

Role of Information technology in Sustainable Agriculture and food security

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Background

- **United Nations SDG goal 2:** “End hunger, achieve food security and improved nutrition and promote sustainable agriculture “
- **SDG 2.4:** By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding, and other disasters and that progressively improve land and soil quality.
- SDG 2 can only occur through the promotion and adoption of sustainable agriculture in the form of a food production and delivery system that meets society’s needs in the present without compromising the needs of future generations.
- **Sustainable agriculture** embraces the environmental, economic and social conditions that challenge food security. By taking a whole systems approach, agriculture, when done sustainably, has the potential to relieve hunger and create lasting change.

How sustainable agriculture can be achieved?

- Sustainable agriculture can be achieved when the farmers are supplied with adequate, appropriate, accurate and timely information. Agricultural information has a key role in facilitating the participation of people

- relating to sustainable development.
- Globally, the emerging concept of **e-agriculture** incorporates the sophisticated use of innovative information and communication technologies (ICT).
 - ICTs have the potential to revolutionize the agricultural sector due to their **affordability, accessibility, and adaptability**. This technology empowers different stakeholders involved in the value chain to perform tasks quickly, efficiently, and with greater ease and accuracy.
 - ICTs can help farmers improve local economies and the quality of life by making **informed decisions**. These ICT tools can be our new arsenal in the fight against hunger and in feeding the billions.

ICTs for Improved Prediction and Monitoring

Monitoring of environmental and soil conditions can make farming more profitable and sustainable and can lead to increased productivity, significant profits and savings. In this regard, ICTs can be useful for various purposes including land-use planning, crop forecasting and early warning systems.

In addition to that, ICT tools can enable farmers to exploit their farming potential by getting timely, accurate and relevant information on sustainable agricultural practices, water management, pest and disease control, soil testing and post-harvest management techniques.

Information Sharing

Information and knowledge play a key role in enhancing sustainable agricultural development and addressing food security.

ICTs can provide farmers with useful and beneficial information, such as new farming techniques, weather reports, and crop prices. This is also referred to as e-agriculture and the **following are some practical examples of this use of ICTs:**

- **Rural Radio: Radio is a relatively inexpensive communication medium and has fairly wide coverage. It can provide farmers with information about farming conditions. These radios do not only aim at modifying agricultural methods but they also aim at changing the state of mind through profound behavior modifications.**
- **Mobile Phones:** The use of mobile phones to distribute food market information offers great advantages for consumers and food producers. Farmers can use mobile phones to receive text messages with market information on commodities (market price, supply, and demand).

For example, e-Choupal in India and **Trade net** in Ghana offer mobile phone and web-based services that help farmers achieve better yields and secure better prices by allowing them to receive accurate weather forecasts and local price information direct to their mobile phones, and in their local language. In addition, the use of mobile phones has become more common for exchanging information such as for disease surveillance and pest tracking.

- **Tele-centers: Community telecenters in rural areas with access to the Internet, telephone and fax services can play a vital role to make relevant information available to the farmers. Farmers can use these services to enhance communication with potential buyers and to access information on improved farming techniques.**
- **ICTs and Agri-Markets:** With the help of ICTs farmers can get information on the location of profitable agri-markets, enquiring about who is paying the highest price and even contact their potential buyers to sell their products online. They can also benefit from mobile banking and government credit programs with reduced transaction costs. Apart from this, there are more-specialized applications, esp. software, for supply chain and financial management that can increase the accuracy of the farm operations.

ICT-enabled marketing and access to markets plays a major role, especially for information on market prices and demand. ICT-enhanced marketing and certification strengthen the capacity of small-scale producers to increase revenue by improving their position on local and international markets.

Bridge the Communication Gap

- ICTs can help bridge the communication gap and improve the interaction between farmers and agri-scientists to better identify farmers' specific problems. Researchers can get critical agricultural information like the incidence of pests and crop-yields using mobile-based applications. Data collection is faster than traditional methods; more people can be interviewed in less-time using minimum resources.
- By 2015, when monitoring of the Millennium Development Goals ended, 72 of 129 countries reached the Millennium Development Goal 1 to halve the number of hungry people or reduce it to below 5 percent, from 1990 to 2015.
- 500 million small farms provide up to 80 percent of the food consumed in a large part of the developing world. Investing in technology and building ICT skills of farmers help to ensure food security for the poorest populations and consistent food production for local and global markets and can also help to achieve the goals for a sustainable development model.

ICAR 2025 – Vision Document

The Indian Council of Agricultural Research (ICAR) 2025 Vision Document outlines following technology drivers of food and agriculture systems in India, and suggests the need to integrate the research agenda of both ICAR and National Agriculture Research and Education System (NARES):

- Convergence across Bio-Technology (BT), Nano-Technology (NT) and Information technology (IT) for technology

- advancement in the Agriculture and Food sector
- Innovations in Industrial sector – Advanced Technology in Agriculture and Food Processing, Robotics and Automation in Agriculture and Food sector
 - Energy-Efficient and Environment-Friendly (EEEF) Devices for farm operations to compensate for the growing shortage of farm labour
 - Developments in Bio-Technology and other Frontier Sciences
 - Genetic improvement, through conventional techniques and frontier scientific techniques, of agricultural commodities by using huge in-situ and ex-situ collections of genetic stocks of crops, animals, fishes, insects and microbes, collected and available with ICAR
 - Information technology (IT) systems – the core component in the transition from breakthroughs in labs to field-scale implementation
 - Precision farming: A combination of Systems-Research Tools relating to Information Technology, Geographic Information Systems (GIS), Global Positioning Systems (GPS), Remote Sensing (RS), and climate-smart resource management technologies
 - Smart sensors and new delivery systems to help combat viruses and pathogens
 - High-Performance Computing (HPC) for manipulation of very large data sets, particularly those related to agricultural genomics, proteomics, geo-informatics and climate change
 - Smart Knowledge Agriculture Corridor (SKAC)
 - An effective regulatory approval process for new technologies, which allow farmers to gain access to the latest technological advancements, to be put in place.

This Vision Document clearly perceives the need for a regulatory process for new technologies so as to allow farmers to gain access to latest technological advancements, and also the fusion of technologies for achieving higher level

productivity in food and agriculture systems