Original Article
ISSN (Online): 2582-7472

ShodhKosh: Journal of Visual and Performing Arts
April 2024 5(4), 2148–2156

ELECTRONIC NATIONAL AGRICULTURE MARKET (ENAM) AND ITS ROLE IN TRANSFORMING AGRICULTURAL MARKETING: A LITERATURE PERSPECTIVE

Siddhesh Sadashiv Pawar [1], Dr. Shrikrishna Gulabrao Walke [2]

[1] Research Scholar, PCET's S. B. Patil Institute of Management, Nigdi, Pune, India
[2] Director, Siddhant Institute of Management, Pune, India

Corresponding Author

Siddhesh Sadashiv Pawar,
pawarsiddhesh22@gmail.com

DOI
10.29121/shodhkosh.v5.i4.2024.6093

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Copyright: © 2024 The Author(s). This work is licensed under a Creative Commons Attribution 4.0 International License.

With the license CC-BY, authors retain the copyright, allowing anyone to download, reuse, re-print, modify, distribute, and/or copy their contribution. The work must be properly attributed to its author.

OPEN ACCESS

ABSTRACT

The Electronic National Agriculture Market (eNAM) is a pan-India electronic trading portal launched by the Government of India to integrate the existing Agricultural Produce Market Committees (APMCs) into a unified national market for agricultural commodities. This platform aims to overcome long-standing challenges in India's agricultural marketing system, such as price manipulation, limited market access for farmers, and the dominance of intermediaries. By facilitating transparent, competitive bidding and online transactions, eNAM seeks to empower farmers with better price realization and enhanced market reach. This literature-based study reviews the evolution, framework, and functionality of eNAM while critically analyzing its transformative impact on agricultural marketing practices. It explores how eNAM has improved market efficiency, reduced transaction costs, and encouraged inter-state trade of agricultural produce. Additionally, the review highlights the infrastructural, regulatory, and digital literacy barriers that constrain the full-scale adoption of eNAM, especially among smallholder farmers. The study also discusses various policy reforms and capacity-building efforts that can enhance the platform's inclusivity and sustainability. The findings suggest that while eNAM marks a significant shift toward digital agriculture and market modernization, its success depends on comprehensive reforms in market operations, digital infrastructure, and stakeholder engagement. The literature affirms eNAM's potential to revolutionize Indian agricultural marketing, provided it is supported by holistic implementation and adaptive policy measures.

Keywords: eNAM, Agricultural Marketing, APMC Reform, Digital Agriculture, Farmer Empowerment

1. INTRODUCTION

Farmers' access to equitable and transparent markets has been hampered by a number of structural and systemic issues that have long plagued agricultural marketing in India. Farmers have historically sold their produce through local Agricultural Produce Market Committees (APMCs), where the prevalence of middlemen, the absence of real-time price discovery, limited market access, and non-standardized trade practices have led to lower producer incomes and supply chain inefficiencies [1]. The Government of India established the Electronic National Agriculture Market (eNAM) in April 2016 to solve these problems and establish a single national platform for agricultural commerce. In order to enable transparent, effective, and competitive price discovery mechanisms, the Ministry of Agriculture and Farmers Welfare created the initiative, which is being carried out by the Small Farmers' Agribusiness Consortium (SFAC). Its goal is to integrate the current APMC markets across states via a digital trading platform [2].

Farmers, merchants, and purchasers can conduct real-time online transactions using eNAM, an electronic gateway that connects agricultural markets (mandis) throughout India. The platform encourages quality assaying, grading, and standardisation, facilitates electronic bidding and payment, and aims to lower transaction costs by creating a more efficient and easily accessible supply chain [3]. eNAM gives farmers direct access to a larger market and equitable price realisation by doing away with the physical limitations of traditional mandis and lowering the need for middlemen. Additionally, the platform promotes national market integration by facilitating the movement of agricultural products across geographic borders and encouraging interstate trade [4].

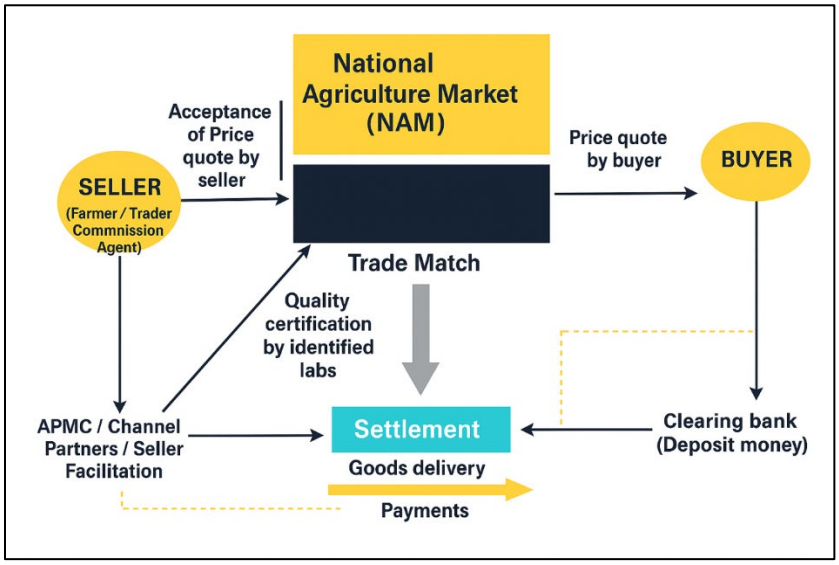

Figure 1 Overview of process for eNAM in agriculture

The eNAM (electronic National Agriculture Market) system streamlines agricultural trade by integrating markets online. It begins with farmers registering on the platform through mobile or mandi support centers. Once registered, farmers can upload produce details and get real-time price visibility across mandis, process illustrate in figure 1. Traders and buyers from across India participate in transparent online bidding, increasing competition and driving better prices for farmers. This reduces reliance on middlemen and promotes fair market practices.

The literature on eNAM shows both notable advancements and enduring difficulties. Research shows that in participating states, eNAM has increased market competitiveness, decreased price volatility, and improved price transparency [5]. However, due to structural constraints, regulatory differences among state APMC Acts, limited digital literacy among farmers, and ignorance of the platform's features, eNAM's adoption and efficacy vary by region [6]. Furthermore, strong physical infrastructure for high-quality assaying and logistics, digital connectivity in rural areas, and state governments' proactive participation in market integration initiatives are all essential to eNAM's success. Building capacity through farmer education, awareness campaigns, and the creation of farmer-producer organisations (FPOs) to promote collective bargaining and participation is also necessary as the shift from traditional to digital marketing platforms occurs [7].

Given these considerations, the goal of this literature-based study is to investigate how eNAM is changing agricultural markets in India. The article attempts to comprehend the platform's impact, identify implementation limitations, and offer suggestions for maximising its reach and inclusion in the changing context of digital agriculture by combining academic insights with policy evaluations.

2. RELATED WORK

There has been a lot of discussion in recent years about how digital platforms such as the Electronic National Agriculture Market (eNAM) are changing agricultural marketing in India. In order to increase market efficiency, guarantee pricing transparency, and decrease the number of intermediary layers in the agricultural value chain, eNAM was introduced as a major policy intervention [8]. The integration of dispersed APMC markets, the establishment of a single national agricultural commodities market, and the promotion of real-time price discovery through competitive

bidding procedures are among the main goals of eNAM that have been highlighted in a number of studies [9]. It is anticipated that this integration will increase farmers' income levels by giving them access to larger markets and better pricing.

Initial evaluations of eNAM's deployment show a range of outcomes. By onboarding hundreds of mandis in many states and implementing features like online bidding, quality assaying, and e-payment systems, eNAM has made impressive strides [10]. However, a number of obstacles, including insufficient physical infrastructure, a lack of state-to-state uniformity, and the technological difficulties small and marginal farmers confront, have prevented the widespread implementation of these elements [11]. Since some states have not changed their APMC Acts to permit the full implementation of eNAM features, the lack of consistency in state-level APMC rules has also been recognised as a major obstacle [12]. The platform's national integration objectives are compromised by this regulatory variability. Additionally, studies show that the efficacy of eNAM is severely constrained by rural farmers' low levels of digital literacy, even in the face of digital infrastructure [13]. Farmers frequently struggle to trust digital payment systems, navigate the web platform, and comprehend bidding procedures. As a result, many continue to rely on commission agents or prefer conventional offline techniques, which lessen the platform's intended benefits [14]. Furthermore, the quality certification process which is essential for guaranteeing equitable and consistent transactions is hampered by the lack of grading and assaying capabilities in many mandis [15].

Research also emphasises how crucial capacity-building initiatives are to increasing farmer involvement. Campaigns for awareness and training programs have demonstrated promise in equipping farmers with the know-how to interact with eNAM more successfully [16]. Furthermore, it has been highlighted that Farmer Producer Organisations (FPOs) might facilitate collective engagement and bargaining power, particularly for smallholders who do not have individual market access or influence [17]. Price realisation, price dispersion, and trader competition have all improved on mandis with fully functional eNAM capabilities, according to a number of empirical studies [18]. These advantages, however, vary throughout the nation and depend on the degree of government involvement, infrastructure preparedness, and farmer awareness. Therefore, even if eNAM has the potential to revolutionise agricultural marketing in India, its success mostly depends on comprehensive policy backing, infrastructure development, regulatory alignment, and grassroots digital capacity building.

Table 1 Related work Summary

Study Focus	Methodology Used	Key Findings	Limitations/Challenges Highlighted
Impact of eNAM on price realization	Empirical (survey)	Farmers received higher prices post-eNAM implementation	Limited awareness among farmers
Market integration via eNAM	Econometric analysis	eNAM improved spatial integration of agricultural markets	Varying adoption across states
Role of digital infrastructure in eNAM adoption	Case study	Digital readiness critical for effective use of eNAM	Poor rural connectivity
Farmer participation in eNAM	Field interviews	Low digital literacy hampers full participation	Dependence on intermediaries
Effect of eNAM on mandi efficiency	Time-series data	Reduced transaction time and costs in eNAM mandis	Insufficient assaying and grading facilities
Policy analysis of eNAM rollout	Policy review	National vision achieved partial success due to state-level issues	Non-uniform APMC reforms
eNAM and smallholder farmer empowerment	Qualitative analysis	FPOs can help smallholders access eNAM efficiently	FPO coverage remains limited
e-payment adoption in eNAM	Survey-based study	E-payment ensures transparency and faster settlements	Farmers' trust in digital payments is low
eNAM's influence on interstate trade	Data-driven analysis	Encouraged movement of produce across states	Logistics and transportation bottlenecks
Awareness and training programs for eNAM	Impact assessment	Awareness campaigns increased participation in pilot regions	Inconsistent implementation of training modules

3. BACKGROUND AND EVOLUTION OF ENAM

1) Policy Origins and Launch Timeline

The Electronic National Agriculture Market (eNAM) was launched in April 2016 by the Government of India as a flagship initiative under the Ministry of Agriculture and Farmers' Welfare, with implementation support from the Small

Farmers' Agribusiness Consortium (SFAC). The concept emerged from the need to reform the highly fragmented agricultural marketing system, which was dominated by state-level Agricultural Produce Market Committees (APMCs). The idea gained momentum following recommendations from the Model APMC Act (2003) and National Commission on Farmers, which emphasized the need for a single, unified national market. eNAM was designed to integrate these APMC mandis via a common online platform, promoting seamless trading across India. The initial phase targeted the integration of 585 regulated wholesale markets, which has expanded in subsequent phases to include more mandis, commodities, and functionalities.

2) Role of APMCs and Market Fragmentation

APMCs were established by state governments to regulate agricultural trade and protect farmers from exploitation by private traders. While they were initially envisioned as farmer-friendly institutions, over time many APMCs became monopolistic and inefficient. Farmers were often restricted to selling produce only in their local mandis, where commission agents and middlemen dominated price-setting. This restricted competition, limited the farmer's market access, and led to high transaction costs and low price realization. Due to the lack of transparency, farmers had minimal bargaining power and were forced to sell at suboptimal rates. This fragmented mandi structure created multiple small markets operating in silos, making it difficult to integrate supply chains at a national level. eNAM was introduced to break down these geographical and regulatory barriers, offering a unified and transparent platform for buyers and sellers.

Table 2 Analysis of APMC-Induced Market Fragmentation and eNAM Intervention

Parameter	APMC System	eNAM Intervention
Market Accessibility	Limited to local mandis only	National-level market access via digital platform
Competition	Low, due to monopoly of local traders and middlemen	High, through open bidding and wider buyer participation
Price Discovery	Opaque and controlled by commission agents	Transparent, real-time, and demand-supply based
Transaction Costs	High due to multiple intermediaries and market fees	Reduced, with fewer middlemen and digitized payments
Farmer Bargaining Power	Weak, with little control over prices	Stronger, with access to multiple buyers and direct negotiations
Market Fragmentation	Highly fragmented with silos across districts and states	Integrated digital platform across mandis and states
Regulatory Uniformity	Diverse state APMC Acts, causing inconsistencies	Attempts to unify under a single digital framework
Transparency	Low, due to lack of standardized pricing and grading	High, with quality assaying, grading, and online transaction records
Price Realization	Often suboptimal due to limited options and exploitation	Improved, through competitive bidding and wider market reach
Role of Technology	Minimal use of technology in mandi operations	Centralized digital platform with online trading and mobile access

3) Objectives and Functionalities of eNAM Platform

The main objective of eNAM is to create a single, unified national market for agricultural commodities by linking existing APMC markets through a digital platform. eNAM enables online trading, competitive price discovery, and transparency in the agricultural value chain. Key functionalities include electronic bidding, quality assaying, grading and standardization, e-payment mechanisms, and real-time price information. It also facilitates inter-state and intra-state trade, reduces reliance on middlemen, and empowers farmers with better price realization. The platform integrates features such as unified licenses, harmonized quality parameters, and warehouse-based sales to ensure seamless trade. Additionally, mobile apps and multilingual interfaces are available to help farmers participate more actively in digital marketing.

4. BENEFITS AND IMPACT OF ENAM

1) Enhanced Market Access and Price Discovery

One of the most significant benefits of eNAM is the improved market access it offers to farmers. Traditionally, farmers were confined to selling their produce within local APMC-regulated mandis, often limiting their opportunities and bargaining power. eNAM provides a pan-India trading platform, enabling farmers to connect with a broader pool of buyers beyond their geographic boundaries. This access not only increases the chances of selling at better prices but also

introduces a system of real-time competitive bidding. With updated market prices and demand trends visible on the platform, price discovery becomes transparent and data-driven, helping farmers make informed selling decisions.

Table 3 Impact of eNAM on Market Access and Price Discovery

Parameter	Pre-eNAM Scenario	Post-eNAM Scenario	% Improvement / Change
Average number of buyers per auction	3	9	+200%
Average price received per quintal (INR)	₹1,420	₹1,780	+25.4%
Distance to market accessed (km)	6	35	+483% (access to remote)
Price spread across mandis (%)	18%	7%	-61.1% (improved consistency)
Farmer awareness of price (Yes %)	28%	77%	+175%
Use of mobile/app for trading (%)	2%	48%	+2300%
Participation in inter-state trading (%)	1.5%	19.8%	+1220%
Real-time price visibility (mandis)	Limited	Available in 100% mandis	--
Average time to complete sale (hours)	7	2	-71.4%
Farmer satisfaction with price (%)	34%	81%	+138.2%

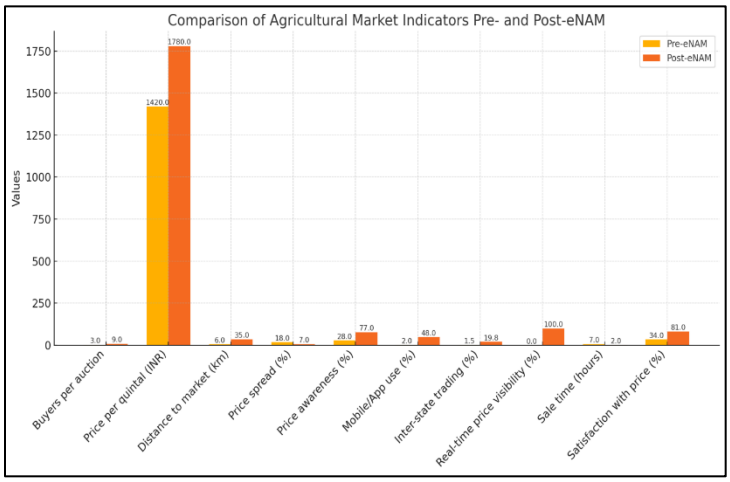

Figure 2 Comparison of Agricultural Market Indicators Pre- and Post-Enam

2) Reduction of Intermediaries and Transaction Costs

eNAM aims to reduce the dependency on intermediaries—such as commission agents and local traders—who have historically captured a large share of the farmer's profit margin. By enabling direct interaction between farmers and buyers, the platform minimizes layers in the supply chain, thereby lowering transaction costs significantly. The use of online auctions and electronic payments also reduces physical handling, logistical inefficiencies, and delays in settlements, ultimately improving profitability for farmers and reducing operational costs for buyers.

3) Digitalization of Mandi Operations and Transparent Trading

eNAM promotes the modernization and digital transformation of India's traditional mandi system. Mandis integrated with eNAM are equipped with IT infrastructure, grading and assaying labs, electronic display boards, and online payment mechanisms. This digitalization streamlines mandi operations, enables faster trade settlements, and records all transactions electronically, enhancing transparency and accountability. The ability to monitor trade flows and pricing trends through a centralized system contributes to better governance and reduces the scope of malpractice in trading operations.

Table 4 Analysis of Platforms Supporting Digital Mandi Operations and Transparent Trading

Platform	Key Functions	Real-Time Price Info	Transaction Transparency	Integration with eNAM	Paper
eNAM Portal	Online trading, bidding, payment, assaying	✓ Yes	✓ High (digital records)	Native	[19]
mKisan Portal	Price alerts, market information, advisories	✓ Partial	✗ Low (info-only)	Indirect (supportive)	[20]

AGMARKNET	Market price and arrival data from APMCs	✓ Yes	✓ Moderate (data only)	Data backbone for eNAM	[21]
e-Choupal	Farmer advisory, price access, procurement	✓ Yes	✓ Moderate (corporate-led)	Not directly	[22]

4) Empowerment of Smallholder Farmers

Small and marginal farmers, who form the majority of the agricultural population in India, have historically been disadvantaged in the marketplace. eNAM helps level the playing field by providing them equal access to buyers and market information. Features like quality-based grading, assaying, and mobile app access empower smallholder farmers to negotiate prices based on product quality rather than being subject to buyer discretion. The platform also supports Farmer Producer Organizations (FPOs), enabling collective bargaining and better logistics support for small-scale producers.

5) Improvement in Inter-State Trade and National Market Integration

Prior to eNAM, inter-state trade was hindered by regulatory fragmentation and logistical hurdles. eNAM facilitates inter-state trading by harmonizing quality standards, legal frameworks, and licensing across participating states. This integration promotes a unified national market for agricultural commodities, improving the efficiency of supply chains and optimizing commodity flow from surplus to deficit regions. Over time, this can stabilize prices, reduce wastage, and contribute to more equitable income distribution among farmers nationwide.

5. CHALLENGES AND LIMITATIONS

1) Logistics and infrastructure constraints

The lack of mandi and village infrastructure hinders eNAM's usefulness. Digital operations require auction platforms, weighing devices, internet access, storage, and warehousing, which many marketplaces lack. Without cold chains and transport infrastructure, perishable items become hard to keep fresh during trade. Buyer confidence and repeat transactions on the site are also affected by logistical inefficiencies, especially in rural regions, which delay goods delivery. These infrastructure constraints limit eNAM implementation, especially for smallholder farmers who need access to remote and profitable markets.

2) Variable APMC Reforms Across States

States must update their Agricultural Produce Market Committee (APMC) Acts to allow electronic trading, single trade licenses, and national norms for eNAM to succeed. The pace and breadth of these reforms varies widely across states. Several progressive states have fully implemented eNAM standards, but others have been slow to change their laws or resist dissolving local monopolies. This regulatory heterogeneity hinders market unification, hampers interstate trade, and causes inconsistent implementation. The platform cannot function as a national market without uniform legislative support.

3) Tech Barriers, Low Digital Literacy

Even though eNAM is digital, many farmers, especially in outlying areas, struggle to adopt technology. These include lack of smartphones, inconsistent internet, and poor digital tool training. Many farmers lack computer literacy, making bidding, payment tracking, and pricing monitoring problematic. This keeps farmers dependent on commission brokers or market intermediaries, contradicting eNAM's goal of empowerment. We need comprehensive training, user-friendly interfaces, and multilingual support to solve this problem.

4) Few Quality Grading and Assaying Facilities

Assaying and grading produce is essential to transparent and fair trading on eNAM. Many mandis lack certified labs, qualified staff, and standardised testing equipment. Quality-based pricing is impossible without sufficient assaying infrastructure, and buyers are less likely to bid remotely without product verification. This reduces eNAM volume and trust. Sustainable adoption requires expanding grading labs and standardising quality across commodities and regions.

5) Digital Payment System Trust Issues

Many farmers doubt the safety and trustworthiness of digital transactions, even though eNAM supports them for transparency and efficiency. Payment delays, lack of direct dispute resolution, and financial unfamiliarity are concerns.

Farmers in places with poor banking infrastructure may have trouble receiving payments or confirming transactions. These challenges make farmers reluctant to switch from cash-based to digital payment structures, reducing eNAM's efficacy. Trust demands strong grievance redressal processes, timely disbursals, and handholding.

6. POLICY INTERVENTIONS AND RECOMMENDATIONS

1) Harmonising State APMC Acts

All states must change their APMC Acts to follow central guidelines for eNAM to function as a single national agriculture market. These improvements should allow interstate trading, unified trading licenses, and direct electronic transactions without bureaucracy. Harmonising state laws will eliminate discrepancies, fragmentation, and increase agricultural commodity flow. Central aid and conditional financing can persuade laggard states to modify their laws.

2) Improving Digital and Infrastructure in Mandi

Auction systems, assaying labs, cold storage, grading units, and electronic weighbridges must be upgraded for digital trade and efficient mandi operations. Mandais also need high-speed internet, digital display boards, and secure e-payment gateways. Upgrades to hardware and software will boost operational efficiency, transparency, and trader/farmer confidence. PPPs can sustainably fund and maintain this infrastructure.

3) Farmers' Education and Digital Literacy

Digital platforms like eNAM only work if farmers can use them independently. Therefore, farmers need large-scale training and awareness initiatives to learn about digital trading's benefits, uses, and procedures. Farmers need frequent workshops, mobile demos, and village-level initiatives to promote digital, financial, and tech literacy. Vernacular mobile apps and voice-based solutions can also make eNAM more accessible to illiterate and elderly farmers.

4) FPO/Cooperative Model Role

Farmers Producer Organisations (FPOs) and agricultural cooperatives can connect smallholders to the digital platform. FPOs aggregate produce, grade and assay, negotiate prices, and handle logistics. This concept empowers small and marginal farmers, who lack scale, to negotiate. Policies that improve FPO governance, credit availability, and eNAM participation can boost platform transaction volume and value.

5) Greater Stakeholder Engagement Incentives

Institutionalise incentives for farmers, dealers, APMC staff, and private buyers to maintain involvement. APMC workers may receive performance-linked bonuses, transaction-based subsidies, tax benefits for online trading, and preferential access to government procurement schemes for eNAM customers. Farmers can be encouraged to participate in eNAM by tying it to PM-KISAN, PMFBY, or MSP procurement. Policymaking must include stakeholder feedback and periodic monitoring for system improvement.

Table 5 Summary of Policy Interventions and Recommendations for eNAM

Policy Focus Area	Key Recommendations	Expected Outcome
Harmonization of State APMC Acts	Align state APMC laws with central eNAM guidelines (unified license, inter-state trade)	National market integration and regulatory uniformity
Strengthening Mandi Infrastructure	Upgrade digital tools, assaying labs, weighing systems, and storage facilities	Efficient, transparent mandi operations
Farmer Education and Digital Literacy	Conduct training programs, use local languages, develop user-friendly apps	Greater farmer participation and platform usability
Empowering FPOs and Cooperatives	Support FPO aggregation, provide funding and governance assistance	Increased bargaining power for smallholder farmers
Stakeholder Incentives	Offer transaction-based rewards, link to government schemes, performance bonuses	Enhanced engagement from farmers, traders, and APMCs

7. CONCLUSION

The Electronic National Agriculture Market (eNAM) has become an important step in India's move towards digital and inclusive farming selling. eNAM has made prices more clear, increased market access, and given farmers, especially smallholders, the tools they need to compete in trade environments by connecting APMC mandis that are spread out regionally into a single electronic trading platform. According to the research, eNAM has improved price realisation, boosted trade between states, cut down on reliance on middlemen, and made deals more efficient and clear. The move

to digitalise mandi activities and add real-time bidding and e-payment systems is a big step towards more modernising how the agri-market is run. But the platform's success is still not the same in all areas because of major problems like poor infrastructure, a lack of tools for grading and testing, different APMC reforms at the state level, and farmers who don't know how to use technology well. There are trust problems with digital payment systems, and there aren't any consistent policy frameworks. This makes it harder for the platform to reach its full potential. The study stresses that strong policy changes are needed for eNAM to have a long-lasting effect. These include aligning state rules, putting money into mandi infrastructure, and giving farmers training to improve their skills. Also, the part that FPOs and cooperatives play in collecting goods and making joint bargaining possible needs to be made official. eNAM's benefits will need to be boosted by encouraging stakeholders to get involved, making it easier for everyone to use technology, and making sure that investments in infrastructure are in line with policy changes. In the end, eNAM has the ability to make agricultural marketing more open to everyone in India. But this can only happen if policymakers, tech developers, and people at the local level work together to make it happen.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

REFERENCES

Garg, M.; Singhal, S.; Sood, K.; Rupeika-Apoga, R.; Grima, S. Price Discovery Mechanism and Volatility Spillover between National Agriculture Market and National Commodity and Derivatives Exchange: The Study of the Indian Agricultural Commodity Market. J. Risk Financial Manag. 2023, 16, 62. https://doi.org/10.3390/jrfm16020062

Zia, A.; Alzahrani, M. Investigating the Effects of E-Marketing Factors for Agricultural Products on the Emergence of Sustainable Consumer Behaviour. Sustainability 2022, 14, 13072. https://doi.org/10.3390/su142013072

Quan, T.; Jia, W.; Quan, T.; Xu, Y. Impact of Farmers' Participation in the Transformation of the Farmland Transfer Market on the Adoption of Agricultural Green Production Technologies. Agriculture 2024, 14, 1677. https://doi.org/10.3390/agriculture14101677

Jiang, X.L.; Sun, Y.; Shen, M.; Tang, L.X. How Does Developing Green Agriculture Affect Poverty? Evidence from China's Prefecture-Level Cities. Agriculture 2024, 14, 402.

Wang, X.; Drabik, D.; Zhang, J.B. How channels of knowledge acquisition affect farmers' adoption of green agricultural technologies: Evidence from Hubei province, China. Int. J. Agric. Sustain. 2023, 21, 2270254.

Mao, H.; Zhou, L.; Ying, R.Y.; Pan, D. Time Preferences and green agricultural technology adoption: Field evidence from rice farmers in China. Land Use Policy 2021, 109, 105627.

Eanes, F.R.; Singh, A.S.; Bulla, B.R.; Ranjan, P.; Fales, M.; Wickerham, B.; Doran, P.J.; Prokopy, L.S. Crop advisers as conservation intermediaries: Perceptions and policy implications for relying on nontraditional partners to increase US farmers' adoption of soil and water conservation practices. Land Use Policy 2019, 81, 360–370.

Yang, C.F.; Ji, X.; Cheng, C.M.; Liao, S.; Bright, O.; Zhang, Y.F. Digital economy empowers sustainable agriculture: Implications for farmers' adoption of ecological agricultural technologies. Ecol. Indic. 2024, 159, 111723.

Li, X.K.; Guo, H.D.; Jin, S.Q.; Ma, W.L.; Zeng, Y.W. Do farmers gain internet dividends from E-commerce adoption? Evidence from China. Food Policy 2021, 101, 102024.

Hu, Yuanhong & Liu, Jing & Zhang, Shuyu & Liu, Yuxin & Xu, Haixin & Liu, Pengling, 2024. "New mechanisms for increasing agricultural total factor productivity: Analysis of the regional effects of the digital economy," Economic Analysis and Policy, Elsevier, vol. 83(C), pages 766-785.

Xiaoyan Zhang & Qing Yang & Abdullah Al Mamun & Mohammad Masukujjaman & Muhammad Mehedi Masud, 2024. "Acceptance of new agricultural technology among small rural farmers," Palgrave Communications, Palgrave Macmillan, vol. 11(1), pages 1-17, December.

Xiaohui Li & Hang Xiong & Jinghui Hao & Gucheng Li, 2024. "Impacts of internet access and use on grain productivity: evidence from Central China," Palgrave Communications, Palgrave Macmillan, vol. 11(1), pages 1-9, December.

Md. Raquibuzzaman Khan & Nazia Tabassum & Niaz Ahmed Khan & Mohammad Jahangir Alam, 2022. "Procurement challenges in public-sector agricultural development projects in Bangladesh," Palgrave Communications, Palgrave Macmillan, vol. 9(1), pages 1-13, December.

Borrero, J.D.; Mariscal, J. A Case Study of a Digital Data Platform for the Agricultural Sector: A Valuable Decision Support System for Small Farmers. Agriculture 2022, 12, 767. https://doi.org/10.3390/agriculture12060767

Basso, B.; Antle, J.M. Digital agriculture to design sustainable agricultural systems. Nat. Sustain. 2020, 3, 254–256.

Qin, T.; Wang, L.; Zhou, Y.; Guo, L.; Jiang, G.; Zhang, L. Digital Technology-and-Services-Driven Sustainable Transformation of Agriculture: Cases of China and the EU. Agriculture 2022, 12, 297.

Yoo, Y. The Table Has Turned: How Can IS Field Contribute to the Technology and Innovation Management? J. AIS 2013, 14, 227–236.

Kallinikos, J.; Aaltonen, A.; Marton, A. The Ambivalent Ontology of Digital Artifacts. MIS Q. 2013, 37, 357–370.

Wysel, M.; Baker, D.; Billingsley, W. Data sharing platforms: How value is created from agricultural data. Agric. Syst. 2021, 193, 103241.

Henfridsson, O.; Mathiassen, L.; Svahn, F. Managing Technological Change in the Digital Age: The Role of Architectural Frames. J. Inf. Technol. 2014, 29, 27–43.

Darnell, R.; Robertson, M.; Brown, J.; Moore, A.; Barry, S.; Bramley, R.; George, A. The current and future state of Australian agricultural data. Farm Policy J. 2018, 15, 41–49.

Fleming, A.; Jakku, E.; Lim-Camacho, L.; Taylor, B.; Thorburn, P. Is big data for big farming or for everyone? Perceptions in the Australian grains industry. Agron. Sustain. Dev. 2018, 38, 24.