	Monthly	2.22
	Need based	1.39
	Casually	13.61
Aware of Krishi Darshan TV program		62.5
Watch Krishi Darshan TV program		26.39
Frequency of watching Krishi Darshan	Daily	1.94
	Weekly	7.5
	Monthly	2.78
	Need based	0.83
	Casually	13.89

A study in Aligarh district of Uttar Pradesh [26] also finds that television was seldom or never used for agricultural information by the majority of farmers. Further, only around 28 percent respondents watch DD Kisan channel to get agricultural related information. DD Kisan is an Indian agriculture 24-hour television channel, owned by Doordarshan. This channel was launched on 26th May 2015. The surprising fact is that only 2.5 percent watch it daily and the maximum users (13.61 percent) of this channel watch it casually. Krishi Darshan is another program premiered on DD National and DD kisan channel for broadcasting the agricultural information. Notably, only around 26 percent farmers watch this program, that too on casual basis. Although some studies suggest that TV programs can be a convenient tool for broadcasting agricultural EAS in regional

language to the masses [27-29], the present study and other literature sources [30-31] indicate that there is utter lack of awareness among the farmers about the utility of these easily accessible information sources.

Other sources as ICT tool

Other than mobile phone and TV, radio and computer are also used as a source of ICT. According to (Table 1), the access of radio and computer is only around 5 and 9 percent respectively, but they are also considered as an important source for information dissemination related to agriculture in

rural areas. Although, in the beginning of the year 2000, ITC (a Private sector company) established Internet kiosks at village level, to be managed and operated by farmers trained in basic computer usage, and provide free services to other farmers related to the new technology in agriculture, weather and market prices, disseminate knowledge on scientific farm practices and risk management and facilitate the sale of farm inputs [32]. These kiosks are known as e-Chaupal. However, the access and use of computer is very low in the study area. The probable reason behind this would be that smart phones are replacing the computer these days.

Table 6 Factors responsible for negligence of ICT for Agricultural EAS by the respondents

Factors		Percentage of households
Facilitating conditions	Lack of training	18.33
	Lack of awareness	39.16
Individual characteristics	Lack of Interest in adopting new technology/ Satisfied with conventional methods	13.88
	Do not understand value of new technology	5.00
	Not enough time	1.66
	Small farm size	10.83
	Technical incompatibility	15.27
Technology attributes	Cost of adoption	4.72
Trust on information	Lack of trust on information through ICT	38.05
	Fear of loss	4.72

The results show that lack of awareness and trust are the two major factors that inhibit the farmers from taking advantage of the ICT resources for agriculture. In order to ensure the successful use of information by the rural communities, “knowledge about the nature of information” and “appropriate communication mechanism understandable to traditional people by the senders” are the significant factors [33]. Around 40 percent of the farmers are not aware of the utility of ICT tools for agricultural inputs. There is dearth of knowledge among the community members about the availability of the ICT tools. Some households report that they can access the information through ICT tools but lack in required training and skills to implement the same. Approximately 14 percent of the respondents state no interest in the extension advisory or satisfaction with the traditional practices. Notably, not many respondents positively responded to this factor. This reflects that farmer are willing to adapt for new practices but the lack of awareness and institutional limitations inhibit them to do so. Further, small land size holding is another individual characteristic constraining the use of ICT. This can be related to the lack of trust factor as small farmers have limited resources to invest in new technical advice which ultimately hampers their risk-taking capacity. Furthermore, the cost of implementing the technical advice is another constraint. The large farmers are more likely access information from multiple sources about the modern technology to manage the risks associated with large scale farming [14]. With respect to trust factor, 4.72 percent farmers are concerned about the post-technical advice adoption scenario. In the present study also, it is observed during the field survey that farmers have fear of loss of yield in case of any fault in application of the technical advice. This perceived risk and lack of trust inhibits them to adopt the ICT tools for AES. Other factors are time constraint and the perceived underestimation of value of ICT for agricultural purpose.

CONCLUSION

Digital extension is the ultimate option in such an unprecedented time underlining the role of agriculture extension system through ICT tools. In order to assess the preparedness of the agriculture sector in the study region to combat with the situations like Covid pandemic, the present study investigates the level of awareness and access of ICT tools for agricultural extension and advisory services by the farmers. This paper examines the use of agricultural EAS and the factors responsible for non-utilization of ICT tools among the farmers for agricultural purpose. The findings on low usage of radio underscores the fact that farmers have shifted from radios to mobile technologies and government should divert its human and financial resources from radio programs to active mobile services. The study shows that there is no dearth of access of ICT tools like Television and mobile phones with the farmers, however, they lack in acknowledging these tools for agricultural extension and advisory services. It is strongly recommended that public authorities initiate rigorous awareness campaigns through social media applications like WhatsApp, voice call and SMSs, advertisements on Television on both public and private commercial channels, and face-to-face communication wherever feasible. Lack of trust on the information through ICT and perceived risk associated with the implementation of the technical advice among the farmers necessitates a regular follow-up by the agricultural extension department. This factor underlines an important dimension of the agriculture extension system, that is, accountability of the extension agents. The direct interface with the farmers through ICT can assist in getting the real time feedback on the functioning and efficacy of extension agents in a particular region and the corrective measures can be taken thereof. Farmers lack in training for adopting the technical advisory. The delivery of information without knowledge about its

implementation proves to be a vague activity. Well trained farmers can provide the on-field demonstration and promote faster knowledge dissemination among the neighbouring

farmers. It is imperative to make sure that technology-oriented inputs should be complemented with training campaigns.

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