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Digital Divide in Agriculture: A Barrier to Inclusive Growth and Innovation

Chintawar Shraddha[1],Talari Akshay Kumar[2] and Shana Srivalli[3]

[1] Ph.D. Scholar, Department of Agricultural Extension, IGKV, Raipur, Chhattisgarh

[2] Ph.D. Scholar, Department of Genetics & Plant Breeding, IGKV, Raipur, Chhattisgarh

[3] M.Sc Scholar, Department of Agricultural Economics, IGKV, Raipur, Chhattisgarh

Corresponding Author : shraddhachintawar909@gmail.com

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ABSTRACT

Digital technologies like smartphones, AI, mobile apps, and remote sensing are reshaping Indian agriculture by improving productivity, market linkages, and resilience. However, the benefits remain uneven due to a persistent digital divide. Only 24% of rural households in India have internet access compared to 66% in urban areas, highlighting inequalities in connectivity, device ownership, digital literacy, affordability, and content accessibility.This divide marginalizes smallholder farmers, especially women and tribal communities, excluding them from vital services like e-advisories, crop insurance, and online markets. Despite initiatives like eNAM, Digital Agriculture Mission, and Common Service Centres (CSCs), barriers in infrastructure, training, and last-mile delivery remain.Bridging this gap requires targeted action like improved rural connectivity, localized digital literacy, public-private collaboration, and inclusive policy frameworks. Empowering all farmers with digital tools is essential for sustainable, equitable, and innovative agricultural growth in India.

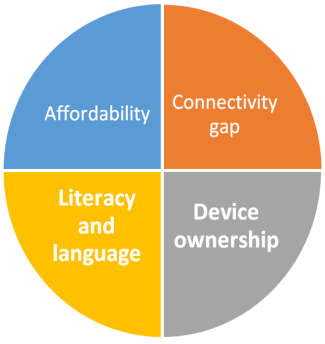
Keywords: Agriculture, Digital Divide, Gender Disparity, Inclusive Growth, Rural Development

Introduction

In recent years, digital technologiesranging from smartphones and mobile apps to artificial intelligence (AI) and remote sensinghave transformed agriculture globally. In India, tools such as mobile applications, online marketplaces (like eNAM), and artificial intelligence-based advisories are reshaping the sector. Digital transformation in agriculture promises higher yields, optimized input use, market linkages, and climate resilience. However, the benefits of digital agriculture are not equally shared. According to NSSO data, only 24% of rural Indian households have access to the internet, compared to 66% in urban areas. This digital divide risks marginalizing smallholder farmersmost of whom already face socio-economic disadvantagesand hinders the broader goal of inclusive agricultural development.

The Nature of the Digital Divide in Indian Agriculture

The digital divide is not just about internet connectivity it includes access to digital infrastructure, digital literacy, affordability, language barriers, and relevance of content.



- **Connectivity gap:** Many villages lack stable mobile networks or broadband. Even in areas with 4G coverage, signal strength and data quality are often poor.
- **Device ownership:** Smartphones and computers are still luxuries for many rural families. Shared usage among family members often limits learning and experimentation.
- **Literacy and language:** Many farmers struggle with English-language interfaces or lack the basic literacy to operate apps or navigate digital platforms.

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- Affordability: Data plans and smart devices are still considered expensive, especially for marginal farmers with seasonal incomes.

This multifaceted digital divide restricts meaningful engagement with technology, especially in backward and tribal districts.

Impacts on Innovation and Inclusive Growth

1. Exclusion from Information Systems

Farmers without digital access are unable to benefit from real-time data on weather forecasts, early warnings for pest/disease outbreaks, or best practices for crop management. For example, the Kisan Suvidha app or state-specific e-advisory platforms are only useful if a farmer can download, understand, and apply the recommendations. This lack of access perpetuates traditional, low-productivity practices.

2. Inequitable Access to Credit and Insurance

Schemes like PM Fasal Bima Yojana and e-KYC-enabled PM-Kisan payments rely on digital interfaces for registration and claim processing. In areas with limited digital literacy, farmers often depend on middlemen or CSC (Common Service Centres), which can delay or complicate access.

3. Gender Disparities

The digital divide is further exacerbated by gender. Studies show that rural women in India are significantly less likely to own mobile phones or access the internet. Cultural norms, lower education levels, and lack of agency contribute to this exclusion. As a result, women farmerswho make up nearly 33% of the agricultural workforceare often excluded from digital extension, agri-finance, and market access initiatives.

4. Stifled Startups and Innovation Diffusion

India's agri-tech sector has seen a surge in startups offering AI-based diagnostics, remote sensing, farm automation, and digital marketplaces. However, these innovations often fail to penetrate the rural grassroots. The NASSCOM (2023) report notes that while the number of agri-tech users is growing, deep rural penetration is limited to just 10-15% of farmers. Thus, the potential for scale, feedback loops, and inclusive innovation remains underutilized.

Government Efforts and Gaps

The Government of India has made several policy-level interventions, such as:

- Digital Agriculture Mission (2021–2025): Focuses on integrating AI, IoT, drones, and blockchain in agriculture.
- eNAM (National Agriculture Market): Connects farmers to national markets through online bidding.
- Common Service Centres (CSCs): Offer digital services like PMFBY registration, soil health cards, etc.
- APAIMS 2.0 in Andhra Pradesh: A comprehensive AI-driven system for pest alerts, subsidy tracking, and field-level monitoring.

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Despite these efforts, challenges persist:

- Implementation is fragmented across states.
- Last-mile delivery remains weak.
- Training and awareness are limited.
- Schemes often fail to reach marginalized groups such as tribal farmers, women, and those in remote locations.

Strategies to Bridge the Divide

1. Infrastructure Development

Government and private telecom companies must prioritize rural broadband expansion. Affordable 4G/5G internet and solar-powered Wi-Fi hotspots can provide robust connectivity in off-grid villages.

2. Digital Literacy and Training

Regular training camps, digital inclusion workshops, and mobile vans with trainers can promote hands-on learning for farmers. Programs should be localized in regional languages and made accessible for women, older farmers, and youth.

3. Public-Private Collaboration

Startups, NGOs, and agribusinesses can work with Krishi Vigyan Kendras (KVKs), FPOs, and SHGs to co-create solutions. For example, AI-powered tools can be simplified and customized for local crops and dialects.

4. Community Access Points

Establishing Digital Resource Centres in every gram panchayatequipped with tablets, projectors, and internet accesscan ensure collective access and reduce dependency on personal devices.

5. Inclusive Policy Design

Digital tools must be integrated into agricultural extension services. State-level agri-policies should mandate digital inclusion goals and monitor them across schemes. Additionally, digital tools should be gender-sensitive and support minority languages.

Conclusion

Digitalization is not a luxuryit is a necessity for transforming Indian agriculture. Yet, the benefits of digital agriculture will remain limited unless the deep-rooted digital divide is addressed with urgency and inclusiveness. Bridging this divide is critical not just for innovation, but for empowering every farmer to make informed, profitable, and sustainable decisions. Only then can we move towards a truly inclusive and resilient agricultural future.

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