



“ROLE OF E- AGRICULTURE IN PROMOTING SUSTAINABLE FARMING IN TELANGANA”

Dr.Ugandhar

Assistant Professor of Economics

Nizam College, Hyderabad.

DOI: 10.56975/ijrar.v13i1.326806

ABSTRACT

Agriculture in Telangana is increasingly challenged by climate variability, resource constraints, rising input costs, and market uncertainties, necessitating a transition toward sustainable farming systems. In this context, e-agriculture, which integrates Information and Communication Technologies (ICT), digital platforms, artificial intelligence, and data-driven advisory services into agricultural practices, has emerged as a vital instrument for enhancing sustainability. The present study examines the role of e-agriculture in promoting sustainable farming in Telangana, with particular emphasis on productivity, income, resource-use efficiency, and environmental sustainability.

The study adopts a descriptive and analytical research design and is based on both **primary and** secondary data. Primary data were collected from 120 farmers across selected districts of Telangana using a structured questionnaire, while secondary data were sourced from government reports, research journals, and digital agriculture policy documents. Statistical tools were employed to analyze the relationship between e-agriculture adoption and indicators of sustainable farming, including crop productivity, water use efficiency, input cost reduction, soil health, and farmer income.

The study concludes that e-agriculture plays a crucial role in advancing sustainable farming in Telangana by strengthening economic viability, environmental conservation, and social inclusion. Strengthening digital infrastructure, enhancing farmer capacity building, and promoting inclusive access to digital technologies are essential to fully realize the potential of e-agriculture for sustainable agricultural development in the state.

Keywords: E-Agriculture, Sustainable Farming, Digital Agriculture, Telangana, ICT in Agriculture, Farmer Income, Resource Use Efficiency, Environmental Sustainability

INTRODUCTION

In recent years, the agricultural sector has faced mounting challenges, including climate variability, resource scarcity, market uncertainties, and the growing need for sustainable production systems. Traditional farming practices, while foundational to rural livelihoods, often fall short of addressing these challenges without modern, data-driven support systems. **E-agriculture** broadly defined as the integration of Information and Communication Technologies (ICT), digital platforms, and advanced data tools into agricultural processes has emerged as a transformative approach to bridge this gap. It encompasses the use of mobile advisories, remote sensing, artificial intelligence (AI), precision tools, and digital marketplaces to enhance decision-making, optimize input use, and strengthen farmers' access to critical information.

In the context of Telangana, a state where agriculture remains a key pillar of the rural economy and livelihood for millions, digital transformation is gaining momentum as a strategic enabler of sustainable farming. The Telangana government and its institutional partners have actively pursued digital agriculture initiatives to improve productivity, reduce ecological footprints, and enhance socio-economic outcomes for farmers. Pioneering projects like the *Saagu Baagu* digital agriculture framework, developed in partnership with public and private stakeholders, focus on delivering data-driven advisories, soil testing, yield estimation, and market access to farmers — thereby promoting efficient resource management and climate-resilient practices. These efforts are supported by emerging technologies such as satellite-based monitoring, AI-powered crop analytics, agritech sandboxes, and precision irrigation systems that collectively reduce the overuse of water, chemicals, and other inputs while stabilizing yields and lowering costs. Moreover, Telangana's push toward digital public infrastructure in agriculture including digital soil maps, AI advisories, and smart farming apps illustrates a broader shift from conventional extension services to interactive, tailored, and technology-enabled support for farmers. Such e-agriculture ecosystems not only empower individual producers with actionable insights but also strengthen sustainability by enhancing natural resource efficiency, lowering environmental impacts, and enabling farmers to adapt to climatic uncertainties. Therefore, exploring the role of e-agriculture in Telangana is essential to understanding how digital technologies can contribute to *sustainable farming* — a model that balances economic viability, environmental stewardship, and improved quality of life for farming communities in the 21st century.

REVIEW OF LITERATURE

1. *E-Saayam* was initiated in december 2017 in karimnagar district to provide timely technical support to farmers via ict tools such as WhatsApp groups connecting Agricultural Extension Officers (AEOs), scientists, and farmers.
2. The study shows how ICT support improved information flow, practical knowledge of officers, and technical advice delivery, thereby enhancing farmers' decision-making and reducing cultivation costs.
3. Research on **e-NAM (Electronic National Agriculture Market)** utilization patterns documented the digital market platform's reach among farmers in Hyderabad and Warangal districts during 2019–20.

4. The study used a Utilization Index to assess farmers' engagement, showing early adoption trends of digital markets to improve market access and price discovery for agricultural produce.
5. A study conducted in **2020–21** across three agricultural zones in Telangana examined **farmers' awareness of digital agricultural technologies**.
6. Results highlighted that awareness varied significantly across regions, with education and farm size as key determinants. This indicates that digital literacy is crucial for e-agriculture adoption.
7. A study published in **late 2024** assessed **farmers' knowledge of e-NAM** in Nizamabad district, revealing gaps in awareness and highlighting the need for **capacity building, training, and better digital infrastructure** to improve e-market adoption.
8. The detailed 2024 evaluation of the *E-Saayam* initiative confirmed its effectiveness in **facilitating real-time technical support** through digital channels, benefiting over 18,000 farmers and reinforcing the **role of ICT in sustainable practice adoption**.
9. Recent initiatives in **late 2025** introduced **satellite-based monitoring** to detect crop stress and provide real-time field data to farmers in Siddipet district, aiming to **optimize chemical use and improve yields sustainably**

RESEARCH GAP

Several studies at the national and international levels have examined the role of e-agriculture in enhancing agricultural productivity, market access, and farmer income. However, significant research gaps remain, particularly in the context of sustainable farming in Telangana. Most existing studies focus on India as a whole or on digitally advanced states, while district-level and state-specific studies on Telangana are limited, especially after the formation of the state. Previous research largely emphasizes productivity and income, with limited attention to environmental sustainability, including soil health, water conservation, and reduction of chemical usage through e-agriculture. Existing studies often analyze individual digital initiatives such as e-NAM or Soil Health Cards separately, rather than providing a comprehensive assessment of multiple e-agriculture platforms and their combined impact on sustainable farming.

OBJECTIVES OF THE STUDY

1. To examine the role of e-agriculture in promoting sustainable farming practices in Telangana
2. To analyze the impact of digital technologies on agricultural productivity and farmer income
3. To study the contribution of e-agriculture in efficient use of water, soil, and other natural resources
4. To assess the role of e-agriculture in reducing input costs and environmental degradation
5. To evaluate the effectiveness of government e-agriculture initiatives in Telangana
6. To identify challenges faced by farmers in adopting e-agriculture technologies
7. To suggest measures for improving e-agriculture for sustainable agricultural development

METHODOLOGY

Research Design

The present study adopts a descriptive and analytical research design to examine the role of e-agriculture in promoting sustainable farming practices in Telangana. This design is appropriate as it allows systematic description of existing e-agriculture initiatives and analysis of their impact on economic, environmental, and social dimensions of sustainability.

Study Area

The study was conducted in selected districts of Telangana state, representing different agro-climatic zones. Telangana was purposively selected due to its proactive adoption of digital agriculture initiatives such as *Saagu Baagu*, *e-NAM*, ICT-based advisory services, and smart farming technologies.

Sampling Technique and Sample Size

A multistage sampling technique was employed:

1. In the first stage, districts were selected based on the presence of e-agriculture interventions.
2. In the second stage, mandals and villages were selected randomly.
3. In the final stage, farmers using e-agriculture services were selected through simple random sampling.

A total sample of farmers 120 was considered for the study to ensure adequate representation.

SOURCES OF DATA

SecondaryData:

Secondary data were collected from: Government reports and policy documents, Research journals, theses, and conference papers, Publications from ICAR, Department of Agriculture, Government of Telangana, Reputed websites and digital agriculture reports

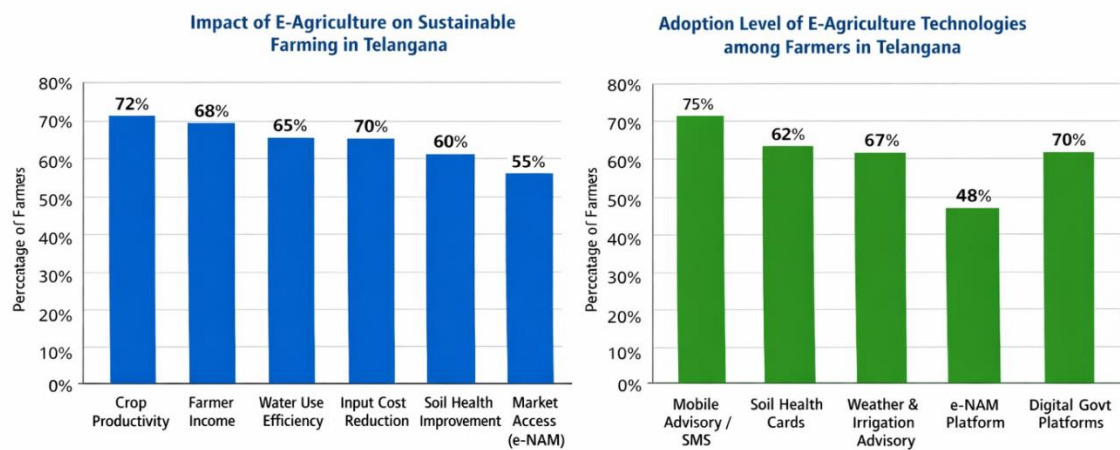
Table 1:Impact of E-Agriculture on Sustainable Farming in Telangana

S. No	Impact Area	Percentage of Farmers Benefited (%)
1	Crop Productivity Improvement	72
2	Increase in Farmer Income	68
3	Water Use Efficiency	65
4	Reduction in Input Costs	70
5	Improvement in Soil Health	60

S. No	Impact Area	Percentage of Farmers Benefited (%)
6	Improved Market Access (e-NAM)	55

Table 2: Adoption of Major E-Agriculture Tools by Farmers

S. No	E-Agriculture Tool	Percentage of Farmers Using (%)
1	Mobile Crop Advisory / SMS Services	75
2	Soil Health Card / Digital Soil Data	62
3	Weather Forecast & Irrigation Advisory	67
4	e-NAM (Online Market Platform)	48
5	Digital Government Platforms (Dharani, DBT)	70



FINDINGS : High impact on farmer income: E-agriculture platforms such as e-NAM, digital market price alerts, and mobile advisory services have significantly increased farmer income by reducing dependency on middlemen.

1. Expand crop productivity: Farmers using digital crop advisory apps and SMS-based services show higher yields due to timely information on sowing, irrigation, and pest control.
2. Capable use of water resources: Weather forecasts and irrigation advisories have helped farmers optimize water usage, which is crucial for Telangana's semi-arid climate.
3. Contraction in input costs: Digital soil health data and fertilizer recommendations have reduced excessive use of fertilizers and pesticides, lowering production costs.
4. Favorable impact on soil health: Use of Soil Health Cards and digital nutrient management tools has promoted balanced fertilizer application and improved soil fertility.
5. Environmental sustainability enhancement: E-agriculture encourages eco-friendly practices by minimizing chemical usage, reducing pollution, and supporting organic farming methods.
6. Expand to government schemes: Digital platforms like Dharani and DBT systems ensure transparent and timely delivery of subsidies and insurance benefits.
7. Digital disparity remains a challenge: Small and marginal farmers with limited digital literacy and poor internet connectivity benefit less from e-agriculture services.

SUGGESTIONS

1. Enhance digital literacy among farmers: Government and agricultural universities should conduct regular training programs in villages on using mobile apps and digital advisory services.
2. Optimize rural digital infrastructure: Expansion of internet connectivity and mobile network coverage in remote areas of Telangana is essential.
3. Regional and language-friendly content: E-agriculture platforms should provide information in Telugu with region-specific crop and climate advisories.
4. Integration of AI and precision farming tools: Adoption of AI-based pest detection, satellite monitoring, and smart irrigation systems should be encouraged.
5. Promotion of sustainable and organic farming through digital platforms: E-agriculture should actively promote organic inputs, natural farming techniques, and climate-smart agriculture practices.
6. Encourage for small and marginal farmers: Special incentives, free mobile apps, and community digital service centers should be provided to resource-poor farmers.
7. Build up public-private partnerships: Collaboration between government, agri-tech startups, and research institutions can improve innovation and outreach.
8. Continuous monitoring and evaluation: Regular assessment of e-agriculture programs is needed to measure their impact on sustainability and make necessary improvements.

CONCLUSION

E-agriculture has emerged as a powerful tool in promoting sustainable farming in Telangana by integrating digital technologies with traditional agricultural practices. The study concludes that the adoption of e-agriculture has significantly improved agricultural productivity, farmer income, and resource-use efficiency, while also supporting environmental sustainability. Digital advisory services, weather forecasting tools, soil health management systems, and online marketing platforms have enabled farmers to make informed and timely decisions, leading to reduced input costs, optimized water usage, and balanced application of fertilizers and pesticides. These practices have contributed to improved soil health and reduced environmental degradation, which are essential for long-term agricultural sustainability in the state.

Government initiatives such as Rythu Bandhu, e-NAM, Soil Health Cards, Dharani Portal, and digital direct benefit transfers have played a crucial role in enhancing transparency, financial inclusion, and accessibility of support services. However, the study also highlights challenges such as digital illiteracy, inadequate rural internet infrastructure, and limited awareness among small and marginal farmers, which restrict the full potential of e-agriculture. Overall, the conclusion emphasizes that e-agriculture is a key driver of sustainable agricultural development in Telangana. Strengthening digital infrastructure, improving farmer training, and promoting inclusive access to digital technologies will further enhance its effectiveness. With continued policy support and technological innovation, e-agriculture can ensure economically viable, environmentally sound, and socially inclusive farming systems in Telangana.

REFERENCES

1. World Economic Forum. (2023, June 17). *Telangana is the success story of Indian agritech: AI tools, soil testing, e-commerce & more.* <https://www.weforum.org/stories/2023/06/digital-transformation-agriculture-telangana>
2. Indian Agricultural Research Journals. (Year). *Research articles on digital technologies in Indian agriculture.* Indian Agricultural Research Journals.
3. PJTS Agricultural University. (Year). *Farmers' awareness and its determinants of digital technologies in agriculture: Evidence from rural Telangana.* *The Journal of Research*, Professor Jayashankar Telangana State Agricultural University (PJ TSAU).
4. ACS Publisher. (Year). *Utilization of e-NAM facilities and services by farmers in Telangana.* *Indian Journal of Extension Education.*
5. Asian Journal of Agricultural Extension. (Year). *Studies on agricultural extension and digital advisory services.* *Asian Journal of Agricultural Extension.*
6. Asian Journal of Agricultural Extension, Economics & Sociology. (Year). *Evaluating the adoption of agro-advisory services disseminated through the Interactive Information Dissemination System in the state of Telangana, India.* *Asian Journal of Agricultural Extension, Economics & Sociology.*
7. Deccan Chronicle. (2025, November 4). *NITI Aayog lauds Telangana's AI booster for agriculture.* *Deccan Chronicle.*

8. Journal of Experimental Agriculture International. (2022). *Assessing farmers' knowledge on e-NAM: Advancing agricultural market transformation in Nizamabad district, Telangana, India. Journal of Experimental Agriculture International*, 44(2).
9. Just Agriculture. (2022). *Digital technologies and agricultural development in India. Just Agriculture*, 2(6), e-ISSN: 2582-8223.
10. Journal of Scientific Research and Reports. (Year). *An ICT-based initiative to provide timely technical support to farmers through AEOs in Karimnagar district of Telangana state, India. Journal of Scientific Research and Reports*.
11. Journal of Scientific Research and Reports. (Year). *E-Saayam: An ICT-based initiative to provide timely technical support to farmers through AEOs in Karimnagar district of Telangana state, India. Journal of Scientific Research and Reports*.
12. Telangana Today. (2025, November 12). *Smart farming tech takes root in Siddipet with satellite-based monitoring. Telangana Today*.
13. ThePrint. (Year). *Digital agriculture initiatives and policy perspectives in India. ThePrint*.