Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 06, Issue: 01 (JAN-FEB, 2026)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Beyond the Green Revolution: An Economic Analysis of Digital Public Infrastructure (AgriStack) and Transaction Costs in Indian Agriculture

*Kiran Mohanty and Debaprakash Upadhyay
Department of Agricultural Economics, College of Agriculture, OUAT, Bhubaneswar
*Corresponding Author's email: aniliku1234@gmail.com

Abstract

Context: Indian agriculture is currently pivoting from input-intensive growth (Green Revolution) to information-intensive growth. The Government of India's recent push for "AgriStack"—a unified Digital Public Infrastructure (DPI) for agriculture—represents a structural shift in the sector.

Problem Statement: Despite high production, smallholder farmers (86% of the agrarian population) face persistent market failures, primarily due to asymmetric information in credit and output markets. Banks lack verifiable data on tenant farmers, leading to high transaction costs and credit rationing.

Objective: This paper applies an Institutional Economics framework to analyze how AgriStack and the Unified Farmer Service Interface (UFSI) can reduce transaction costs and improve price discovery for smallholders.

Analysis: We argue that by assigning a unique digital ID (Farmer ID) linked to land records and crop data, the state effectively reduces the "search and monitoring costs" for formal lenders.

Conclusion: The digitization of Indian agriculture is not merely a technological upgrade but an economic imperative to integrate smallholders into formal value chains, provided that issues of digital literacy and data privacy are addressed.

Keywords: AgriStack, Transaction Costs, Institutional Economics, Digital Public Infrastructure, Smallholder Credit.

Introduction

Indian agriculture currently contributes approximately 18% to the national GDP while employing over 45% of the workforce. However, the sector is plagued by a classic economic problem: market fragmentation. Post-2023, the Indian government has accelerated the development of AgriStack, a digital foundation similar to the "India Stack" (Aadhaar/UPI) but tailored for farming. For an Agricultural Economist, AgriStack is not just a database; it is a mechanism to solve Information Asymmetry. Currently, a bank manager in rural Odisha has no cost-effective way to verify if a loan applicant actually cultivated a crop or suffered a yield loss. This lack of information creates high Transaction Costs, forcing banks to rely on collateral (land titles) which many tenant farmers lack. This paper analyzes how digital infrastructure serves as a public good that lowers these barriers.

Theoretical Framework: Transaction Cost Economics (TCE)

According to Coase (1937) and Williamson (1981), economic exchanges are not free; they involve search, bargaining, and enforcement costs. In the context of Indian agriculture, these costs manifest as:

- Search Costs: The cost for buyers (or banks) to find reliable farmers.

- Verification Costs: The cost to verify land ownership and crop status.
- Enforcement Costs: The cost to ensure contract compliance (e.g., in contract farming).

Current Scenario: Without digital records, these costs are prohibitively high. A formal lender might spend ₹500 to process a KCC (Kisan Credit Card) loan of ₹5,000, making small loans economically unviable.

The Economic Impact of AgriStack

The proposed digital ecosystem serves three primary economic functions:

Reduction of Credit Rationing

By creating a Farmer ID linked to land records and satellite-based crop surveys, AgriStack acts as a verifiable "Reputation Collateral."

- Mechanism: When a farmer's history of inputs and yields is digitally recorded, banks can use algorithms to assess creditworthiness rather than relying solely on land titles.
- Impact: This expands the Production Possibility Frontier (PPF) for tenant farmers who were previously excluded from the formal credit market due to lack of documentation.

Price Discovery and Market Efficiency

The integration of e-NAM (Electronic National Agriculture Market) with digital logistics platforms reduces spatial arbitrage.

* **Analysis**: Currently, price dispersion between mandis (markets) is high due to lack of real-time data. A unified digital interface allows for "One Nation, One Market" in practice, reducing the gap between the Producer Price and the Consumer Price.

3.3 Targeted Subsidy Delivery (DBT)

From a fiscal economics perspective, universal subsidies (like fertilizer subsidies) are prone to leakage. Digital identification allows for Direct Benefit Transfer (DBT) based on actual farm needs (e.g., soil health cards), improving the Marginal Efficiency of Capital (MEC) in the public sector.

Challenges and Risks

While the economic logic is sound, two critical bottlenecks remain:

* **The Digital Divide**: As per recent NSSO data, internet penetration in rural India is growing but remains uneven. A "digital-first" policy risks excluding the most marginalized farmers (the poorest of the poor) who lack smartphones, potentially increasing inequality (the Kuznets curve effect).

* **Data Monopolization**: There is a risk that private AgTech firms may capture the value of data generated by farmers, leading to an oligopolistic market structure where a few firms control farm inputs and advisory services.

Policy Recommendations & Conclusion

For the "Digital Harvest" to yield economic dividends, the following policy measures are recommended:

* **Phygital Extension**: Digital tools must be supported by physical extension workers (Krishi Vigyan Kendras) who can act as intermediaries for illiterate farmers.

* **Data Cooperatives**: Farmers should be encouraged to form "Data Cooperatives" (similar to FPOs) to collectively bargain with private firms for the value of their data.

Conclusion

The transition to a digitally integrated agricultural economy is inevitable. From an economic standpoint, AgriStack represents a shift from "trust-based" local trade to "verification-based" national trade. By lowering transaction costs, it has the potential to do for agricultural credit what UPI did for retail payments—democratize access and enhance efficiency.

References

1. Chand, R. (2023). Transforming Indian Agriculture: The Digital Way. NITI Aayog Policy Paper.

2. Gulati, A., & Reardon, T. (2024). The Rise of Supermarkets and Digital Supply Chains in India. Agricultural Economics Research Review.
3. Narayanan, S. (2022). Credit constraints and smallholder farming in India. Journal of Development Economics.
4. World Bank (2025). Digital Public Infrastructure for Agriculture: The Case of India. Washington D.C.