

Modernization of Agriculture: An Essence of Agriculture 4.0

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Abstract

Agriculture 4.0 signifies the transition from a conventional to a modern approach through the use of artificial intelligence, robotics, or other smart gadgets. The use of technology boosts the efficiency of farmers and enhances their earnings. Considering that both the Union and State Governments are willing to construct digital infrastructure and educate farmers. The first step toward modernizing agriculture is to enhance digital awareness among farmers. This study aims to comprehend the government's digital programs and Information and Communication Technology (ICT) initiatives, farmers' awareness levels, and the limiting factors for the implementation of digital inclusion programs. The research was carried out in the Tumkuru district of Karnataka, and both primary and secondary data were used. The outcomes suggest that the majority of farmers have a basic understanding of ICT tools and are willing to participate in the digitization process.

Keywords: Agriculture, Digitalization, Digital Awareness, Farmers, ICT

JEL Classification Code: Q13, Q16

1. Introduction

Digitalisation and ICT are the buzzing twines of the 21st century. They can leverage any operations by using electronic devices. Digitalisation is the process of applying technology to the business and conversion of information into digital format; It enables easy, customised, cost-effective and user-convenient operations. ICT refers to a diverse set of technological tools and resources used to transmit, store, create and exchange information. Digitalisation ICT is omnipresent it can be applied in every dimension of human geography. Today Digitalisation and ICT are extensively used in the service sector followed by the industry and agriculture sectors of the economy.

Agriculture being an unorganised activity is practiced mostly by rural households. Lack of literacy and poor digital infrastructure are the major challenges associated

with the rural area. Digitalisation can transform the process by making it more convenient. Implementation of ICT in agriculture helps in imparting education and training to rural farmers, market access, and transparency in market operations, thus it expands the rural market.

The process of Digitalisation started in the year 2015, when the Hon'ble Prime Minister of India launched the program *Digital India* with the mission of *Power to Empower*. The objective of Digitalisation is to empower the citizens digitally. Agriculture 4.0 refers to smart farming by using modern technologies like Artificial intelligence, Robotics, Drones, and IoT. For applying modern technology, the farmers have to be digitally literate and basic understanding of ICT tools. Therefore, the study attempts to evaluate the digital literacy level with ICT awareness among the farmers in Tumkuru district of Karnataka.

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2. Review of Literature

A review of literature involves referring to previous studies. It gives insights and expands the knowledge of researchers. The researchers reviewed various peer-reviewed journals some of them are as follows,

Goller et al. (2021), in their research titled “Digitalisation in agriculture: Knowledge and Learning”, concluded that Digitalisation in agriculture has a positive impact on farmers. Farming became more flexible. It saves time and thus enables work-life balance due to a reduction in manual work. It requires farmers on permanently on duty and beware of the risk associated with the introduction of technology. It helps greatly the younger farmers who are not much aware of the traditional model.

Haque and Hoque (2021) conducted ex-post facto research on the utilization and effectiveness of ICT in agriculture by considering 250 sample respondents from the Thakurgaon District of Bangladesh. The author concluded that the majority of households utilized ICT in agriculture. The government should ensure high-speed internet and an uninterrupted power supply. He added that authorities should provide regular training to farmers to achieve effectiveness in ICT-enabled agriculture.

Purohit and Purohit (2021) discussed that the internet of things is an emerging technology being used in every field. digitalisation helps in the augmentation of traditional to modern ones. Internet of Things (IoT) based agriculture promotes production efficiency; enhances the quality of production, supply chain management, and quality control. Monitoring of climatic conditions, crop management, cattle monitoring, and end-to-end farm management systems can be achieved through smart farming. Rapid technological advancement and digitalisation led to a revolution in agriculture.

Upadhyay (2019) found that digitalisation transformation enables multi-dimensional holistic development in agriculture. The usage of ICT in agriculture helps the farmers to make decisions based on climatic conditions, soil conditions, and marketing modes. High and sustainable growth can be achieved through Digitalisation. It reduces cost and ensures a good return. The farmers need the motivation to adopt cost-effective and environmentally friendly technology.

Anitei et al. (2021) In this study, the researchers have discussed the significance of agriculture in society, particularly in light of the recent pandemic, which has underscored its importance. This study highlights the potential for accelerated digitalization in the agricultural sector. As the world emerges from the pandemic, the abstract suggests that countries will likely reassess their priorities and allocate investments accordingly, with agriculture becoming a key focus. To gain insights into the challenges and needs of farmers in the context of digitalization, the abstract mentions the use of a questionnaire-based research approach. The researchers have collected data from both experienced Romanian farmers and business experts in agriculture.

2.1 Research Gap

After an extensive review of numerous research articles, the researchers identified a noticeable gap in the existing literature pertaining to the impact of digitalization and ICT on the modernization of agriculture. In other words, there has been limited research conducted on how these technologies are influencing and contributing to the modernization of agricultural practices.

2.2 Objectives of the Study

1. To understand initiatives of e-governance in agriculture.
2. To know the ICT awareness among rural farmers
3. To identify the challenges involved in the modernization of agriculture.

2.3 Scope of the Study

The research was conducted with the aim of assessing the government’s e-governance initiative and evaluating the level of ICT awareness among rural farmers. The study specifically focused on the population of farmers in the Tumakuru district. Consequently, it does not encompass farmers from regions outside the Tumakuru district.

3. Research Methodology

The study is descriptive in nature. The study is based on both primary and secondary data. The primary data was collected by distributing questionnaires to the farmers. 50 samples were selected for the study by using the Simple Random sampling technique. Data was gathered from

a group of farmers chosen at random from the APMC yard situated in Batawadi, Tumakuru. The secondary data was obtained through referring journals, magazines, newspapers, and government publications.

4. Government Initiative towards e-Governance in Agriculture

i. Digital India

The Honorable Prime minister of India introduced the Digital India program on July 1st 2015 focusing on three areas namely:

1. Providing digital infrastructure as a source of utility to every citizen.
2. Governance and service on demand.
3. To look after the digital empowerment of every citizen.

Agriculture is the largest sector in terms of population engagement digital India cannot be fulfilled without the digital inclusion of farmers. Therefore, the Union Government introduced various digital education initiatives for the well-being of the farmers. A few initiatives are in order.

ii. Soil Health Card Scheme

The Department of Agriculture and Cooperation implemented Soil Health Card Scheme in 2015. Under this scheme, the soil sample of individual farmers' will be tested in laboratory to test the quality of the soil. The experts will test the nutrition level in the particular soil. Based on the result, the authority will issue a soiled card that contains the recommended fertilizers and nutrients for the individual farmland. This scheme will ensure the balanced use of fertilizers and helps to achieve sustainability in agriculture.

iii. National Agriculture Market (e-NAM)

Ministry of Agriculture introduced e-NAM an online unified national trading platform for agricultural commodities. It brought the sellers, traders and buyers together and facilitates all of them to discover the best price. Through the app, the farmers can see the progress of their lot being traded on a real-time basis. Transactions taken place through the e-NAM mobile app and payment will be done through NEFT, RTGS, Debit card, Internet

banking, and UPI mode. The state can enact law and add a provision to the APMC act to promote e-NAM.

iv. Bhoomi Online

Bhoomi online, the digital initiative, is jointly implemented by the Government of Karnataka and the Union Government. The National Informatics Centre is responsible for the implementation and development of the project. It enables the Digitalisation of land records and creates a software mechanism to control the land registry. Under this project, the government hires 12th pass youths. They visit households directly and collect and verify land details digitally.

v. National e-Governance Plan in Agriculture (GPA)

NeGAPA was introduced in 2010 with a vision of rapid development through timely access to agricultural data for the farmers. Under the scheme, funds are released for the establishment of digital infrastructures like computer training labs, and the installation of hardware and software systems. It envisages the use of Information and Communication Technology to augment existing delivery channels provided by the departments and their agencies.

vi. M-Kisan Portal

M- Kisan portal was launched by the Hon'ble President of India on 16th July 2013. This portal was dedicated to sending messages/services/ advisory to farmers from the various departments and agencies for agriculture and the allied sector.

vii. Crop Survey App

The government of Karnataka launched Crop Survey to have clear data about crops sown and the type of irrigation adopted across the state. Through the mobile app, the farmers have to capture crops sown on their land along with photos and submit the same. These single, verified sources of data can be utilized by various departments in connection with agriculture including banks and insurance agencies.

viii. Meghdoot App

Meghdoot is a joint initiative of the India Meteorological Department (IMD), the Indian Institute of Tropical Meteorology (IITM), and the Indian Council of Agriculture Research (ICAR) to provide critical information simply and easily. It seamlessly aggregates

contextualised district and crop-wise advisories and it forecast weather information every Tuesday and Friday.

ix. Kisan Suvidha

Kisan Suvidha app was developed by the Department of Agriculture, Cooperation and Farmers Welfare in collaboration with the Mobile Seva Team. It gives information on Weather, Market prices, Farm input dealers, Pest and Crop Diseases identification and management, and Advisories sent by experts at district/blocks.

x. e-Sahamathi

e-Sahamathi is an electronic platform introduced by Government of Karnataka which enables farmers to sell their products directly to the retailers by surpassing conventional APMC Mandis. e-Sahamathi allows the farmers to share their data with retailers and helps in discovering the best suitable price for their products.

xi. Kisan Rath

Kisan Rath app has been developed by the National Informatics Center (NIC); it enables farmers and traders across the country to transport the farm produce by establishing a connection with the transporter. Through the app, the farmers can post their order, then the transporter at another end can view the details of the order and communicate with the farmer for further operations.

xii. Crop Insurance App

The crop insurance app enables a farmer to calculate the premium of the insurance based on crop, area covered, and other factors.

xiii. AgriMarket Mobile App

This app was developed by Ministry of Agriculture to assist the farmers in selling their crops for the best price. The app uses GPS to discover the market within a 50-kilometer radius.

4.1 ICT Awareness among Farmers

Awareness of ICT tools among farmers perform basic requirement to up-gradation. In this context awareness implies basic know how of ICT tools. The researchers categorised the respondents on the basis of age group and studied the awareness of ICT among farmers of select district.

Table 1 depicts the awareness level of ICT gadgets among farmers by considering across the entire age stream. Here, the awareness represents basic know-how about the ICT tools. Among all ICT tools used to know awareness - TV and Mobile are emerged as the most popular devices to have a connection with farmers across the entire age stream. Majority of farmers (48) are aware of TV followed by Mobile (46), Radio (41) and Computer (06).

Communication models plays crucial role in dissimilation of information. In this study the awareness of communication models are categorized according to the age group of farmers. Table 2 represents the awareness level of communication models among farmers.

Table 2 represents the awareness level of communication models among the farmers according to the land holding pattern. Kisan Call Centre is emerged as the most popular communication model across every size of land holding

Table 1. Awareness of ICT Tools among the farmers

ICT Tools	Radio		Television		Mobile		Computer	
	Aware	Unaware	Aware	Unaware	Aware	Unaware	Aware	Unaware
<30	04	03	07	00	07	00	02	05
31-40	16	03	19	00	18	01	03	16
41-50	18	02	19	01	18	02	00	20
>51	03	01	03	01	03	01	01	03
Total	41	09	48	02	46	04	06	44

Source: Sample Survey

Table 2. Awareness of communication model among farmers

Parti-culars	Email		Video conference		e-NAM		Mobile app		Kisan Call center(KCC)		Agri-portal	
	Aware	Un-aware	Aware	Un-aware	Aware	Un-aware	Aware	Un-aware	Aware	Un-aware	Aware	Un-aware
<30	06	01	03	04	04	03	06	01	04	03	0	07
31-40	06	13	05	14	02	17	09	10	12	07	02	17
41-50	04	16	01	19	0	20	08	12	13	07	02	18
>50	01	03	0	04	0	04	03	01	02	02	0	04
Total	17	33	09	41	06	44	26	24	31	19	04	46

Source: Sample Survey

with 62 per cent awareness followed by a Mobile app of 50 per cent. The study shows that the majority of farmers are not aware of emerging e-trading platforms e-NAM, video conferencing, and agri-portals. Therefore, it can be said that farmers are still unaware of communication model other than KCC and Mobile apps.

4.2 Limiting Factors for the Modernization of Agriculture in India

The idea behind Digital India is to modernize India in every dimension. Since 2015 Government of India is aggressively planning to implement an ICT eco-system in agriculture to enable operations transparently with less cost. Despite these efforts, the farmers were not able to capitalize it properly because of various limiting factors. A few of them are discussed here;

i. Infrastructural Barrier

By the end of 2021, India has 47 per cent network coverage (Statista.com). Network issues presented in rural areas will become a major limiting factor for the implementation of ICT.

ii. Digital Illiteracy

The agriculture sector has the lowest level of digital literacy, which is 13 per cent (Ideas for India, 2021). The illiteracy discourages the digital inclusion initiatives of the government.

iii. Economic Barriers

According to a study, 20 per cent of Indian farmers are living in Below Poverty Line (BPL) (Mehta, 2019). The

purchasing and maintenance of modern equipment require more investment that rural farmers cannot afford.

iv. Non-economies of Scale

In the Indian context, small farmers (<5 Acres) represent 85 per cent of the country's farmers (Sing, 2021). The fragile land holding discourages capital investment because of insufficient return.

v. Shifting of Trend

Nowadays, the youths are shifting from primary sector towards secondary and service sector as a result of cultivable wasteland in is increasing. The outcome of Mapping Cycle published in 2019 as wasteland Atlas of India reveals that 17 per cent of Geographical area comes under wasteland (Pardikar, 2021) . It is a crucial challenge for the state to attract youths to agriculture

vi. Cultural Barriers

Indian farmers have an emotional touch with the traditional practices of agriculture; they are not easily adapted to the change. These cultural barriers may hinder the modernization of agriculture.

5. Discussions and Conclusion

Modernization of agriculture fosters rural development. This transformation ultimately leads to the economic and social betterment of society. In the Union Budget 2022, the government planned to spend 1.24 lac crore (03 per cent) on agriculture with the view of providing digital and hi-tech services to the farmer. Apart from this, the government intends to launch the Public-

Private Partnership (PPP) model for the advancement of agriculture. So far, the government has launched an e-platform from the selection of inputs to the marketing of agricultural produce across the nation. The addressing of limiting factors would augment the modernization of agriculture.

5.1 Suggestions

The study offers the following suggestions,

1. Since TV and mobile are extensively used by the farmers, it would be more effective to broadcast various awareness program through these ICT tools.
2. The farmers are still dependent on the traditional Kisan Call Centre, the state should promote the usage of the advanced communication model by conducting an ICT awareness Campaign at the Panchayath level.
3. The state should extend subsidies toward purchasing modern tools, it will promote modernization.
4. The state should promote the consolidation of land holding by promoting traditional group farming methods.
5. Cultural waste land should be minimized through campaigns at grass root level with the association of educational institutions and local service organizations.

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