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Article

The Importance of Information and Communication Technologies for Agripreneurs

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Abstract

Purpose: *Utilizing Information and Communication Technologies (ICTs) in agriculture is an emerging necessity for growing economies. This study concentrates on the status of information transmission in the agriculture sector. Therefore, the primary objective of this study is to explore ICT usage among agripreneurs.*

Method: *The significant findings were analysed using a descriptive research design. A survey-based questionnaire was the medium of data collection. The total 120 agripreneurs registered in the "Rural Enterprise Acceleration Project Uttarakhand" are respondents of the study.*

Results: *The findings highlight that mobile phones, television, and radio are the most popular ICTs among agripreneurs to increase agricultural productivity and profitability. However, their constraints are the unawareness of ICTs and the need for proper skills and confidence.*

Contribution: *This study serves as a springboard to promote ICT advancements in agriculture. It helps policymakers, managers, extension employees, and the government to know the current ICT usage situation and problems to execute communication technologies and interventions.*

Keywords: *Agriculture, Agriculture Entrepreneurs, Agriculture sustainability, Agripreneurs, Information and Communication Technology, ICT for Agriculture development.*

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1. Introduction

The advancement of information access for improving the socio-economic state of the farmer's community is the prime concern of agriculture advisors (Food and Agriculture Organization US (FAO) 2019). Additionally, the International Fund for Agriculture Development ((IFAD) 2019–2021) formally supported the role of Information and Communication Technologies (ICTs) in facilitating better information access to enhance food protection and sustainability of rural lives. India is an agriculture-oriented country, and following this, 70 per cent of the population depends on this sector for their livelihoods (Workie et al., 2020). Therefore, the growth of the agriculture sector is essential for sustaining profitable evolution and feeding the increasing population (Datt & Ravallion, 1996). In the past decade, agriculture was regarded as a labour-intensive and limited sector handled by small families in a tightly regulated and non-financially supported market (Naseem et al., (2010); Trivelli et al., (2019). Therefore, the importance of entrepreneurship in the agriculture sector has been overlooked for a long time because the focus has been drawn to other sectors, such as manufacturing and service (Alsos et al., 2011; Condor, 2020).

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Additionally, agriculture is nowadays the world's growing sector (Rosegrant et al., 2009); (Pereira et al., 2017), employing around a billion people and incorporating powerful high-tech applications with developments in technical skills that have transformed agriculture over the last century (Cavallo et al., (2014); Hamani et al., 2022). In the mid-eighteenth century, Richard Cantillon (1986) introduced the term "entrepreneur" to describe a farmer who agrees to give the owner a fixed amount of money in exchange for his farm or land, with no guarantee of profit. Similarly, in the early nineteenth century, Jean-Baptiste developed the term "Agriculture Entrepreneur or Agripreneurs" to describe a farmer who is a risk-taker, organizer, and member of supply chain management. Additionally, a person who produces and manages agricultural products is known as an "Agricultural Entrepreneur" (Paradkar et al., 2015). However, it is a significant expansion in the agricultural industry and a boon for the development of rural areas (Ghezzi & Cavallo, 2020). Similarly, the involvement, availability, and accessibility of information and knowledge are critical factors in increasing agriculture production (Bilali & Allahyari, 2018). Additionally, ICT in agriculture transfers knowledge and information quickly (Baruah and Mohan., 2021). Therefore, ICT is remarkable for minimizing the communication gap between an agricultural extension and agripreneurs through the transmission of information (Birke & Knierim., 2020).

Agriculture entrepreneurs are starting to acknowledge the value of effective communication, modern techniques, and practical learning approaches for the agriculture sector's expansion (Anand et al., 2022). Similarly, agriculture extensions are also adopting ICTs to improve rural lives and to contribute information interaction and access to help the rural population. Agriculture experts also use ICTs for e-extension programs (Vegad et al., (2021). In this context, ICTs can close the information gap in many aspects. However, the significance of ICTs as an advanced tool for growth and development is accepted widely, and individuals from various industries are being influenced by using them directly or indirectly (Harsanto et al., 2020). However, besides other ICTs, mobile phones have become the most preferred electronic tool for urban and rural people (Mwantimwa, 2019). Regardless of age, gender, status, occupation, or area of residence, using a mobile phone has become a requirement today (Ahmed et al., 2019). Therefore, it has been said that among the agriculture community, mobile phones are commonly used tools for information transmission and obtaining information related to agriculture, mostly for production and marketing (Diaz et al., 2021).

Although, ICT technologies could provide the medium for growth in developing nations (Rashid & Elder, 2009). Similarly, mobile phones provide chances to contact many people by making information and knowledge accessible locally or globally (Bhoi, 2017). The new emerging paradigm of technological agricultural development has changed from the previous methods of providing communication services to farmers. The traditional communities are developed into knowledge associations around the globe, which drives rural communities to believe and behave progressively (Spielman et al., 2021; Bachewe, 2018). Jabir's (2011) study highlights that ICT-based knowledge transformation benefited the livestock entrepreneurs of India by generating sustainable quality determinations on livestock operations to compare with non-ICT agripreneurs.

Moreover, its assistance boosted information gathering and money transfers in import and export markets in the "Madhya Pradesh, Uttar Pradesh, and Tamil Nadu" states of India, which helped farmers reduce transaction costs (Adhiguru & Devi, 2012). The advancement of information access for improving the socio-economic state of the agricultural community is the prime concern of agriculture advisors (Food and Agriculture Organization of the United States (FAO) 2019). Additionally, the International Fund for Agriculture Development ((IFAD) 2019–2021) formally supported the role of information and communication technologies (ICTs) in facilitating better information access to enhance food protection and the sustainability of rural lives. In general, India is an agriculture-oriented country, and following this, 70 per cent of the population relies on this sector for their livelihoods (Workie et al., 2020). Therefore, the growth of the agriculture sector is essential for sustaining evolution and feeding the increasing population (Datt & Ravallion, 1996). In the past decade, the agriculture sector was considered a labour-intensive and limited sector handled by small families in a tightly regulated and non-financially supported market (Naseem et al., (2010); Trivelli et al., (2019).

Therefore, the importance of entrepreneurship in agriculture has been overlooked for a long time because the focus has been drawn to other sectors, such as manufacturing and service (Alsos et al., 2011; Condor et al., 2020). Additionally, agriculture is nowadays the fastest-growing sector (Rosegrant et al., 2009; Pereira et al., 2017), employing around a billion people and incorporating powerful high-tech applications with developments in technical skills that have transformed agriculture over the last century (Cavallo et al., (2014; Hamani et al., 2022). In the mid-eighteenth century, Richard Cantillon (1986) introduced the term ""entrepreneur"" to describe a farmer who agrees to give the owner a fixed amount of money in exchange for his farm or land, with no guarantee of profit. Similarly, in the early nineteenth century, Jean-Baptiste developed the term "agriculture entrepreneur" or "agripreneurs" to describe a farmer who is a risk-taker, organizer, and member of supply chain management. Additionally, a person who produces and manages agricultural products is known as an "agricultural entrepreneur" (Paradkar et al., 2015). Moreover, it is a significant expansion in the agriculture sector and a boon for rural development of rural areas (Ghezzi & Cavallo, 2020). Similarly, the involvement, availability, and accessibility of information and knowledge are the main factors in increasing agriculture production (Bilali & Allahyari, 2018). Furthermore, ICT adoption in agriculture transfers knowledge and information quickly (Baruah and Mohan., 2021). Therefore, it is remarkable to reduce the communication gap between an agricultural extension and agripreneurs through the transmission of information (Birke & Knierim., 2020).

Notably, agripreneurs acknowledge the value of effective communication, modern techniques, and practical learning approaches in agriculture (Anand et al., 2022). Similarly, agriculture extensions are embracing it for rural development and contributing information interaction through e-extension programs and access to help the rural population (Vegad et al., (2021). In this context, it could be a means of closing the information gap in many aspects. Similarly, the significance of ICTs as an advanced tool for growth and development is accepted widely, and individuals from various industries are being influenced by using them directly or indirectly (Harsanto et al., 2020). Generally, followed by other ICT tools, mobile phones have become the most preferred electronic tool for urban and rural people (Mwantimwa, 2019). Regardless of age, gender, status, occupation, or residential area, using a mobile phone has become a requirement nowadays (Ahmed et al., 2019). Therefore, previous studies identified that among the agriculture community, mobile phones are commonly used tools for information transmission and obtaining information related to production and marketing (Diaz et al., 2021). Although, ICT technologies could provide the medium for growth in developing nations (Rashid & Elder, 2009). In addition, mobile phones provide chances to contact many people by making information and knowledge accessible locally or globally (Bhoi, 2017). The new emerging paradigm of technological agricultural development has been modified from the previous methods of providing communication services to farmers and agripreneurs. The traditional communities transformed into knowledge associations around the globe, which drives rural communities to believe and behave progressively (Spielman et al., 2021; Bachewe et al., 2018). Additionally, the study of Jabir et al. (2011) highlights that ICT-based knowledge transformation benefited the livestock entrepreneurs of India by generating sustainable quality determinations on livestock operations to compare with non-ICT agripreneurs. Similarly, its assistance boosted information gathering and money transfers in import and export markets in the ""Madhya Pradesh, Uttar Pradesh, and Tamil Nadu"" states of India, which helped farmers to reduce transaction costs (Adhiguru and Devi, 2012).

1.2 Statement of the problem

Agriculture growth and rural development are significant parts of the economy of the Uttarakhand state of India. The present study intended to examine the level of ICT accessibility and availability, the purpose of utilizing it, and identify the constraints that agriculture entrepreneurs experience while accessing them. Therefore, it is necessary to recognize that ICT effectively reaches agripreneurs and rural communities. Similarly, it is essential to investigate the types of ICTs that farmers possess and use, how useful they are, and how frequently they use them. To understand how different ICTs will help to develop suitable extension strategies and ICT services to improve the living standard and status of the farmers

and rural communities. In this context, the objectives of our research are formulated below:

1. To identify the availability and accessibility of ICTs among agriculture entrepreneurs.
2. To explore the purpose of utilizing ICT by agriculture entrepreneurs.
3. To determine the usage level of ICT among agriculture entrepreneurs.
4. To identify the constraints of ICT adoption among agriculture entrepreneurs.

2. Literature Review

ICTs have emerged as crucial tools in modern agriculture, transforming how agripreneurs operate and manage their agricultural businesses. This literature review aims to provide an overview of the essential findings and insights from various studies that highlight the significance of ICTs in the agripreneurship sector (Mansour, 2023). Senyo et al. (2023) claim that ICT is one of the prominent solutions to economic empowerment. Similarly, Ofori et al. (2021) also suggest that it is a medium to reduce poverty in rural regions. Additionally, "Public Opinion and Customer Research Canada" (COMPAS 2005) highlights that ICT usage among farmers has led to significant changes in the agriculture sector. However, farmers have gained more competitive knowledge to increase production and satisfy the market needs and demands. Instead of these, it allows agripreneurs to expand their business and obtain new clients by using the Internet. One of the primary benefits of ICTs in agriculture is the ability to provide agripreneurs with easy access to a wealth of agricultural information (Samuel et al., 2023). ICT tools such as mobile apps, websites, and SMS services offer real-time data on weather, market prices, pest control, and farming techniques (Anand et al., 2022). A study by Twumasi et al. (2021) has shown that improved access to information helps agripreneurs make informed decisions, optimize resource allocation, and increase productivity. ICTs have also facilitated better market access and price transparency for agripreneurs. Platforms like e-commerce websites and mobile marketplaces enable farmers to sell their products directly to consumers or intermediaries, reducing their dependency on traditional supply chains (Kleine et al., 2019). Research by Ali (2019) demonstrates that this direct market engagement can lead to higher profits and reduced post-harvest losses. The adoption of ICTs has ushered in the era of precision agriculture, allowing agripreneurs to optimize resource usage. Sensors, drones, and IoT devices collect data on soil health, moisture levels, and crop growth, enabling precise decision-making (Liu et al., 2021).

Studies by Bucci (2019) and Benos et al. (2022) emphasize the role of precision agriculture in conserving resources, reducing environmental impacts, and enhancing agricultural sustainability. ICTs have also facilitated knowledge sharing and capacity building among agripreneurs. Online forums, webinars, and social media platforms enable farmers to connect with experts, share experiences, and access training materials. The work of Singh and Misra et al. (2021) and Ouko et al. (2018) underscores the role of ICTs in building agripreneurial skills and fostering innovation within the agricultural sector. Panda et al. (2019) identified agripreneurs attitudes and knowledge toward technology adoption as primary factors of ICT adoption. Additionally, the author explains that information transmission could increase agricultural production and help the agriculture community to upgrade their livelihoods by providing updated information related to global market demand, weather forecasts, pest control, and consumer behaviours. Chowhan and Ghosh (2020) suggested that ICTs are a great source of timely information for farmers; they provide agriculture information at any time and everywhere, and if communication channels are implemented effectively, more active participation is possible from all agriculture stakeholders.

ICT has proved to be a powerful means of communication because it is a convenient mode for acquiring, organizing, collecting, and disseminating information electronically worldwide. Specifically, in rural areas, it provides an opportunity to adopt new knowledge and helps people to increase their skills and understanding levels (Mdoda & Mdiya, 2022). Furthermore, the findings indicate that if the rural population uses it wisely, they could overcome the drawbacks of being far and alone from the city areas. Additionally, its facilities encourage people, open new doors of opportunities, connect people, and provide systematic channels for commercial growth. Khanna and Kaur (2019) investigate internet access, interest,

and management in agriculture operations, and their findings drive us to understand the positive impacts of ICTs on agriculture techniques. Therefore, the findings suggest that interviewed rural households, farmers, and agripreneurs obtain access to online content through the internet, which helps them in the online dealing of products. Silvestri et al. (2021) performed a survey method study and investigated different communication channels. The results identified that significant efforts are required in ICT usage and awareness to provide information support for the rural community at a large scale for sustainable agriculture growth and development. Ansari et al.'s (2019) findings suggest that ICT provides different perspectives for agriculture management, marketing, processing, and purchasing of goods and services of agricultural products. Therefore, in emerging economies, ICT adoption supports small agriculture businesses to generate financial assistance for business expansion.

Similarly, it encourages small businesses to adopt technology adoption and product modernization. Ali et al. (2019) identified the connection between ICT and agriculture as e-agriculture because its adoption in agriculture development indicates an emerging area that aims to promote sustainable agriculture and food security by improving information access and sharing procedures. Furthermore, the mobile phone is an example of a successful implementation of ICT tools in agriculture expansion. Farmers use it to obtain market pricing, weather forecasts, pest control, and various agriculture-related information. Surprisingly, it is now the most accessible ICT, allowing a wide range of people, especially underprivileged people in rural regions.

Moreover, ICT tools have played a transformative role in modern agriculture, revolutionizing various aspects of farming and contributing to increased productivity, sustainability, and profitability. Here are some critical roles of ICT tools in agriculture More and Aslekar (2022). In their study, Gupta et al. (2020) identified mobile phones as indispensable tools in modern agriculture, significantly transforming the agricultural landscape. Incorporating mobile technology into farming practices has brought multifaceted advantages, addressing critical challenges farmers face in developed and developing regions (Panda et al., 2019). Another study conducted by Ankuyi et al. (2022) found that radios have been instrumental in shaping agricultural practices across the globe. While contemporary technology has introduced various sophisticated communication tools, radios remain an essential and accessible medium, especially in rural and remote farming communities (Monarca et al., 2022). However, the role of radios in agriculture emphasizes their contributions to information dissemination, agricultural education, disaster management, and community cohesion. Raju et al. (2018) identified television as a cornerstone for disseminating agricultural information to rural communities. Agricultural news programs and dedicated channels provide farmers real-time updates on weather forecasts, market prices, and relevant government policies (Dwivedi et al., 2017). The visual and auditory appeal of television enhances the accessibility and understanding of critical information. The internet has enabled the widespread adoption of precision agriculture. Internet-connected sensors and devices collect data on soil conditions, crop health, and environmental factors (Lopes et al., 2018). This data is then analyzed using advanced algorithms to optimize planting, irrigation, and fertilizer use. Precision agriculture improves resource efficiency and minimizes environmental impact.

E-commerce platforms have opened new avenues for farmers to sell their produce directly to consumers, eliminating the need for intermediaries (Gebremariam et al., 2019). Henceforth, formulating ICT tools like mobile phones, television, radio, and the internet in the agriculture sector is one of the measures to make agribusiness the primary focus for the growing economy of a country.

Additionally, according to a document published by the NOS (2018), India is a nation with a strong demand for ICT services, even though the level of its usage among farmers and agripreneurs is still average.

Similarly, the Farmers Organization Authority India (2019) highlighted that ICT practices provide agripreneurs with data on current technology, seeds, and the pricing of agriculture products. Additionally, agricultural entrepreneurs could obtain access to information through ICTs, which helps to establish connections with organizations and other farmers, increasing their chances of expanding their

agriculture business. ICT adoption is maintained since it has the potential to expand the agriculture sector; moreover, it would only be helpful for them if agripreneurs take advantage of the opportunity to acquire the technology. Therefore, this study is suitable for the government to understand the availability, accessibility, and usage level of ICTs among agripreneurs and as an answer to the World Trade Organization (WTO), which instructs our agriculture community to be more talented, acquainted, and competitive.

3. Research Methodology

3.1. Study area and sample size

The respondents to this study are agripreneurs belonging to Uttarakhand state, India. It is one of India's most beautiful, well-preserved, and fascinating places. It is identified with the natural surroundings of the Himalayas, the Bhabar, and the Terai regions. It borders the Tibet self-administering region of China northward, the Sudurpashchim Pradesh of Nepal eastward, the Indian domains of Uttar Pradesh southward, and Himachal Pradesh westward and northwest. The researcher chose this region for several reasons. First, with the variety of climates and crops, it offers better opportunities for agriculture in Uttarakhand (Chhimwal et al., 2019). Second, farming employs three to five per cent of the working population (Tuteja, 2013). Third, the nation prioritizes connecting its network centres to increase internet connectivity in this region (Subrahmanyeswari & Chander, 2022).

3.2. Sampling technique and survey instrument

The study used random, convenient sampling techniques and collected data from agripreneurs registered under the Uttarakhand government's Rural Enterprise Acceleration Project scheme. Generally, a significant sample size is necessary to ensure both representativeness and proficiency for performing the statistical tools. Prior studies have suggested diverse sample sizes and advanced theories for defining a suitable sample size (Chege et al., 2020). However, the literature emphasized that sample size may differ according to the statistical analysis, even when the same tools are used. Therefore, the researcher circulated 320 questionnaires, from which 164 were collected, and 120 were filled correctly and usable for analysis. Thus, the sample size for this study is 120.

3.3. Data collection

The data analysis aimed to comprehend better the various information and knowledge that agriculture entrepreneurs utilize to make informed critical decisions in agricultural production. In addition, the investigation sought to identify the providers of knowledge and information and communication channels. Following this, quantitative data were analyzed with descriptive statistics to determine the information needs of agricultural entrepreneurs and how that information is disseminated from several identified sources, and 120 agriculture entrepreneurs were surveyed using an adapted questionnaire. However, to gather data from the user group, a survey using a questionnaire was used. The questionnaire was prepared in both English and Hindi languages for information collection. The researcher encountered the support of a university professor, two doctoral students, and three agripreneurs to consider the design and variables of the questionnaire. Following their advice and suggestions, the researcher constructed the required questions. The researcher performed a pilot study on 35 agripreneurs with adequate knowledge and experience in using ICTs in agriculture operations. Pre-testing facilitated the researcher to define the accuracy of the questionnaire to accumulate the required data. According to Tavakol and Dennick (2011), an alpha value of at least 0.7 is acceptable for any research. The Cronbach's alpha values of the instrument were higher than 0.7; therefore, the questionnaire was suitable for the study.

3.3. Respondent profile

The descriptive analysis of respondents is presented below in Table 1. The result shows that 67.1% of the respondents were men, and the rest were women; their ages ranged from 20 to 78 years old, with a mean of 45. However, over two-thirds of the respondents are 41, indicating the need to entice youth into the agricultural sector. Additionally, the majority of respondents own their business, and only 19% of respondents manage their agriculturally based business with family or in groups. Similarly, 4 out of every surveyed stated that they worked

in the food processing industry. Importantly, in manners of education, 45.1% of respondents have completed high school, while 30.7% have completed intermediate. Consequently, in terms of agriculture education, more than 88.2% of respondents have no formal education, whereas only 0.7% hold an agricultural degree. Additionally, the state agriculture association, Krishi Nideshalay Uttarakhand, has 55% of respondents as committee members.

Table 1: Demographic profile of respondent (N= 120)

Profile	Categories	Frequency	Percentage
Gender	Male	80	67.1
	Female	40	32.9
Age	Less than 40	36	29.8
	41 to 49	43	36.2
	More than 50	41	34.0
Education level	Primary	37	30.7
	High School	54	45.1
	Intermediate	11	9.3
	Diploma	10	8.5
	Degree	8	6.5
Education in agriculture	No Formal Education	105	88.2
	Certificate	10	8.7
	Diploma in Agriculture	3	2.4
	Degree in Agriculture	2	1.2
Project ownership	Individual	97	81.1
	Family	16	13.3
	Group	7	5.6
Membership in association (At least a member)	Krishi Vigyan Kendra	67	55.5
	Krishi Nideshalay Uttarakhand	24	20
	Institute of Agriculture Training and Research	13	10.5
	Agriblinder	10	8.8
	Conserve Agro Foundation	6	5.4

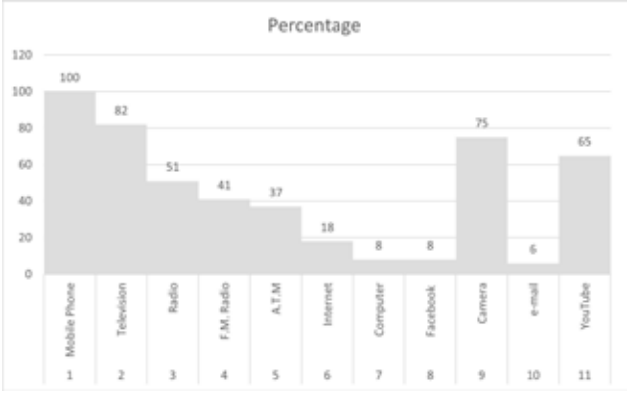
Respondents' Profiles (n=120)

4. Results

4.1. The Availability and Accessibility of ICTs among Agriculture Entrepreneurs.

The primary objective of the study is to identify the availability and accessibility of ICTs among agripreneurs, and they were both identical and comparable. Additionally, the collected data highlights the availability of ICTs in study areas, which makes accessibility of ICTs for agripreneurs. Therefore, the availability and accessibility of mobile phones are 100% in the study area. Similarly, the second-highest number of ICTs belongs to Television and Radio. Additionally, ATMs are available but used very frequently for transaction purposes. Furthermore, the collected data highlights that listed ICTs are available for agripreneurs and could be accessed easily for utilization in agriculture sectors and rural development. Figure 1 represents the availability and accessibility of ICTs.

Figure 1: Availability and accessibility of ICTs (n=120)



4.2. The Purpose of Utilizing ICT by Agriculture Entrepreneurs.

The second objective is to know the purpose of using ICTs and electronic media in their agriculture operations, and the surveyed questionnaire contained seven ICT tools and thirteen purposes for using them. In addition, they were asked to select their three most often used ICTs or electronic media tools for each usage. Table 2 highlights the descriptive analysis that most agripreneurs depend on conventional electronic media for information accessibility. Moreover, the majority of respondents use a mobile phone, radio, television, and the Internet as their primary sources of gathering information. Generally,

these tools are medium to access production factors, expert guidance, loan services, farmland, post-harvest, record-keeping, entrepreneurial information sharing, disease prevention, production processing, business opportunities, and ICT information.

The results also highlight that mobile phones are the most common source of information. On the other hand, they did not depend on a mobile phone to obtain information when they needed weather forecasts, and they chose the television and radio for such purposes. Additionally, the radio also has a high number of users to learn about ICT and business opportunities.

Table 2: Purpose of using ICT and sources of information (n=120)

Purpose of using ICT	Mobile (%)	Radio (%)	Tele-vision (%)	In-ter-net (%)
Market information	60	18	15	4
Production factors	50	19	25	6
Weather information	47	25	22	6
Disease prevention	42	22	24	12
Production processing	38	28	32	2
Expert Guidance	40	28	22	10
Loan services	38	33	25	4
Agriculture land	39	24	32	5
Post-harvest	48	25	21	6
Record keeping	34	24	36	6
Business opportunities	37	23	32	8
Entrepreneurial information sharing	36	25	29	10
ICT related information	38	29	26	7

4.3. To Determine the Usage Level of ICT Among Agriculture Entrepreneurs.

The third objective is to determine the usage level of ICTs among agripreneurs. The study agripreneurs enrolled in various ICT projects, particularly mobile-based initiatives, so it could be assumed that all of them had availability and accessibility to mobile phones. Similarly, in India, mobile phones are less expensive, portable, and handy during emergencies other than ICTs. Therefore, the accessibility of mobile phones is the main reason for them to use mobile phones. Additionally, apart from phones, they admitted to utilizing television and radio for accessing information, and half of the respondents also used FM radio to encounter agricultural experts and extensions. Although it suggested the existence of radio applications on mobile phones could support agripreneurs in education, and if agricultural and rural development programs broadcasted on it, most of them have access to FM radio through mobile phones. However, the ATMs also have high availability, but only a minority of the respondents in this research used them. Furthermore, many of them watch YouTube, and only a small percentage of agricultural producers are educated and have access to the internet usage of web-based services like Facebook, e-mail, and e-books, which are extremely limited in use in the research area.

Figure 2: Level of ICT usage (n=120)

4.4. To Identify the Constraints of ICT Adoption among Agriculture Entrepreneurs.

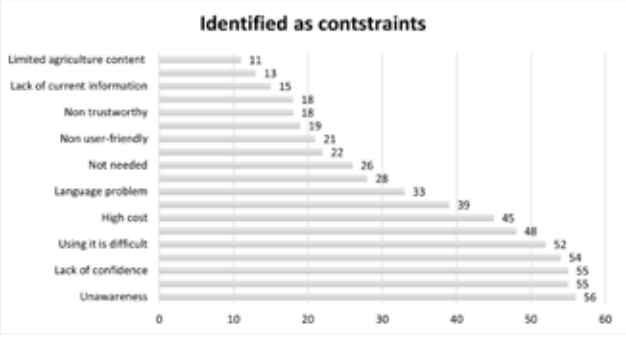
The fourth objective is to identify the constraints of using ICTs. A total of 19 closed-ended questions were created, and the top 5 obstacles among them were asked by respondents they faced while using it effectively. Therefore, the primary constraint was a need for more awareness due to less exposure and knowledge about the benefits of using them. Farmers face difficulty using them for the growth of agricultural operations as they do not know how to use them and do not have much time for them. However, farmers claimed that the cost of these tools is high and technical infrastructure is also limited.

They regard adopting it as less trusty because improper network access is a challenge.

Furthermore, due to a shortage of confidence, trust, and government support, it is difficult to argue that ICTs could assist them in their development.

Moreover, they stated that lacking technical support services and assistance is trouble while utilizing its applications and the internet. Therefore, some respondents identified that they need the proper skills and knowledge to use the primary functions of mobile phones, such as SMS and video recording. Some also cited the lowest number of repair and service centres available in their localities for repairing mobile phones and television, adding transportation charges to the fixing cost. Therefore, the usage of ICTs is limited to the youth agripreneurs, and the elderly farmers do not want to use them because they rely on traditional methods of information sharing. Furthermore, only some respondents cited insufficient funds as an obstacle to purchasing it. Similarly, English becomes a barrier while using mobile phone applications and the Internet as they are only comfortable with their native languages. Figure 3 presents the main constraints.

Figure: 3 Constraints of ICT adoption



5. Discussion and Conclusion

Although the literature on ICTs for agripreneurs, this study identified that availability and accessibility levels of ICTs are high; mobile phones, followed by television and radio, are commonly used in research areas. Similarly, the result indicates that all respondents, even uneducated agripreneurs, use mobile phones comfortably. Furthermore, the purpose of widely used ICTs is to access information services on the market, production factors, weather, disease prevention, production processing, expert guidance, and loan services. In addition, young agripreneurs are using the internet to obtain information services on profession and employment opportunities, access academic materials, and understand the basics of computer courses. Moreover, they need help using it effectively and need more knowledge, awareness, confidence, time shortage, less experience, high cost, insufficient technical infrastructure, and language problems. Since the adoption level is increasing positively, it is considerable to conduct possible efforts to fulfil the needs of the agriculture community to benefit as much as possible from improved access to information facilities for development purposes.

5.1. Policy Implications

- Based on the study findings, the following suggestions are proposed.
- Radio program broadcasts suggest disseminating agricultural information.
- The Internet infrastructure facilities should be enhanced satisfactorily with proper penetration at the agripreneurs locations.
- To improve agripreneurs' confidence, awareness, and skill in using ICTs, agriculture state departments, research organizations, and their linked departments should support more awareness campaigns.
- It would be advisable to use renewable energy sources, such as solar panels, especially in rural areas, to deal with the unpredictable and irregular power supply.
- There should be improved engagement with social media and young people in rural areas to improve communication between them and agriculture extension agents.
- There needs to be more repair facilities at the local level; therefore, it is advisable to develop technical training centres for young people.
- Animal menace is a big problem faced by the agricultural community, so it is advisable to facilitate them to overcome these difficulties through technological advancements.

5.2. Practical implications

This research presents empirical importance for adopting ICTs by agripreneurs, and it enhances our understanding of encouraging the farming community towards agriculture digitalisation. In conclusion, recognising the importance of ICT for agripreneurs is the first step towards driving positive change in the agricultural sector. Policymakers have a crucial role in creating an enabling environment that harnesses the potential of ICTs to improve productivity, increase income, and ensure food security for agripreneurs and the broader population. By implementing these policy implications, governments and stakeholders can pave the way for a more resilient and sustainable agripreneurship sector in the digital age.

5.3 Limitations

The study findings improve our knowledge of the relationship between the variables. Although, it also has some restrictions that construct roadways for future research. First, the study decided on respondents based on a sampling technique that is convenient to them, which has drawbacks regarding the generalizability of the results. Furthermore, this research was performed in Uttarakhand, and there is a high chance that other states may have different outcomes due to differences in knowledge, behaviour, skills, and the nature of additional agripreneurs.

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