Agriculture Technology Transfer in India: Challenges, Problems, Prospects

V. G. Dhulgand[1], Y. J. Waghmode[1], P. P. Puranik[1]
[1]Department of Extension Education, CSMSS, College of Agriculture, Kachanwadi, Chh. Sambhajinagar

Corresponding Author :
V. G. Dhulgand
E-mail : vgdhulgand91@gmail.com

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Abstract

Agricultural technology transfer (ATT) in India plays a pivotal role in bridging the gap between research innovations and field-level adoption by farmers. Despite considerable investments in research and development, the dissemination of agricultural technologies remains suboptimal due to fragmented extension systems, low farmer engagement, infrastructural gaps, and socio-economic disparities. This article briefly explores the key challenges impeding technology transfer, reviews the systemic and policy constraints, and highlights emerging prospects through public-private partnerships, ICT-based platforms, and participatory extension models. Findings suggest that a pluralistic, demand-driven, and decentralized model holds promise for improving technology adoption and agricultural productivity. A national strategy emphasizing inclusive access, institutional collaboration, and capacity building is urgently needed to transform India's agricultural landscape.

Keywords: Agricultural extension, technology transfer, India, ICT

Introduction

Agricultural technology transfer (ATT) is a cornerstone of rural development and food security in India. With over 60% of the population engaged in agriculture, effective dissemination of innovations—ranging from improved seeds to climate-resilient practices—is critical for sustainable growth. Despite substantial progress in agricultural research, India continues to experience yield gaps and slow adoption of best practices, particularly among small and marginal farmers[1].

Methodology

This short communication draws on a scoping literature review and policy analysis following STROBE-adapted qualitative inquiry guidelines. Sources included peer-reviewed articles, government reports, and institutional data from ICAR, FAO, and state extension services. Thematic coding was applied to extract insights across challenges, gaps, and opportunities.

Challenges and Problems in ATT

• Institutional Limitations

India's extension system is primarily state-driven, with overlapping responsibilities among multiple agencies. Fragmented coordination between ICAR, Krishi Vigyan Kendras (KVKs), and state departments results in diluted impact[2].

• Low Farmer Engagement

Top-down dissemination models often neglect local knowledge and fail to involve farmers in the decision-making process. This leads to mistrust, underutilization of innovations, and poor adoption rates[3].

• Infrastructure and Resource Constraints

Lack of access to timely information, poor rural internet connectivity, and limited human resources impede last-mile technology delivery. Women and landless farmers face additional exclusion[4].

• Policy and Funding Gaps

Policy discontinuity, low investment in extension services, and inadequate monitoring and evaluation frameworks hinder the effectiveness of ATT programs[5].

Emerging Prospects

• ICT and Digital Platforms

The integration of digital tools such as SMS advisories, mobile apps (e.g., Kisan Suvidha), and e-NAM has demonstrated potential in bridging communication gaps and promoting market access[6].

• Public–Private Partnerships (PPP)

Collaborations between agritech startups, private input companies, and public institutions have created scalable models for advisory services and supply chain management[7].

•Participatory and Decentralized Models

Approaches such as farmer field schools, self-help groups, and community-led innovation platforms are gaining traction in improving the relevance and uptake of technologies[8].

• Capacity Building and Training

Enhancing the skills of extension agents, especially in digital tools and participatory communication, is critical. Training programs at the district level can empower farmers as co-innovators[9].

Conclusion

India's ATT ecosystem requires a paradigm shift from supply-driven to demand-responsive systems. Emphasizing inclusivity, decentralization, and multi-stakeholder engagement can overcome current barriers. Strategic investment in ICT infrastructure, institutional reform, and farmer capacity building is vital for achieving sustainable agricultural transformation.

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