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Research Article

Digital Transformation in Agricultural Marketing: An Empirical Study of Trade Trends on India's e-NAM Platform

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ABSTRACT

This study investigates the digital transformation of agricultural marketing in India through an empirical analysis of trade trends on the Electronic National Agriculture Market (e-NAM) platform from 2016–17 to 2019–20. Drawing on secondary data from official sources, it examines both the quantity (in metric tonnes) and value (in crores) of commodities traded across six key categories: food grains, oilseeds, fruits, vegetables, spices, and miscellaneous products.

The findings reveal significant growth in both trade volume and value, with a compound annual growth rate (CAGR) of 23% and 35.1% respectively. High-value crops such as spices and perishables like vegetables and fruits showed the strongest gains, indicating enhanced price realization and inclusion. The analysis demonstrates e-NAM's potential to streamline agri-marketing, reduce reliance on intermediaries, and support a more efficient and inclusive market environment.

The study concludes with targeted policy recommendations to improve digital infrastructure, encourage broader crop inclusion, and integrate e-NAM with complementary agri-services. It also outlines directions for future research including mandi-level analysis and stakeholder-focused studies.

Keywords: e-NAM, Digital Transformation, Agricultural Marketing, Trade Trends

I. Introduction

Agricultural marketing in India has historically been hindered by a lack of transparency, limited access to competitive markets, and the dominance of intermediaries. The traditional system, centered on Agricultural Produce Market Committees (APMCs), often restricts farmers to localized mandis, thereby limiting their bargaining power and reducing price realization. To address these inefficiencies and create a more integrated and transparent marketplace, the Government of India launched the Electronic National Agriculture Market (e-NAM) in April 2016.

e-NAM is a pan-India electronic trading portal designed to unify existing mandis into a single national platform. It enables farmers, traders, and buyers to participate in transparent online trading of agricultural produce, irrespective of geographical boundaries. By facilitating better price discovery, real-time information access, and streamlined transactions, e-NAM seeks to modernize India's agri-market infrastructure and empower farmers with wider market access.

Since its inception, e-NAM has expanded significantly, both in terms of geographic reach and stakeholder participation. However, beyond registration numbers, a more substantive measure of its effectiveness lies in examining the volume and value of commodities traded over time. These metrics offer a direct reflection of platform utilization, market trust, and the economic relevance of digital agricultural marketing.

This study aims to conduct a temporal analysis of commodity trade trends on the e-NAM platform from 2016–17 to 2019–20. By analyzing both the quantity (in metric tonnes) and the value (in crores) of traded commodities across key categories—such as food grains, oilseeds, fruits, vegetables, spices, and miscellaneous goods—this research captures the evolving dynamics of agricultural trade in the digital era.

The findings provide empirical insights into:

- Which categories have driven the growth of e-NAM;
- Whether the increase in trade volume is accompanied by proportional value gains;

• How commodity-specific trends reflect broader structural changes in agri-marketing.
By evaluating these trends, the study contributes to understanding the real-world impact of e-NAM and offers policy suggestions for further enhancing its inclusivity, effectiveness, and scalability.

II. Literature Review

The transformation of agricultural marketing in India has been a focal point of policy reforms aimed at improving farmers' income, reducing post-harvest losses, and ensuring equitable access to markets. Traditional marketing channels—dominated by Agricultural Produce Market Committees (APMCs)—have often been criticized for inefficiencies, lack of transparency, and the excessive role of intermediaries. Recognizing these challenges, the Government of India launched the Electronic National Agriculture Market (e-NAM) in 2016, intending to integrate and digitize existing APMC mandis into a unified national market.
e-NAM and Market Efficiency
Several scholars have highlighted the theoretical benefits of e-NAM in enhancing market efficiency. According to Gulati et al. (2018), e-NAM holds potential to improve price discovery, reduce transaction costs, and promote inter-state trade in agricultural commodities. Similarly, Mishra and Singh (2020) observed that digital platforms like e-NAM help in curbing information asymmetry and allow farmers to access a wider pool of buyers, potentially leading to better price realization.
Empirical Evaluations of e-NAM
While policy discussions around e-NAM are extensive, empirical evaluations remain relatively limited. Yadav (2018) conducted a case study on Varanasi's e-mandi and found that although trading volumes were initially low, the system improved transparency and bidding practices for select vegetables. Shivangi et al. (2024) analyzed wheat and paddy trade in Uttar Pradesh and found that e-NAM contributed to increased trade volumes and quicker payments, although awareness and infrastructure remained major constraints.
Sandeep Gautam et al. (2022) conducted a survey-based study in Sultanpur district of Uttar Pradesh to identify constraints to e-NAM adoption. Their findings highlighted both technological and behavioral barriers, including poor internet access, trust in traditional middlemen, and low digital literacy among farmers.
Digitalization and Commodity Participation
Few studies have examined crop-specific participation on e-NAM platforms. A study by SFAC (2021) showed that while food grains dominated early e-NAM transactions, perishables such as fruits and vegetables witnessed the fastest growth in later years. This trend aligns with findings from NITI Aayog (2019), which noted that categories like spices and oilseeds—traditionally marginalized in APMC setups—gained greater visibility and value through digital trading platforms.
Gaps in the Literature
Despite these contributions, limited research exist that combines temporal analysis of both quantity and value of traded commodities across multiple categories on e-NAM. Most existing works either focus on case studies, perception-based surveys, or crop-specific analysis. There is a need for more comprehensive, data-driven studies that assess how trade has evolved across categories over time and what this indicates about the platform's effectiveness and inclusivity.
This study seeks to fill this gap by providing an empirical assessment of commodity-wise trade trends on e-NAM from 2016 to 2020, based on officially reported aggregate quantity and value data. The analysis aims to capture both the economic scale and category-wise diversification of digital agricultural marketing in India.

III. Methodology

3.1 Research Design
This study employs a quantitative and descriptive research design to examine the digital transformation of agricultural marketing in India through the e-NAM platform. Specifically, it analyzes temporal trends in commodity trade based on aggregate data covering both the physical quantity (in metric tonnes) and monetary value (in Indian Rupees) of commodities traded via e-NAM over a four-year period (2016–17 to 2019–20). The approach aims to identify growth trajectories, category-wise participation patterns, and implications for market inclusivity and efficiency.
3.2 Data Source and Scope
The study is based entirely on secondary data obtained from the official e-NAM portal and affiliated government reports. These sources are authoritative and widely cited in policy and academic literature on agricultural market reforms in India.
The dataset encompasses annual trade statistics for six broad commodity categories:
• Food Grains
• Oil Seeds
• Fruits
• Vegetables
• Spices
• Miscellaneous Commodities

Each category includes cumulative annual figures for:
- Total quantity traded (in metric tonnes)
- Total trade value (in crores)
- Compound Annual Growth Rate (CAGR) from 2016–17 to 2019–20

3.3 Analytical Framework
The study employs the following analytical techniques:
Descriptive Statistics: Used to summarize absolute and relative changes in trade volume and value over the four-year period.
Trend Analysis: Year-wise changes in quantity and value are visualized using line and bar charts to illustrate category-wise growth or decline.
Growth Metrics: The Compound Annual Growth Rate (CAGR) for each commodity category is used to compare performance over time and across groups.
Derived Indicators
Average Price Realization: Estimated by dividing annual trade value by corresponding trade quantity for each category, providing a proxy for price trends and market efficiency.
Data organization and visualizations were conducted using Microsoft Excel and Python (specifically, Pandas and Matplotlib libraries) to ensure precision and reproducibility.

3.4 Scope and Limitations
While the analysis provides a macro-level overview of commodity trade on e-NAM, the study is subject to the following limitations:
The analysis does not incorporate state-wise or market-level granularity, which may reveal more nuanced spatial trends.
The study relies exclusively on quantitative secondary data; it does not include qualitative insights from farmers, traders, or market functionaries.
The role of external variables (such as policy shocks, climatic variations, or logistical disruptions like COVID-19) is not explicitly accounted for in this analysis.
Despite these limitations, the study offers valuable empirical insights into the evolving role of e-NAM in India's agricultural marketing system, and lays the groundwork for more granular or mixed-method follow-up research.

IV. Results and Discussion

4.1 Overview of Trade Trends
The data from the e-NAM platform between 2016–17 and 2019–20 indicate a strong upward trajectory in both the quantity and value of agricultural commodities traded. The total quantity of trade grew from 5.00 million metric tonnes (MT) in 2016–17 to over 10.53 million MT by 2019–20, reflecting a compound annual growth rate (CAGR) of 23%. Similarly, the total trade value increased from 21,143.5 crores to 57,165.76 crores, yielding an impressive CAGR of 35.1%.
This growth reflects increasing stakeholder participation, improved digital adoption, and growing confidence in e-NAM as a viable alternative to traditional mandi-based transactions.

4.2 Commodity-Wise Performance
Food Grains
Food grains constituted the largest share of traded quantity throughout the period. The traded volume increased from 4.24 million MT to 6.45 million MT, with a CAGR of 9.4%, while the trade value grew from 8,203.22 crores to 16,411.35 crores (CAGR: 21.7%). This suggests both volume expansion and improved price realization over time.

Oil Seeds
Oil seeds saw substantial growth in volume, rising from 0.32 million MT to 0.99 million MT (CAGR: 42.3%) and in value from 1,325.81 crores to 3,964.59 crores (CAGR: 41.7%), indicating increased digital market penetration for these crops.

Fruits and Vegetables
Though lower in absolute volume compared to grains, fruits and vegetables showed the fastest growth rates:
Fruits: Quantity rose from 36,008 MT to 141,366 MT; value increased from 55.22 crores to 331.65 crores (CAGR: 72.1%)
Vegetables: Quantity expanded from 274,885 MT to 981,917 MT; value from 171.5 crores to 1,202.51 crores (CAGR: 80.5%)
These high growth rates suggest successful onboarding of perishable commodities, which typically face high market inefficiencies in traditional systems.

Spices
Spices demonstrated the highest value growth, with trade value increasing from 816 crore to 6,672.78 crore (CAGR: 93.4%) and quantity growing from 111,472 MT to 743,672 MT. This reflects enhanced digital trading infrastructure and increased interstate demand aggregation.

Miscellaneous Commodities
This category, which includes non-categorized or newly added commodities, witnessed exceptional growth:
Quantity increased from 5,576 MT to 1.22 million MT (CAGR: 407.1%)
Value surged from 10,571.75 crores to 28,582.88 crores (CAGR: 35.1%)
This diversification indicates an evolving platform that increasingly supports non-traditional and high-value niche products.

4.3 Price Realization Trends (Average Price per MT)
By dividing total value by quantity for each category, the study estimated average price trends. For instance:
Food Grains: Approx. 2,544/MT (2016–17) to 2,543/MT (2019–20)
Spices: Increased from 7,322/MT to 8,973/MT, reflecting greater value addition
These figures suggest that while volumes increased significantly, certain commodity categories—particularly spices and perishables—also achieved better price realization.

4.4 Interpretation and Implications
The findings reveal that:
e-NAM has moved beyond staple grains to actively include high-value and perishable commodities.
Improved trade volume and value suggest enhanced trust, reduced intermediation, and growing digital literacy among stakeholders.
The dramatic growth in categories like spices and vegetables points to policy success in infrastructure investment, grading facilities, and e-payment systems

Tableno. 4.1: Quantity of commodity trade date-NAMPlatform (Quantity in Metric Tonnes)

Commodity Category	2016-17	2017-18	2018-19	2019-20	CAGR
FoodGrains	4247151.7	6797886.9	4754556.4	6453646	9.4
OilSeeds	326332.8	787654.52	958727.75	991645.07	42.3
Fruits	36008.73	161714.88	137674.81	141366.57	48.3
Vegetables	274885.19	713327.1	944103.63	981917.94	50.7
Spices	111472.16	590019.81	763995.3	743672.09	81.3
Miscellaneous	5576.73	674156.04	711643.93	1227013	407.1
Total	5001427.33	9724759.24	8270701.82	10539260.7	23

Source: Official Website of e-NAM

Tableno. 4.2: Value of commodity traded at e-NAM Platform (Quantity in Crores)

Commodity Category	2016-17	2017-18	2018-19	2019-20	CAGR
FoodGrains	8203.22	14032.82	12502.25	16411.35	21.7
OilSeeds	1325.81	2932.49	3570.41	3964.59	41.7
Fruits	55.22	358.48	377.42	331.65	72.1
Vegetables	171.5	721.13	766.83	1202.51	80.5
Spices	816	4078.68	5473.89	6672.78	93.4
Miscellaneous	10571.75	22123.6	22690.8	28582.88	35.1
Total	21143.5	44247.2	45381.6	57165.76	35.1

Source: Official Website of e-NAM

V. Conclusion and Policy Recommendations

5.1 Conclusion
This study has explored the evolution of commodity trade on the Electronic National Agriculture Market (e-NAM) platform from 2016–17 to 2019–20, using official aggregate data on trade quantity and value across six major commodity categories. The findings clearly demonstrate that e-NAM has made measurable progress in promoting digital agricultural marketing in India:
Total trade volume more than doubled from 5.00 million MT to 10.54 million MT, with a compound annual growth rate (CAGR) of 23%.
Total trade value increased from 21,143 crores to 57,165 crores, with a CAGR of 35.1%, indicating both increased adoption and improved price realization.

High-growth categories, particularly spices, vegetables, and fruits, showed stronger value growth compared to volume, suggesting better market access and improved efficiency in price discovery for perishable and high-value crops.
The miscellaneous category saw a remarkable surge in both volume and value, indicating increasing inclusion of non-traditional or niche commodities into the e-NAM ecosystem.
These outcomes reflect e-NAM's effectiveness in enhancing transparency, reducing intermediation, and facilitating wider market access—hallmarks of digital transformation in agricultural marketing.

5.2 Policy Recommendations

Based on the results and observed trends, the following policy interventions are recommended to strengthen the impact and inclusivity of the e-NAM platform:

1. Expand Infrastructure for Perishables

To support the growth of fruits, vegetables, and spices, the government should invest in cold storage, sorting/grading facilities, and transport logistics within and around e-NAM mandis.

2. Enhance Digital Awareness and Capacity Building

Many farmers and small traders remain unaware or unsure of using digital platforms. Large-scale training, demonstration modules, and vernacular interfaces should be promoted through Krishi Vigyan Kendras (KVKs), Farmer Producer Organizations (FPOs), and mobile apps.

3. Promote Crop Diversification on e-NAM

Efforts should be made to onboard more niche and high-value crops under e-NAM, particularly from regions with untapped production potential. This can be done through incentive schemes and linking procurement agencies with the platform.

4. Encourage Mandi-Level Innovations

Autonomous APMCs should be empowered to innovate within the e-NAM framework, such as through local quality-assaying centers, dispute redressal mechanisms, and better display systems to increase trust in digital bidding.

5. Integrate e-NAM with Other Platforms

To enhance interoperability, e-NAM should be integrated with warehousing systems (e-NWRs), agri-credit platforms, and e-commerce ventures, creating an end-to-end ecosystem from farm to market.

5.3 Future Research Scope

- While this study provides macro-level insights, future research could:
- Incorporate mandi- or district-level data for spatial analysis,
- Examine post-2020 trade patterns, including the impact of COVID-19 disruptions, and
- Use primary data (e.g., farmer and trader surveys) to assess behavioral factors influencing adoption.

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