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The Digital Agrarian Frontier: Economic Policy and Market Transformation in Maharashtra (2015–2025)

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Abstract:
Between 2015 and 2025, Maharashtra's agrarian economy underwent a significant transformation driven by the growing integration of digital technologies into agricultural governance, production, and markets. This paper examines the evolution of digital agrarian policies in Maharashtra and analyses their role in reshaping agricultural markets and rural economic structures. Focusing on initiatives such as digitised land records, Direct Benefit Transfer (DBT), the National Agriculture Market (e-NAM), Agri Stack, and the MahaAgri-AI Policy, the study adopts a policy analysis and secondary data approach. The findings indicate that digital interventions have enhanced price discovery, market access, administrative efficiency, and productivity while strengthening institutional governance. However, persistent challenges—including the digital divide, infrastructural gaps, limited digital literacy, and data governance concerns—continue to constrain inclusive outcomes. The paper concludes that while digitalisation has expanded market opportunities and improved policy effectiveness, farmer-centric and inclusive implementation is essential for achieving sustainable agrarian transformation.

Keywords: Digital agriculture, agrarian policy, market reforms, e-NAM, Maharashtra, artificial intelligence in agriculture

Introduction

Agriculture remains central to Maharashtra's rural economy, supporting livelihoods for a substantial share of the population and contributing significantly to the state's income. Despite its economic importance, the sector has historically faced structural constraints such as fragmented landholdings, climatic uncertainty, inefficient market structures, and excessive dependence on intermediaries. These factors have limited income growth and weakened farmers' bargaining power.

Over the last decade, digitalisation has emerged as a strategic policy response to these challenges. Advances in information and communication technologies (ICTs), data platforms, artificial intelligence (AI), and online marketplaces have enabled new forms of agricultural governance and market participation. The notion of a *digital agrarian frontier* captures this expanding interface between agriculture and digital technologies, where traditional practices are increasingly supplemented or replaced by data-driven systems. Between 2015 and 2025, Maharashtra positioned itself as a leading state in adopting digital agrarian reforms. Through investments in e-governance, digital markets, and data infrastructure, the state sought to improve transparency, efficiency, and inclusiveness in agriculture. This paper analyses how digital economic policies contributed to market transformation and structural change in Maharashtra's agrarian economy during this period.

Review of Literature

1. Scholarly literature widely acknowledges the transformative potential of digital technologies in agriculture. Studies on digital agricultural markets highlight improved price discovery, reduced transaction costs, and enhanced transparency (Mathur & Shah, 2025). Digital platforms such as e-NAM are shown to weaken the dominance of intermediaries by enabling farmers to access wider markets.

2. Research on precision agriculture emphasises the role of AI, IoT, and data analytics in optimising input use, reducing post-harvest losses, and improving farm profitability (William & Kumar, 2025). Madrewar et al. (2024) document productivity gains from AI-enabled irrigation and crop monitoring systems, while Yadav and Singh (2025) underline the role of mobile-based advisories in improving farm-level decision-making.
3. However, several studies caution that socio-economic conditions shape digital adoption. Sindakis and Showkat (2024) highlight disparities in access to digital infrastructure and skills in rural India. Methodological contributions by Tsoumas et al. (2022) emphasise the need for rigorous evaluation of digital interventions to distinguish between causal impacts and correlations.
4. Policy-oriented literature on Agri Stack and AI-driven governance underscores the importance of data integration, consent-based systems, and institutional coordination (Government of Maharashtra, 2025). Together, these studies provide a conceptual and empirical foundation for examining Maharashtra's digital agrarian transformation.
5.

Objectives of the Study

The study aims to:

1. Examine the evolution of digital agricultural policies in Maharashtra between 2015 and 2025.
2. Analyse the role of digital platforms in transforming agricultural markets and price mechanisms.
3. Assess the economic implications of digitalisation for farmer income, productivity, and market access.
4. Identify challenges and limitations in the implementation of digital agrarian reforms.
5.

Methodology

The study is based on secondary data and qualitative policy analysis. Sources include government reports, policy documents, academic journals, institutional publications, and credible digital repositories. Descriptive and comparative methods are employed to analyse policy evolution and economic outcomes. The selected time frame captures a decade of accelerated digital policy adoption in Maharashtra.

Digital Agrarian Policy Framework in Maharashtra

Early Digital Initiatives (2015–2020)

The initial phase of digital reform focused on administrative efficiency and transparency. Digitisation of land records through *Mahabhulekh* improved ownership clarity and reduced transaction costs. The expansion of DBT systems ensured the timely and targeted delivery of subsidies. The introduction of e-NAM facilitated electronic trading and inter-market integration, addressing long-standing issues of information asymmetry and intermediary dominance.

Data-Driven Agriculture and Agri Stack

Data-driven agriculture refers to the systematic use of digital data, analytics, and advanced technologies to improve agricultural decision-making, productivity, and sustainability. Agri Stack represents a national digital public infrastructure initiative aimed at integrating farmer identities, land records, crop data, and service delivery platforms through secure, consent-based systems.

In Maharashtra, Agri Stack complements platforms such as Mahabhulekh, DBT portals, and e-NAM by integrating fragmented datasets. This integration improves beneficiary identification, strengthens credit and insurance delivery, supports digital advisory services, and enables evidence-based agricultural planning at state and district levels.

MahaAgri-AI Policy (2025–2029)

The MahaAgri-AI Policy marks a significant shift towards AI-enabled and predictive agricultural governance. Its objectives include promoting precision farming, strengthening climate risk management,

improving market forecasting, and enhancing service delivery. The policy encourages the use of machine learning, drones, remote sensing, and predictive analytics across the agricultural value chain.

Institutionally, the policy establishes steering committees, technical expert groups, innovation centres, and public–private partnerships. Economically, it seeks to enhance productivity, reduce risks, improve farm incomes, and promote agritech entrepreneurship. Emphasis on local-language interfaces and capacity building reflects a commitment to inclusive digital agriculture.

Digital Market Transformation

Digital market transformation involves restructuring traditional agricultural markets through digital platforms, electronic trading systems, data analytics, and digital payments. Platforms such as e-NAM integrate physical mandis with electronic trading, enabling transparent price discovery, interstate trade, and reduced transaction costs.

Digital market information systems provide real-time data on prices, weather, input availability, and demand trends. AI-enabled advisory services assist farmers in deciding when and where to sell, thereby reducing market risks and improving income stability.

Economic Implications

Digitalisation has contributed to improved market efficiency, enhanced farmer bargaining power, cost reduction, and income stabilisation. Precision farming and predictive analytics have improved productivity and resource efficiency, particularly in drought-prone regions. Institutional governance has strengthened through improved transparency, coordination, and monitoring. However, uneven access to digital tools and skills has limited benefits for small and marginal farmers.

Challenges and Limitations

Despite progress, digital agrarian transformation faces several challenges:

- Persistent digital divides across regions and socio-economic groups
- Inadequate rural connectivity and infrastructure
- Limited digital literacy among farmers
- Data privacy, ownership, and consent concerns
- Interoperability issues across platforms

Addressing these constraints is essential for ensuring inclusive and sustainable outcomes.

Conclusion

1. Maharashtra's digital agrarian policies between 2015 and 2025 represent a decisive shift towards a technology-enabled, market-oriented agricultural economy. Initiatives such as land record digitisation, DBT, e-NAM, Agri Stack, and the MahaAgri-AI Policy have improved efficiency, transparency, productivity, and market integration. However, the long-term success of digital agrarian transformation depends on inclusive implementation, robust data governance frameworks, sustained capacity building, and effective coordination among government agencies, technology providers, and farmers.
2. Despite notable progress, persistent challenges such as the digital divide, inadequate rural infrastructure, limited digital literacy, and unresolved data governance concerns highlight the need for inclusive policy design and sustained capacity-building efforts to ensure long-term and equitable agrarian transformation.
3. Data-driven agriculture and Agri Stack represent a paradigm shift in agricultural governance and market organisation. By integrating data across the agricultural value chain, these initiatives enhance productivity, transparency, and policy efficiency. However, their long-term success depends on inclusive implementation, strong data governance frameworks, and continuous capacity building among farmers and institutions.

4. The MahaAgri-AI Policy represents a transformative step in Maharashtra's agricultural development strategy by institutionalising artificial intelligence within agrarian governance. It has the potential to enhance productivity, sustainability, and market integration. However, its success depends on inclusive implementation, strong data governance, continuous capacity building, and effective coordination between government, technology providers, and farmers.

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