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### Utilization of ICT in Krishi Vigyan Kendra (KVK) system for agricultural development

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#### Abstract

Agricultural systems are under a lot of stress due to growing population and climate change. The ICAR Institutes, SAU and *Krishi Vigyan Kendras* spread all over the nation - responsibility of developing, refining and disseminating the technologies to farmers. Limited extension staff and monetary limitations make the agriculture extension more challenging. The National Commission on Farmers has discovered that this information lacking situation leads to less efficiency and productivity in agriculture. Promotion of Information Communication Technologies (ICTs) for agricultural growth is one way of satisfying the information needs of farm community. This review discusses the concept of ICT, focusing on its utilization, challenges, applications in KVK system. It also highlights the role of ICT in Agricultural Extension System.

**Keywords:** Krishi Vigyan Kendra (KVK), ICT information communication technology, extension system

#### Introduction

Agriculture is Rising global temperatures, shifting rainfall patterns, and the increasing frequency of extreme weather events-such as droughts, floods, and hurricanes-poses significant risks to agricultural output. According to the Food and Agriculture Organization (FAO), by 2050, global food production will need to increase by 60% to meet the growing population's demands, yet climate change is expected to significantly reduce crop yields and disrupt global food systems (FAO, 2016). ICT or Information and Communication Technology is the gathering, processing, storage of information and retrieval and dissemination done through the combination of telecommunication, computing, and broadcasting technologies to meet the information gathering, processing and dissemination needs in order to find effective and efficient methods of achieving these goals. ICT in agriculture/rural development includes, among others, computers, mobile phones, the internet, Geographic Information Systems (GIS), and multimedia platforms whose applications enable the sharing of knowledge and decision-making processes in the agricultural value chain (FAO, 2017). ICTs are also instrumental to the increased access to time-sensitive information on pest control, weather, market prices, and innovative practices thus, increasing productivity, sustainability and resilience of farming communities.

#### ICT Utilization in Agriculture: A Global Perspective

ICTs have entered contemporary agriculture and people use these to boost productivity, access markets, build resilience and make informed decisions. In the world, farming systems are being revolutionized with the utilization of mobile phones and the internet-based platforms, GIS, remote sensing, drones, and AI. The World bank (2021) estimates that more than 70 percent of smallholders across the world own mobile phones, and nearly 45 percent have access to mobile-based products, such as advisories on agriculture-related matters.

In Sub-Saharan Africa, platforms like mFarms (Ghana) and iCow (Kenya) have improved yields and input efficiency. In Latin America, tools such as Agrosmart and Digital Green support precision agriculture and extension services. Asia has also advanced significantly-China's Digital Agriculture and Rural Development Plan (2019-2025) promotes big data and IoT integration, while India's e-NAM has connected 1,000+ mandis for online trading, and 160 million soil health cards have been distributed using ICT (Government of India, 2022).

#### Integration of ICT in Extension

In India ICT has significantly transformed agricultural extension by enabling faster, more targeted, and cost-effective dissemination of knowledge. Traditional methods

often faced limitations in scalability, timeliness, and outreach, whereas ICT tools have facilitated real-time, localized, and personalized advisory services.

Key government initiatives include the mKisan Portal, which delivers SMS-based advisories in regional languages to over 100 million farmers, and Kisan Call Centers (KCCs), offering expert guidance via a toll-free helpline through a three-tier system (GOI, 2020). Mobile applications such as Kisan Suvidha, Pusa Krishi, and AgriMarket provide crucial updates on weather, pest control, and market prices.

Private agritech startups like DeHaat, AgroStar, and CropIn leverage AI, ML, and satellite imagery to offer precision farming solutions, including soil health analysis and market linkages (Ghosh, 2020) [2]. Common Service Centers (CSCs) and digital kiosks further improve rural access to digital services.

ICT tools like community radio, video-based platforms (e.g., Digital Green), and IVRS enhance outreach in low-literacy areas. However, challenges such as digital illiteracy, poor connectivity, and gender disparities remain. Addressing these through inclusive strategies and public-private partnerships is essential for sustainable, farmer-centric extension. The utilization of ICT would be fruitful by increased digital literacy of farmers.

### Integration of ICTs in KVK

The introduction of ICT in India in agricultural extension

has enhanced greatly the level of efficiency, reach and responsiveness of knowledge dissemination systems. Although the conventional extension approaches are still valid, they tend to exhibit low capacity to scale, become very expensive to operate and there is time lag. Mobile applications, SMS advisories, video conferencing, and social media tools in ICT have facilitated the real time, location based and interaction specific communication making farmers make regulated decisions.

Government services like the mKisan Portal, Kisan Call centers and applications like Kisan Suvidha and Pusa Krishi are two examples of services that provide tailor-made crop advisories in their preferred local languages to all the farming community. At the same time, commercial agriculture companies are integrating modern technologies, including artificial intelligence (AI), geographic information systems (GIS), and satellite photos, to facilitate precision agriculture (Ghosh, 2020) [2]. Extending their services Krishi Vigyan Kendra (KVKs) which fall under ICAR have been turning to ICTs by use of digital kiosks, Common Service centres (CSCs), and e-learning as well.

Furthermore, the ICT has enhanced the research-extension-farmer connection, impact tracking, and inclusive knowledge sharing especially among smallholders, women farmers, and tribal people. Despite persistent digital divides, ICT adoption is transforming India's agricultural extension landscape into a more dynamic, data-driven, and sustainable model aligned with national development priorities.

**Table 1:** ICT utilization in KVKs

Sr. No.	ICT Initiative	Description / Features	Implementing / Supporting Body
1	Kisan Mobile Advisory Services (KMAS)	SMS-based advisory on crops, weather, pest control, and market updates	KVKs with ICAR support
2	mKisan Portal & Farmer Portal	Centralized platform for sending advisories and receiving farmer queries	Ministry of Agriculture, Govt. of India
3	Interactive Voice Response System (IVRS)	Audio-based query resolution and advisories, suitable for illiterate farmers	Select KVKs in collaboration with tech partners
4	Video Conferencing & Virtual Trainings	Remote training, field demonstrations via Zoom, Facebook Live, YouTube Live	KVKs, especially post-2020 (COVID-19)
5	WhatsApp Groups	Group-based communication and sharing of images, audio, advisories in real-time	Local KVKs across districts
6	e-KVK (Electronic Krishi Vigyan Kendra)	Digital hub with expert systems, online libraries, and e-learning resources	ICAR & State Agricultural Universities
7	Mobile Apps (e.g., AgriApp, IFFCO Kisan)	Apps offering crop info, market prices, soil health, weather updates, etc.	KVKs with ICAR or private developers
8	YouTube Channels / Facebook Pages	Dissemination of videos on best practices, farmer success stories, and KVK events	Individual KVKs at district level
9	GIS and Remote Sensing Tools	Used for soil health mapping, precision farming, pest surveillance	ISRO, NRSC in partnership with KVKs
10	Digital Farmer Feedback Systems	Tablets/mobile tools for capturing feedback on FLDs, OFTs, and training impact	KVKs with ICAR guidance
11	Integration with National Digital Platforms	Contributions to eNAM, Soil Health Card Portal, National Farmers Database, Agri Stack	Ministry of Agriculture, ICAR, KVKs

### Challenges in ICT utilization in KVKs

- Digital Literacy:** A significant challenge is the low level of digital literacy among farmers, which hampers effective utilization of ICT tools.
- Infrastructure Limitations:** Issues such as poor internet connectivity, electricity shortages, and lack of technical infrastructure in rural areas.
- Cost and Accessibility:** Despite the potential of ICT,

the cost of smartphones, data plans, and other resources can be a barrier for many farmers.

- Cultural Barriers:** The reluctance of farmers to adopt new technologies due to traditional farming practices and a lack of trust in digital systems.
- Language and Regional Barriers:** The availability of ICT tools in only a few languages limits their reach, as many farmers may not understand English or Hindi.

## Conclusion

Krishi Vigyan Kendra right from 1974 i.e., 1 to 732 still now in 2023 are really playing important role in uplifting and developing the farmers in respective districts of the India. For this KVK scientists have to do different farmer and location specific extension activities. Crop specific and need based Farm advisory services by providing useful timely research information is most important activity doing by KVK scientists. The different ICT tools and services are proving its usefulness for increasing overall effectiveness and efficiency of KVK system. There are different research studies on application of such ICT tools in KVK system and still continuing to know and understand various ICT tools, their actual purpose, factors affecting such application and problems facing in application of ICTs in KVK system. There is really a great scope for application of ICTs for KVK scientists to work more productively for farming community. There are urgent challenges in front of agriculture in our country and in whole world. So, tackle these challenges both KVK scientists and farmers have to be trained regarding acquiring skills to use this ICT tools effectively. Still, only ICT applications will not enough but the combination of different traditional extension methods and modern ICT tools and services by KVKs will prove successful in reaching and helping the farming community of our India.

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