



and efficacy in the agriculture sector, as well as providing unique chances to integrate more smallholders in supply chains. Agriculture has a number of contemporary and serious issues, particularly in developing nations that are subject to price shocks, climate change, and rural infrastructural deficits.

## The Role of ICT in Agriculture

### **Regulatory policy and governance:**

Agriculturists' extensive embrace of digital technology is resulting in an exponential increase in the availability of a wide range of big data that can help with better policy-making and monitoring, as well as alter the agriculture sector.



**Agricultural extension and advisory services:** ICT, in the form of novel media platforms, bridges the gap between farmers and agricultural researchers and extension agents on the one hand, and researchers and extension agents on the other. It is a more cost-effective way for smallholders to have a better understanding of contemporary agricultural techniques and markets.

**Enhanced market access:** Through the conveyance of information from traders, ICT enabled market information services improve farmers' access to neighboring markets and their awareness of current customer wants. ICTs also encourage agri-stakeholder networking, facilitating expanded market access for inputs as well as product marketing and trading.

**Environmentally sustainable agriculture:** Low-cost mobile phones, the internet, and other information-dissemination services, as well as better access to climate-smart solutions and the necessary knowledge to employ them for rural farmers.

**Early warning system (EWS) for disaster management:** ICTs give governments and communities with actionable and real-time information on catastrophe prevention and management. They also improve the efficiency of emergency response activities and promote more effective communication by giving people with timely advice on risk reduction techniques.

**Food safety and traceability:** A combination of simple and sophisticated technologies, such as mobile phones, software solutions, RFID tags, and data input websites, and GPS-enabled sensors, among others, enable producers to capture and monitor reliable data while also complying with international traceability and food regulations.

**Financial inclusion and risk management:** ICTs improve rural and smallholder farmers' access to financial services by allowing them to discover affordable insurance schemes and risk management instruments, as well as providing them with knowledge about the financial services that are accessible to them.

**Building capacity and empowering people:** ICTs play an important role in the development of local communities as educational instruments. They extend the reach of women, youth, and other beneficiaries, as well as new business prospects, allowing them to improve their livelihoods and incomes.

**ICTs and Farmers' Advisory Services:** Telephone-based Tele Advisory Services, mobile based Agri Advisory Services, television and radio-based mass media programmes, web-based online Agri Advisory services, videoconferencing, and the Online Agri video Channel, among other traditional media such as printed literature, newspapers, and farmer's exhibitions/fairs, are the most widely used and available tools of farmers' advisory services. Most agricultural institutes and organizations have their own telephone-based advisory services for farmers, which provide real-time information and advice via a dedicated phone number. Kisan Call Centers (KCC), an on-line phone-based expert assistance service

developed by the Ministry of Agriculture, Government of India, has been available to all citizens of India since January 2004. The toll-free number "1800-180- 1551" is available 24 hours a day, 7 days a week, from 6 a.m. to 10 p.m. Outside of these hours, calls are answered via an Interactive Voice Response System (IVRS). Agri Advisory Services for Mobile Phones provides text, voice, and video content based Agri information services via mobile phones. Mobile phones are becoming an indispensable tool for all types of users, regardless of age. In India, mobile technology has ushered in a fundamental shift in the way people communicate with one another. Community radio is one of the most essential ICT instruments for giving farmers and people a voice and assisting in community development. A community or people of a community own and run community radio.

**ICTs in Animal Disease Management:** In a time when natural resources are becoming scarce, the agricultural industry faces a fundamental challenge: expanding productivity to feed a rising and increasingly wealthier population. Water shortages, deteriorating soil fertility, climate change effects, and the rapid loss of fertile agricultural lands owing to urbanization are all causes for concern. However, rising demand, notably for higher-quality products, provides opportunity for rural populations to improve their livelihoods. To take advantage of these opportunities, producers and handlers of agricultural products must adhere to progressively stringent quality requirements and regulations. To meet these issues and improve the livelihoods of the rural population, new approaches and technological advances are necessary. Evidence of ICT's assistance to agricultural growth and poverty alleviation is becoming increasingly available, despite the fact that it is still a relatively young phenomenon. Knowledge distribution, social interaction, economic and business practices, political engagement, media, education, health, leisure, and entertainment are all expected to be transformed by ICT. Through the creation of information-rich societies and the support of livelihoods, ICTs may play a vital role in fighting rural and urban poverty and fostering sustainable development. If ICTs are used correctly and recognize the differences in requirements between urban and rural people, they can become strong economic, social, and political tools.

**ICTs for Women's Empowerment:** The use of ICT for women's economic empowerment is fraught with difficulties. Using and benefiting from ICT necessitates knowledge, training, inexpensive access to technology, user relevant information, and a lot of help (to create an enabling environment). If ICTs are to be used for women's economic empowerment, there is little doubt that access to inexpensive services and infrastructure is a must.

**Soil Quality Assessment Using ICTs:** Soil quality can be assessed at the farm level as well as at the regional level. It can be done at the regional level based on soil, climate, and land usage. Some useful technologies aid in comprehending the nature of soil and the difficulties that it faces as a result of management techniques. In recent years, information and communication technologies (ICTs) have taken on various new forms. The scope of the assessment of natural resource status has also expanded. Some beneficial technologies, such as remote sensing, are used to analyze soil quality. Remote sensing is a technique for gathering information about an object from a distance. To do this, geographers use a variety of mechanical instruments. These gadgets have advanced sensors that can collect data from objects via the reflection or emission of radiation. Remote sensing devices are designed to detect specific wavelength bands. The items being felt have distinct spectral characteristics, which must be matched to the sensor. A boundary has been drawn around the area where productivity has been observed to be declining. Visual observations are used to collect and analyze remote sensing products for low productivity.

**ICTs for Market Intelligence:** The lack of reliable and timely market information in the agri-input industry is a problem at the continental, regional, national, and local levels, and it continues to be a major impediment to the global expansion of agricultural business links and



trade. Public and corporate entities are continuing to make significant progress in implementing market information services utilizing advanced information and communication technology (ICT) capabilities. The intricacies of the fertilizer, seed, and crop protection product value chains, on the other hand, remain significant barriers to integration into larger information systems. Even the most isolated parts of the continent are benefiting from the information provided by advanced technology, thanks to rapidly increasing access to cell phones and computer centers.



## Conclusion

The greatest communications revolution in recent years has been the evolution and availability of ICTs. Any knowledge transfer should take into account farmers' perspectives in order to build on and benefit on their knowledge. The decreasing cost of hardware, the expansion of communication network reach, and the availability of the same at the district and sub district level have created a huge opportunity for agricultural scientists and extension workers to reach out to farmers in a more focused, precise, and specific manner.

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