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Popular Article

Digital Seeds of Change: ICT-Driven Innovations in Indian Agriculture

Vidhi Rani[1], Amarpreet Kaur[2]
[2]Project Coordinator, ASSOCHAM Foundation For Corporate Social Responsibility
[2]Project Officer-Communications and IEC, Centre for Environment Education
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India is entering a pivotal phase in its economic evolution, where transforming demographic potential into sustainable growth remains a key challenge. Digitalization has emerged as a cornerstone of this transformation, driving both economic and social progress. In a nation where agriculture forms the backbone of the economy—contributing approximately 21% to the Gross Value Added (GVA) [i] and serving as a primary livelihood for millions—the sector faces mounting challenges. These include gaps in knowledge, operational expertise, food security, and other socio-economic barriers affecting rural communities.

Information and Communication Technology (ICT) has become a transformative tool for overcoming these hurdles, unlocking opportunities for rapid growth and modernization. By leveraging ICT, rural communities can access new technologies, gain valuable insights, and disseminate knowledge through strategic and innovative approaches. [ii]This integration of ICT is not only redefining agricultural practices but also enhancing the livelihoods of farming communities. The World Summit on the Information Society (WSIS) identified E-agriculture as a critical driver for rural development, emphasizing the role of ICT tools like computers, the internet, Geographic Information Systems (GIS), and traditional media such as television and radio[iii]. India's digital journey gained momentum with the launch of the Digital India Initiative in 2015, which aimed to extend internet connectivity to every corner of rural India. This initiative empowered farmers by providing access to digital agricultural services, e-commerce platforms, and weather forecasting tools.

India started its digital journey by launching the **Digital India** Initiative in **2015** aimed to enhance the accessibility of the internet to every corner of rural India, primarily focused on enabling farmers to access digital agricultural services, e-commerce platforms, and weather forecasting tools[iv]. Today, Digital India has successfully established the Government to Citizen (G2C) setting in the

country. Under the program, **India BPO Promotion Scheme (IBPS)** and the **Northeast BPO Promotion Scheme (NEBPS),** with the vision of enhancing employment opportunities within the vast domain of agriculture[v]. However, with the aim of boosting digitalization, in September 2024, the budget for Rs. 2817 Cr approved by the Union Cabinet for the **Digital Agriculture Mission** with the aim of transforming the agriculture sector of India into a strong **Digital Public Infrastructure** (DPI).[vi]

Role and application of ICT:

ICT helps in building the capacity of the farmer community by helping in gaining information on cropping patterns, use of yield seeds, fertilisers and its applications, pest and disease control, etc. As a vital role, the geographical information system (GIS) is drastically opening new opportunities for agriculture experts, development practitioners and farmers. Furthermore, the role of ICT is not only limited in spreading awareness but also it inculcates and ensures **food security and nutrition**[vii]. The platform has extended its services by ensuring the proper between suppliers and farmers, from production to storage of food in distribution and consumption. ICT extends its application from production of enough food to managing the entire food chain at every stage. The reason behind increasing suicide rate among farmers happened because of lack of proper financial support, readily available information, crop diseases, unnecessary labour charges and inadequate market information[viii]. By enabling market linkages, it connects farmers directly to the consumer with estimated cost and eliminates intermediaries.

Implementing and inculcating innovative technology to streamline agriculture-based practices helps in reducing costs and improving yield. **Satellite sensors** help farmers crop measurements for identifying biophysical properties such as crop height, crop development stage, vegetation index (NDVI), leaf area index. By providing historical information based on scientific data for understanding land use changes, following crop development guidelines, and identifying environmental changes with the span of time.[ix] Through various platforms such as mobile applications providing real-time information, pest and disease management, market prices and weather forecast. ICT has played a vital role in empowering women farmers by enhancing accessibility to information, resources and markets[x].

Government Initiatives for promoting ICT and addressing SDGs:

Various Government, NGOs, private limited and co-operative entities have been working in the agriculture sector to enhance farmer's well-being and establish market linkages for the cost-effective selling of their production. Under the **Skill India mission** various capacity-building and training programs were launched like **Pradhan Mantri Kaushal Vikas Yojana (PMKVY), National Apprenticeship Promotion Scheme (NAPS), e-Skill India, Skill India Digital Hub (SIDH), UDAAN, Vocationalisation of Education.** While the Skill India Mission focused on

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Entrepreneurship Development and skill development programs, similarly, **Make in India,** and **Startup India** pushed the country's inclusive capacity of Indian farmers.[xi]

The digital divide is prominently making an unfortunate difference among rural and urban demographics, which is responsible for lacking the accessibility to ICT. The Government of India is dedicatedly working to establish and enhance the broadband internet accessibility for building the capacity of rural people for digital development. The Government of India (GOI) introduced the **Rural Broadband Policy Framework (RBPF)**[xii] with the aimed to combat the digital divide faced by the rural communities in India. **BharatNet** is one the largest rural projects aimed to provide **Optical Fibre Cable (OFC)** connectivity to all the Gram Panchayat Network Limited (BBNL). To enhance the accessibility of the internet, a vast network of community Wi-Fi hotspots, the **PM-WANI** scheme was launched, while to robust digital infrastructure, **Bharat Nidhi Project** was launched for financial inclusion[xiii].

However, the increment of Internet Subscribers was prominent as compared to 2004, which was 13.5% and it rose by 52.4% in 2024. As per the report by Ministry of Communications, the aggregate of Internet Subscribers is **954.40 million** in India, out of which **398.35 million** Rural Internet Subscribers in March. As of April 2024, out of **6,44,131 village**[xiv], **6,12,952 villages** have 3G/4G mobile connectivity. Apart from this, different ICT initiatives have taken up to disseminate updated information and establish market linkages for selling and educating farmers, some of them are covered as below:

Table: ICT initiatives

Initiatives	**Launched by**	**Implementing year**	**Description**
AGRISNET (Agriculture Information Service Network)	Department of Agriculture and Farmers Welfare, Government of Tamilnadu	2010	The aim is to establish network informational or IT enabled services existing at district and block level to the farming community. Also, digitalization of different offices in the states.
Agmarknet	Ministry of Agriculture & Farmers Welfare[xv]	2000	The objective of this initiative was to digitalise all the markets across India and provide daily market cost to disseminate fair crop prices.
Akashganga	Dairy Cooperative Society (DCS) in Gujarat	1997	The initiative was launched to facilitate effective collection, procurement of milk and generating proper income for dairy farmers.
eSagu (Sagu" means	Indian Institute of Information	2004	By disseminating updated IT-based personalised expert advice on sowing step to small scale farmer's door-step.

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cultivation in Telugu language)	Technology (IIIT)		Establishing advice of agriculture experts about the crop production and its planning based on the situation disseminating through digital photographs or texts.[xvi]
e-Arik Project	DSIR, Ministry of Science & Technology, Government of India.[xvii]	2007	A platform where all the farmers were assisted with expert consultation on crop planning, protection and establishing market linkages. All the necessary and required methods of communication tools were equipped to facilitate the real-time information and assistance.
eNAM	Ministry of Agriculture and farmers welfare	2016	eNAM is a pan-India online trading portal. By creating a central online platform of existing APMC (Agriculture Produce Marketing Committee) / Regulated Marketing Committee (RMC) market yards, sub-market yards, private markets and other unregulated markets to unify all the nationwide agricultural markets for agricultural commodity price discovery.
eKrishi	Centre for Sustainable Agriculture	2006	E-Krishi is a unified network for digitising the Indian Agriculture system. Involve establishing network of farmers with Agribusiness sector, Agri-Experts Agri Bazaar, and Students. The platform is helpful in reducing the gap E-Krishi Kendra reduces by implementing F2B, B2B and B2C platforms for agriculture.[xviii]
e-agri kiosk	NABARD - National Bank For Agriculture And Rural Development	2020	The objective of launching the e-agri kiosk was to disseminate the information to rural farmers on farming practice with dynamic and static content, involving an audio interface in the Adi Tribal Dialect in four villages of Arunachal Pradesh.
Gyandoot Project Madhya Pradesh	Chief Executive Officer Zila Parishad (CEO ZP) of Dhar district	2000	In Hindi, Gyandoot refers to 'purveyor of knowledge', basically the passing of messages is between Government and citizen. The aim of this project was to extend the benefits of informed and innovative technologies by directly linking the Government and villagers through information kiosks.[xix]
Kisan Call Centres (KCC)	Ministry of Agriculture	2004	The objective of establishing Kisan Call Centre is to provide customised information on major aspects of agriculture using local language by utilising toll free numbers which is

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			accessible through mobile phones and landlines. [xx]
Warana "Wired Village" project	Prime Minister's Office Information Technology (IT) Task Force	1998	Transmission of information and build the capacity of farmers regarding agriculture practices including various aspects such as crops, soil, market prices and schemes from the government of Maharashtra.

Conclusion

ICT-enabled agriculture is transforming India's agrarian landscape by driving sustainable growth and addressing key challenges in rural and urban farming communities. As highlighted, the integration of digital tools, such as Geographic Information Systems (GIS), satellite technology, and real-time mobile applications, has empowered farmers with actionable insights on cropping patterns, pest management, and weather forecasts. These innovations are not just increasing agricultural productivity but are also bridging critical knowledge and operational gaps, thereby ensuring a more resilient food system.

Government-led initiatives like Digital India, BharatNet, and PM-WANI have significantly boosted rural broadband connectivity, enabling the penetration of ICT in previously inaccessible areas. Programs like Skill India and Startup India complement these efforts by fostering entrepreneurship and skill development in agricultural communities. Such measures are crucial in addressing the digital divide, enhancing market linkages, and reducing the vulnerabilities that often lead to farmer distress.

The approval of the Digital Agriculture Mission budget underscores the government's commitment to transforming agriculture into a robust Digital Public Infrastructure (DPI). With nearly 400 million rural internet subscribers and 95% of villages connected via 3G/4G networks, India is poised to leverage ICT for sustainable agricultural practices that align with global Sustainable Development Goals (SDGs).

While the progress is promising, challenges remain, particularly in ensuring equitable access to technology and minimizing disparities between urban and rural populations. Strengthening farmer capacity, ensuring food security, and enabling climate-resilient farming will require sustained collaboration among governments, private stakeholders, and NGOs.

In conclusion, ICT-enabled agriculture not only modernizes farming practices but also redefines the role of farmers in the digital era. By fostering inclusivity, sustainability, and resilience, ICT is set to transform agriculture into a key driver of economic and social development in India.

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References:

1. Ministry of Agriculture and Farmers Welfare. (2023). *Agricultural statistics at a glance 2023*. Department of Agriculture & Farmers Welfare, Government of India. https://desagri.gov.in/wp-content/uploads/2024/09/Agricultural-Statistics-at-a-Glance-2023.pdf
2. Sinha, G. R. (2013, October). *ICT Enabled Agriculture Transforming India*. https://www.researchgate.net/?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19. https://www.researchgate.net/publication/287196989_ICT_Enabled_Agriculture_Transforming_India
3. Pratima Bhalekar et al. (2015, January). *THE STUDY OF SOME ICT PROJECTS IN AGRICULTURE FOR RURAL DEVELOPMENT OF INDIA*. www.researchgate.net/publication. https://www.researchgate.net/publication/362033300_THE_STUDY_OF_SOME_ICT_PROJECTS_IN_AGRICULTURE_FOR_RURAL_DEVELOPMENT_OF_INDIA?enrichId=rgreq-0c2423993210e8d8142dc27bd9161fb8-XXX&enrichSource=Y292ZXJQYWdlOzM2MjAzMzMwMDtBUzoxMTc4MzU2OTg5MDgzNjYwQDE2NTc5NTM2MDc3NjE%3D&el=1_x_2&_esc=publicationCoverPdf
4. Ministry of Electronics and Information Technology, Government of India. (2015). *Digital India*. Retrieved January 1, 2025, from https://www.digitalindia.gov.in/
5. Ministry of Electronics & IT. (2022, December 23). *Achievements Made under Digital India Programme*. PressReleaseIframePage. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1885962
6. Ministry of Agriculture & Farmers Welfare. (2024, September 4). *Digital Agriculture Mission: Tech for Transforming Farmers' Lives*. PressReleaseIframePage. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2051719
7. Ohja et al., (2023, November). *THE ROLE OF ICT IN AGRICULTURAL EXTENSION AND FOOD SECURITY IN INDIA (pp.152-156)*. Empyreal Publishing House. https://www.researchgate.net/publication/379310945_THE_ROLE_OF_ICT_IN_AGRICULTURAL_EXTENSION_AND_FOOD_SECURITY_IN_INDIA
8. Siva Shankar, S. S. (2022, February). *Sustainable Development in Agriculture Through Information and Communication Technology (ICT) for Smarter India: Sustainable Agricultural Development Through ICT in IndiaSustainable Development in Agriculture Through Information and Communication Technology (ICT) for Smarter India: Sustainable Agricultural Development Through ICT in India*. https://www.researchgate.net/?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19. https://www.researchgate.net/publication/360324826_Sustainable_Development_in_Agriculture_Through_Information_and_Communication_Technology_ICT_for_Smarter_India_Sustainable_Agricultural_Development_Through_ICT_in_India
9. Petruk, L. P. (2024, May). *Satellite Data and Remote Sensing for Agricultural Operations*. https://www.infopulse.com/. https://www.infopulse.com/blog/satellite-data-remote-sensing-agriculture#:~:text=Satellite%20Remote%20Sensing%20Use%20Cases&text=Crop%20growth%20stage%20calculation%20and,storage%20utilization%2C%20and%20marketing%20activities
10. Ohja et al., (2023, November). *THE ROLE OF ICT IN AGRICULTURAL EXTENSION AND FOOD SECURITY IN INDIA (pp.152-156)*. Empyreal Publishing House. https://www.researchgate.net/publication/379310945_THE_ROLE_OF_ICT_IN_AGRICULTURAL_EXTENSION_AND_FOOD_SECURITY_IN_INDIA
11. Finserv, B. (2021, May 25). *Skill India Mission Programme - Objectives, Advantages, Features*. www.bajajfinserv.in. https://www.bajajfinserv.in/insights/skill-india-scheme#:~:text=Courses%20offered%20under%20the%20Skill%20India%20Mission&text=Training%20of%20trainer%3A%20Accreditation%20program,electroplating%2C%20fashion%20designing%2C%20etc.

12. Alliance for Affordable Internet, C. (2020, February 25). *Rural broadband policy framework: Connecting the unconnected*. https://a4ai.org/wp-content/uploads/2020/02/Rural-Broadband-Policy-Framework-Report-web-ready.pdf.
13. Ministry of Communications, Government of India. (n.d.). *BharatNet Project*. Digital Bharat Nidhi. https://usof.gov.in/en/bharatnet-project
14. Universal connectivity and digital India initiatives reaching to all areas, including tier-2/3 cities and villages. (2024, August). *Press Information Bureau*. https://pib.gov.in/PressReleasePage.aspx?PRID=2040566
15. Elets News Network. (2015, August). *Akashganga*. egov.eletsonline.com. https://egov.eletsonline.com/2005/08/akashganga/
16. Ratnam et al, B. V. (2005). *An IT based personalized agricultural extension system prototype – analysis of 51 Farmers' case studies*. International Journal of Education and Development using Information and Communication Technology (IJEDICT). https://faculty.iiit.ac.in/~pkreddy/assets/media/publications/eSaguIJEDICT05.pdf
17. Saravanan Raj. (2020, July). *Application of ICTs for Agricultural Extension Services Provision and its Impact among the Tribal Farmers of Arunachal Pradesh State of North-East India (e-Arik)*. https://saravananraj.in/. https://saravananraj.in/2020/07/e-arik-e-agriculture/
18. Shaikh, N. S. (n.d.). E-Krishi Kendra A Innovative Frontier for Making Digital Indian Agriculture. *https://justagriculture.in/files/magazine/nov/011%20E-Krishi%20Kendra.pdf*.
19. Anwar Jafri et al. (2002, April). *Information Communication Technologies and Governance: The Gyandoot Experiment in Dhar District of Madhya Pradesh, India*. https://assets.publishing.service.gov.uk/media/57a08d3840f0b652dd00182a/WP160.pdf

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