

## Assessing the Impact of e-NAM on Arrivals and Prices of Agricultural Commodities: A Case Study in Haryana, India

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### ABSTRACT

Despite previous efforts to reform agricultural markets, challenges persist due to resistance from traders and governance issues. The Electronic National Agricultural Market (e-NAM) initiative, launched in 2016, aims to create a unified national market for agricultural commodities through online auctions. While studies suggest that e-NAM can enhance market efficiency and increase competition, challenges like infrastructure constraints remain. This research investigated the impact of e-NAM on commodity arrivals, prices and bidding performance of e-NAM in Haryana, India. The study employed longitudinal comparative approach spanning from 2015-16 to 2020-21. The results revealed that there were significant changes in commodity arrivals and prices post-e-NAM implementation. Markets experienced substantial increases in arrivals, indicating positive responses to e-NAM. Price changes varied across commodities, with some experiencing notable increases while few faced decreases. However, the study revealed poor bidding performance of e-NAM in different markets. Policy implications include the need for targeted awareness programs, infrastructure development, policy reforms and capacity-building initiatives to enhance the impact of e-NAM and foster sustainable agricultural market development in Haryana.

**Keywords :** Agricultural commodity arrivals, Bidding performance, e-NAM, Price changes, Impact of e-NAM, Digital integration

THE Agricultural Produce Market Committee (APMC) Act is a cornerstone of India's agricultural sector, shaping market dynamics and influencing farmers' access to markets and pricing mechanisms. The Model APMC Act, for instance, aimed at providing efficient marketing system to improv price realization for farmers and streamline market operations (Purohit, Imai & Sen, 2017). However, challenges such as resistance from traders and commission agents have impeded the effective implementation of these reforms (Kumari, Gundu & Panasa, 2017). The impact of the APMC Act on agricultural productivity and poverty outcomes in Indian states post-independence has been studied, with variations in institutional market arrangements

significantly influencing agricultural investment, productivity and poverty levels across states (Purohit, 2013). However, despite intentions to enhance marketing opportunities for farmers, implementation and governance issues have hindered the effectiveness of these acts in certain states (Mohanty & Singh, 2014 and Ravishankar *et al.*, 2016). In order to achieve the doubling agriculture farmers' income, there was a felt need to identify new sources of revenue and explore improved possibilities. Over the years, various reforms and amendments have been introduced to enhance market efficiency and promote agricultural growth. The evolution of agricultural markets has undergone a profound transformation with the advent of digital technologies. Among these

advancements, the Electronic National Agricultural Market (e-NAM) stands out as a pioneering initiative aimed at revolutionizing agricultural marketing in India. Rooted in the vision of creating a unified national market for agricultural commodities, e-NAM represents a paradigm shift in the way agricultural trade is conducted, offering immense potential to reshape market dynamics and enhance farmer welfare (Government of India, 2016).

Before the advent of e-NAM, the agricultural sector was characterised by fragmented markets, information asymmetry and a lack of transparent price discovery mechanisms, which collectively undermined the income potential of farmers (Punia and Bishnoi, 2022). The government recognised these limitations and in an effort to address them, introduced a central sector scheme aimed at promoting a National Agricultural Market through the Agri Tech Infrastructure Fund, with a budget allocation of Rs.200 crore starting on 1st July 2015 (MANAGE, 2018). The pre-e-NAM era was marked by the prevalence of localised markets, often operating independently with limited inter-market connectivity, which restricted the ability of farmers to access wider markets and obtain competitive prices for their produce. These markets were frequently dominated by a network of intermediaries, leading to increased transaction costs and reduced profit margins for farmers (MANAGE, 2018)

In 2016, the Government of India initiated the electronic e-NAM portal, aiming to integrate 585 APMC physical markets and establish a unified national market. The objective was to attract buyers from all corners of the country through electronic auctions. e-NAM aims to integrate markets across India through a common online platform, streamline marketing procedures, provide better marketing opportunities for farmers, ensure transparency in auction processes and promote stable prices for consumers (Government of India, 2016). While the produce delivery continues to happen the APMCs, but the online market helps to reduce the information asymmetry and transaction costs (Sharma and Patil, 2018).

The advent of digital platforms like e-NAM presents a promising solution to these systemic market inefficiencies. Farmers in India face significant climate vulnerability due to limited information access, poor transportation and financial constraints (Marepally *et al.*, 2024). e-NAM can help mitigate these risks by enhancing market access and price realization, improving farmers' resilience. Additionally, organizing farmers into collectives like FPOs enhances their market access, financial security and risk-taking ability (Anusha and Kumar, 2024). e-NAM, by integrating digital trading and market linkages, further strengthens these benefits, ensuring better price realization and reduced market constraints for farmers. Studies have indicated that e-NAM can lead to increased competition among traders, reduced collusion and higher average prices for agricultural commodities (Swain *et al.*, 2022 and Reddy, 2017). However, challenges such as lack of awareness, infrastructure constraints and procedural impediments have been identified in the implementation of e-NAM (Bandhavaya *et al.*, 2022 and Kapur & Krishnamurthy, 2014). The impact of e-NAM on commodity arrivals and prices reveals a nuanced picture based on various studies. According to Khandagiri and Kannan (2022), post-e-NAM implementation, there's a discernible decline in market arrivals of commodities, accompanied by a notable increase in average monthly prices, albeit with farmers receiving lower prices on average. This phenomenon suggests a shift in market dynamics, potentially influenced by factors like increased price volatility, indicating incomplete market integration. Swain *et al.* (2022) found that the adoption of e-trading, particularly in regulated wholesale APMC markets, has led to positive outcomes. In Rajasthan, for example, e-NAM adoption correlates with increased farmers' commodity prices or quantities, reflecting heightened demand and supply. Similarly, studies indicate that e-NAM has induced a demand shock for farmers' crops, offering a more efficient alternative for price discovery compared to traditional bidding systems. Reddy (2017) noted that electronic markets in Karnataka fostered increased competition

among traders, reducing collusion and resulting in higher average prices compared to non-e-markets. Moreover, Singh and Goyal (2020) found that the introduction of e-markets in Punjab has significantly boosted trade quantity and value, with positive effects on various agricultural commodities and increased average prices in e-NAM mandis, indicating potential benefits for farmers and traders. As noted by the National Institute of Agricultural Extension Management (MANAGE, 2018), stakeholders have perceived better prices post e-NAM.

Past studies have presented mixed findings regarding the impact of e-NAM on the arrivals and prices of commodities. Despite the aggressive implementation of e-NAM in Haryana, there has been a scarcity of research examining its specific effects on arrivals and prices, particularly within regional contexts like Haryana. Thus, this research aims to investigate the impact of the e-NAM on key aspects:

To analyse the extent of market infrastructure support and digital integration in e-NAM-enabled APMCs in Haryana.

The economic impact of e-NAM on the arrivals of agricultural commodities in APMCs in Haryana.

The impact of e-NAM on the prices of major agricultural commodities in APMCs in Haryana.

To assess the bidding performance of e-NAM in Haryana.

Through a comprehensive examination of commodity arrivals and price dynamics, this study aims to bridge this knowledge gap and offer valuable insights for policymakers, stakeholders and practitioners.

## METHODOLOGY

The research methodology for this study involves a longitudinal comparative approach, where the study spans from 2015-16 to 2020-21 to analyze changes over time and compare data before and after the implementation of e-NAM. Further, to analyse its impact on the arrivals of major agricultural commodities and price changes in selected APMCs in Haryana. Eight e-NAM mandis were selected based

on the highest arrival of commodities based on e-NAM data. These include Panchkula, Sirsa, Ellenabad, Fatehabad, Adampur, Barwala, Julana, Taraori and Gohana. Data collection involved gathering arrivals of commodity quantities in different APMCs before and after e-NAM implementation, sourced from records from AGMARKNET and e-NAM officials in Chandigarh. Additionally, primary and secondary data sources were utilized to examine the impact of e-NAM on commodity prices, incorporating prices obtained from farmers across various commodities in specific APMCs from 2015-16 to 2020-21. Primary data collected directly from farmers determined the prices received by farmers in 2020-21, while average annual prices for 2015-16 were sourced from the AGMARKNET website (Agmarknet, n.d.). Additionally, information regarding infrastructural facilities available in selected APMCs (Table 1), stakeholder registration on the e-NAM platform (Table 2) and the digital integration status of APMCs (Table 3) was gathered from mandi analysts and e-NAM authorities.

### Computation procedure : Impact on Arrivals :

The impact of e-NAM on the arrivals of major agricultural commodities after its implementation is calculated using the formula :

$$\text{Absolute change in Arrivals} = \begin{matrix} \text{Arrivals after e NAM} \\ - \text{Arrivals Before e NAM} \end{matrix}$$

$$\text{Relative change in arrivals} = \frac{\text{Arrivals After eNAM} - \text{Arrivals Before eNAM}}{\text{Arrivals Before eNAM}} \times 100$$

### Calculation of Impact on Prices:

#### Inflation Adjustment

- Inflation adjustment was performed using the CPI values. The Consumer Price Index (CPI) values for the years 2016 and 2021 were obtained to adjust the prices for inflation from the Reserve Bank of India website (RBI, 2023).

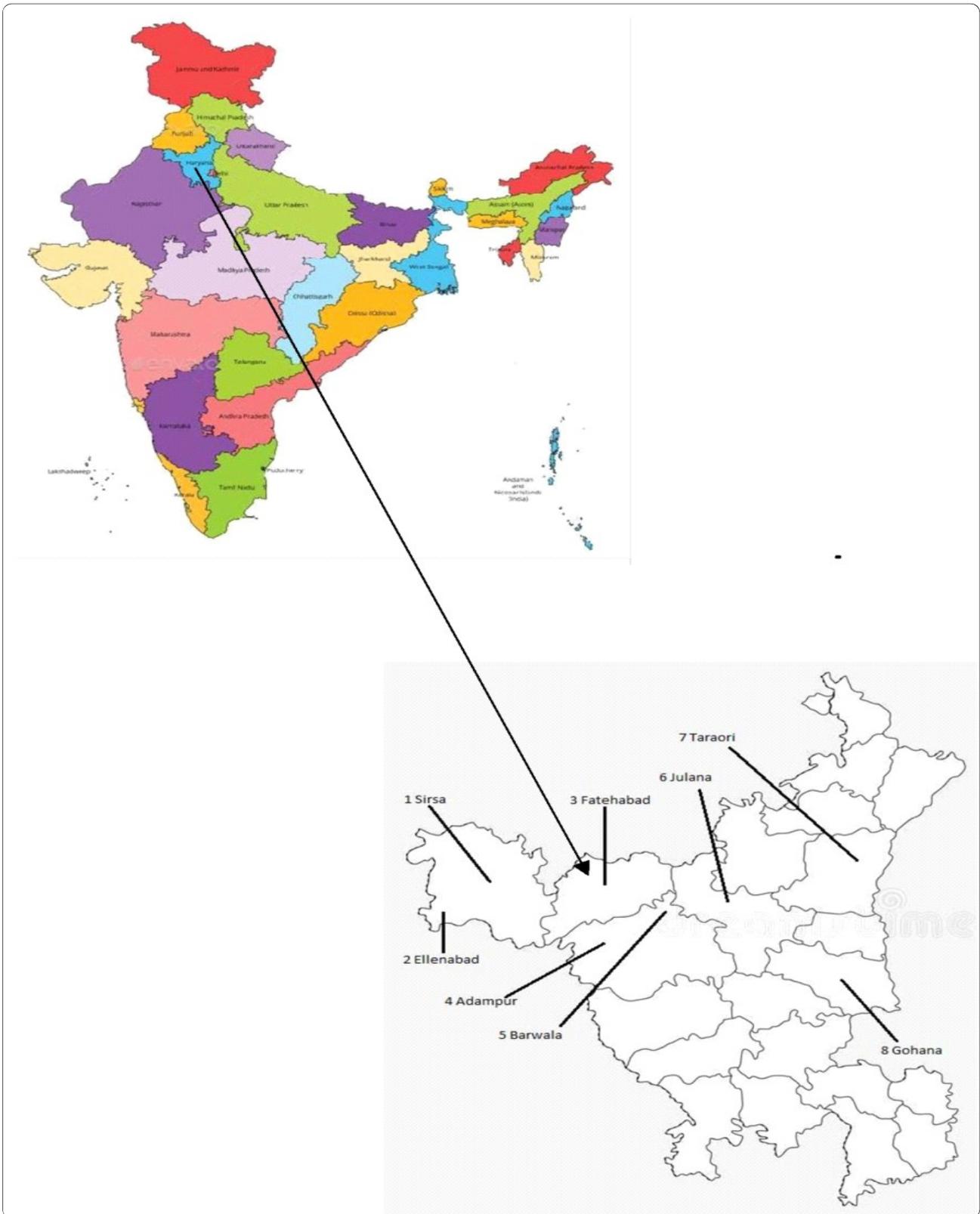


Fig. 1 : Location of the sampled APMCs in Haryana

**Calculation of Real Prices in 2021 :**

$$\text{Real Prices (2021)} = \frac{\text{Nominal Prices (2021)}}{\text{CPI (2021)}} \times \text{CPI (2016)}$$

**Calculation of Change in Price (with Inflation Adjustment)**

$$\text{Absolute change in Price} = \text{Real Price in 2021} - \text{Price in 2016}$$

$$\text{Relatively change in Price} = \frac{\text{Real Price in 2021} - \text{Price in 2016}}{\text{Price in 2016}} \times 100$$

**Calculation of the Degree of Composition as Reflected by Average Number of Bids Received Per Lot from 2016 to 2021**

$$\text{Average number of bids per lot} = \frac{\text{Total number of bids}}{\text{Total number of lots traded}}$$

**RESULTS AND DISCUSSION**

Haryana State Agricultural Marketing Board (HSAMB) plays a crucial role in establishing the infrastructure necessary for the successful implementation of the Electronic National Agricultural Market (e-NAM), which aims to create a unified national market for agricultural commodities (Sekhar and Bhatt, 2018). Table 1

**TABLE 1**  
**Availability of HSAMB's required infrastructural facilities in selected APMCs**

Required infrastructural facilities	Sirsa	Ellenabad	Fatehabad	Adampur	Barwala	Julana	Taraori	Gohana
Agri Business Information Centre	X	✓□	✓□	✓□	X	✓□	X	X
Boundary wall	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Check post & Gates	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Common auction Platforms	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Covered Platforms	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Individual Platforms	✓□	✓□	✓□	✓□	✓□	✓□	X	✓□
Shops & booths	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Weigh bridge	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Internal and service roads	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Approach and link Roads	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Food storage Godowns	X	X	✓□	✓□	✓□	X	✓□	X
Kisan Rest House	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Light Arrangement	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Parking place	✓□	✓□	X	✓□	✓□	✓□	✓□	✓□
Firefighting Station	✓□	✓□	✓□	✓□	✓□	✓□	X	✓□
Drinking water Facilities	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Sulabh Sauchalya	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Provision of site for Post Office & Banks	X	X	X	✓□	✓□	✓□	✓□	✓□
Canteen	✓□	X	✓□	✓□	X	✓□	✓□	✓□
Provision for water supply and sewerage system	✓□	✓□	✓□	✓□	✓□	✓□	✓□	✓□
Provision for petrol/ diesel pump	X	X	X	✓□	X	✓□	X	✓□

Source : Mandi Analyst of the respective APMC

presents the availability of essential infrastructural facilities provided by the Haryana State Agricultural Marketing Board (HSAMB) across selected Agricultural Produce Market Committees (APMCs). The results indicated that while some infrastructure elements, such as boundary walls, gates, auction platforms, weighbridges and internal roads, are uniformly available across all selected mandis and certain other facilities show inconsistencies. Notably, Agri-Business Information Centres are absent in most of the APMCs, with only Ellenabad, Fatehabad and Adampur providing such a facility. Food storage godowns, which are crucial for maintaining stock and reducing post-harvest losses, are only available in Fatehabad, Adampur and Taraori. Additionally, firefighting stations, which are vital for mitigating fire hazards, are present in six APMCs but absent in Sirsa and Taraori. With respect to post offices and banks facilities, it is only available in four APMCs- Adampur, Barwala, Julana and Taraori, potentially limiting financial access for farmers and traders. Similarly, canteens are not uniformly present, being absent in Ellenabad and Sirsa. Petrol/diesel pumps, which facilitate transportation, are only available in Adampur, Barwala and Gohana. These findings align with those of Mahto and Patil (2025), who noted that despite e-NAM's contribution to the digitalization of agricultural marketing in Haryana, substantial infrastructure gaps persist.

The table highlights gaps in infrastructure that may impact the efficiency and smooth functioning of these APMCs, influencing farmers' participation in e-NAM and overall market performance.

Table 2 illustrates the level of stakeholder participation in the e-NAM platform across selected APMCs as of 31st August 2021. The data reflects significant variation in farmer registration, with Sirsa (179,731) and Gohana (118,687) having the highest number of registered farmers, whereas Taraori (19,240) has the lowest. Despite a large number of farmers registering on e-NAM, the participation of Farmer Producer Organizations (FPOs) remains minimal, with most APMCs having only a handful of FPOs engaged. This suggests limited adoption of collective marketing strategies among farmers. The reason for low FPO participation in e-NAM may be due to limited digital access, lack of awareness and resistance from intermediaries. It may also stem from fear of taxation, procedural complexities and regulatory hurdles (Reddy, 2018). Additionally, the absence of quality standards may reduce trust and limit engagement (Chauhan *et al.*, 2021 and Misra, 2019). To boost FPO participation in e-NAM, a comprehensive strategy is needed to address infrastructural, technological, institutional and attitudinal barriers. Improving rural infrastructure such as internet access, storage facilities and transport systems is key to enabling effective engagement.

**TABLE 2**  
**Stakeholders registration on e-NAM platform in selected APMCs (Till 31<sup>st</sup> August, 2021)**

Particulars	Farmers	FPOs	Traders	Commission Agents	Farmers and Traders Ratio	Farmers and Commission agent Ratio
Sirsa	179731	4	442	801	407:01	224:01
Gohana	118687	1	224	395	530:01	300:01
Fatehabad	80990	8	99	636	818:01	127:01
Julana	57286	0	410	435	140:01	132:01
Adampur	96433	3	238	560	405:01	172:01
Ellanabad	109662	1	302	564	363:01	194:01
Taraori	19240	5	212	556	91:01	35:01
Barwalahisar	53010	12	199	351	266:01:00	151:01

Source : e-NAM officials, Chandigarh

Targeted training on digital skills, trading processes, and post-harvest practices can build FPO members' confidence (Chauhan *et al.*, 2021). Additionally, awareness campaigns and success stories can help reduce resistance from traditional intermediaries and promote wider adoption.

The number of registered traders and commission agents also varies widely, with Fatehabad having the lowest number of traders (99) and Sirsa having the highest (442). The farmer-to-trader and farmer-to-commission agent ratios highlight the significant imbalance in market participants. For instance, in Fatehabad, there are 818 farmers per trader, suggesting that a small number of traders handle transactions for a large farming population, potentially reducing competition and affecting price realization. Similarly, in Taraori, the farmer-to-commission agent ratio is only 35:1, indicating a higher presence of middlemen in the mandi.

Overall, the data suggests a need for policies to enhance trader and FPO participation on the e-NAM platform to balance market competition and strengthen the digital marketing ecosystem.

Table 3 provides insights into the digital infrastructure of the selected APMCs, focusing on digital gate entries, assaying machines and weighment machine

integration with the e-NAM portal. The findings indicate that all APMCs have digital gate entry systems, though the number varies across locations, with Adampur having the highest (5) and Fatehabad and BarwalaHisar having the lowest (2). A key observation is that all APMCs have at least one assaying machine, ensuring quality assessment of agricultural produce. However, none of the selected mandis have integrated weighment machines with the e-NAM portal, which may hinder seamless digital transactions and transparency in weight-based pricing. In terms of payment methods, all APMCs follow a mixed mode of payment, implying that while digital transactions are available, traditional payment methods (such as cash or cheques) still play a significant role in farmer payments. This suggests that complete digital financial integration is yet to be achieved in Haryana's APMCs.

The Table underscores the partial progress in digital infrastructure adoption in Haryana's mandis. While digital gate entries and assaying machines are present, the lack of weighment machine integration indicates a gap in full-fledged digital marketing operations.

The impact of e-NAM on agricultural commodity arrivals in APMCs is notable, as evidenced by the data in Fig. 2. Overall, there is a significant increase in

**TABLE 3**  
**Digital Integration Status of APMCs in Haryana**

Name of APMC	No. of Digital Gate Entries	No. of Assaying Machines	No. of Weighment Machines Integrated with e-NAM Portal	Payment Method
Sirsa	4	1	0	Mixed
Gohana	3	1	0	Mixed
Fatehabad	2	1	0	Mixed
Julana	4	1	0	Mixed
Adampur	5	1	0	Mixed
Ellanabad	4	1	0	Mixed
Taraori	3	1	0	Mixed
BarwalaHisar	2	1	0	Mixed

Source : Mandi Analyst of the respective APMC

**TABLE 4**  
**Impact of e-NAM on the arrivals of agricultural commodities in APMCs**

APMCs	Quantity Arrivals Before e-NAM (2015-16)	Quantity Arrivals After e-NAM (2020-21)	Absolute Change	Relative change (%)
Sirsa	17.36	12.86	-4.5	-25.92
Ellanabad	10.52	89.54	79.02	751.14
Fatehabad	12.03	49.06	37.03	307.81
Adampur	8.33	66.01	57.68	692.44
BarwalaHisar	2.83	66.12	63.29	2236.4
Julana	12.63	66.31	53.68	425.02
Taraori	11.39	44.12	32.73	287.36
Gohana	1.01	38.87	37.86	3748.51

Source : Mandi Analyst of the respective APMC

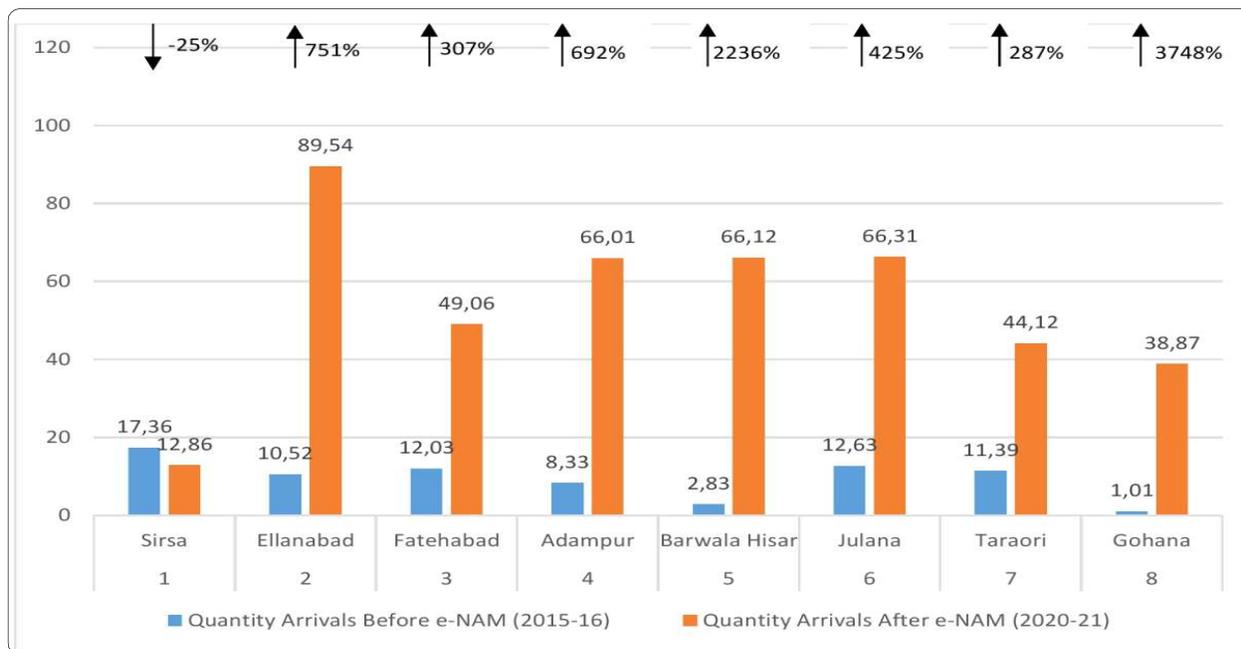


Fig. 2 : Commodity arrivals in selected APMCs before and after implementation of e-NAM

arrivals after the implementation of e-NAM, with some markets experiencing dramatic changes. For instance, markets like Ellanabad, Adampur and Barwala Hisar witnessed a remarkable increases of 751.14, 692.44 and 2236.4 per cent respectively. This study aligns with the findings of Nookathoti and Behera (2022), who reported a positive impact of e-NAM on the arrivals of commodities like tomato, brinjal and bitter gourd in certain APMCs, suggesting

that e-NAM has effectively facilitated greater market access and participation for farmers in these areas. However, it is important to note variations across different markets, as seen in Sirsa, where there was a decrease of 25.92 per cent.

This observation is in line with the findings of Khandagiri and Kannan (2022), who reported that in Odisha, the market arrival of all five commodities

analyzed declined in the post-e-NAM period compared to the pre-e-NAM period. Additionally, the arrival of maize and cashew nut was found to be higher on average in non-eNAM-enabled markets than in e-NAM-enabled ones (Khandagiri and Kannan, 2022). This study is also consistent with Nookathoti and Behera (2022), who noted that the majority of commodities experienced negative growth due to reasons such as corruption practices by mandi officials, highlights the need for further investigation into local infrastructure, farmer awareness and market-level governance.

These findings reflect both the potential and the challenges of e-NAM. While the observed changes in quantity arrivals in certain APMCs underscore the role of e-NAM in enhancing market efficiency, promoting fair pricing and reducing transaction costs for farmers, the mixed results indicate that policy and implementation-level issues still need to be addressed. The surge in arrivals, where present, is expected to positively influence government revenue generation through market fees and the Haryana Rural Development Fund (HRDF), thereby bolstering infrastructure within APMCs and supporting agricultural marketing activities.

The impact of the electronic National Agriculture Market (e-NAM) on the prices of major agricultural commodities in APMCs from 2015-16 to 2020-21, after adjusting for inflation, reveals a mixed but largely positive trend, as presented in Table 5. With the Consumer Price Index (CPI) values for 2016 and 2021 being 870 and 1075 respectively, the adjusted real prices offer a more nuanced understanding of e-NAM's effect on price realization.

For wheat, the real price in 2020-21, adjusted for inflation, was Rs.1598.37 per quintal-an absolute increase of Rs.148.37 and a relative change of 10.23 per cent. This modest increase suggests that e-NAM has had a positive, albeit moderate, impact on wheat prices. A similar trend is observed in cotton, which showed a minimal relative change of 1.07 per cent, with the real price being Rs.4531.32 per quintal, reflecting only a slight absolute increase of Rs.47.75. These moderate gains indicate that while nominal prices have increased, the inflation-adjusted benefits are limited.

On the other hand, mustard exhibited a substantial real price increase to Rs.5135.35 per quintal, with an absolute gain of Rs.1553.71 and a relative change of 43.38 per cent. Guar too reflected a significant positive impact, increasing to Rs.4028.30 per quintal-an

**TABLE 5**  
**Impact of e-NAM on the prices of major agricultural commodities in APMCs**  
**(With Inflation Adjustment) (Rs. Per quintal)**

CPI (2016) = 870, CPI (2021) = 1075

Commodity	Price Before e-NAM (2015-16)	Price After e-NAM (2020-21)	Real Price 2020-21	Absolute Change	Relative Change (%)
Wheat	1450.00	1975.00	1598.37	148.37	10.23
Cotton	4483.57	5599.05	4531.32	47.75	1.07
Mustard	3581.64	6345.40	5135.35	1553.71	43.38
Guar	3562.15	4977.50	4028.30	466.15	13.09
Basmati Paddy	1914.20	2909.19	2354.41	440.21	23.00
Paddy (Normal)	1450.00	1888.00	1527.96	77.96	5.38
Green Gram	4701.85	6483.33	5246.97	545.12	11.59
Bajra	1186.51	1615.85	1307.71	121.20	10.21
Sorghum	1778.76	1500.00	1213.95	-564.81	-31.75

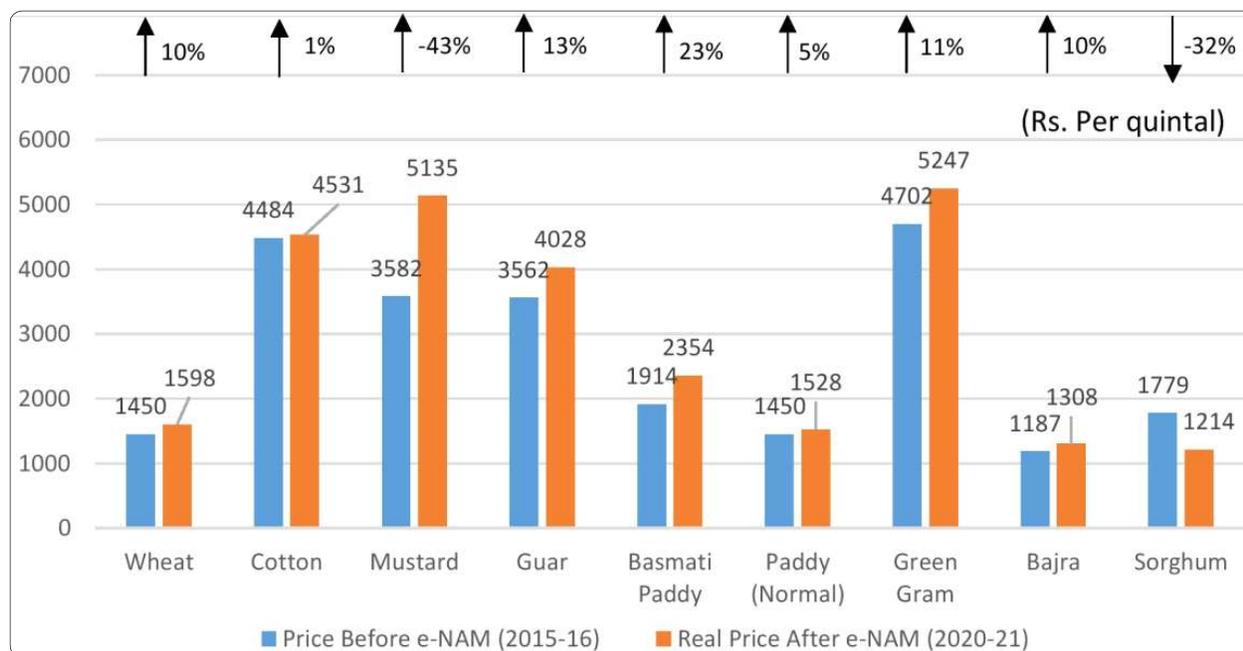


Fig. 3 : Commodity Prices in selected APMCs before and after implementation of e-NAM (With Inflation Adjustment)

Source : AGMARKNET website, direct farmer surveys, and Reserve Bank of India for Consumer Price Index (CPI) data

absolute change of Rs.466.15 and a relative gain of 13.09 per cent. Basmati paddy demonstrated a real price of Rs.2354.41 per quintal, with an absolute increase of Rs.440.21 and a relative rise of 23.00 per cent, suggesting improved price discovery through e-NAM.

These results are consistent with the finding of Saini *et al.* (2023), who observed that e-NAM has increased competition and enabled farmers to receive 1.5-2 per cent higher prices for their produce. Further, Nuthalapati *et al.* (2020a) found that participation in e-market transactions enhanced price discovery by 3.75 per cent, supporting the evidence of improved market efficiency. Similarly, Nookathoti and Behera (2022) reported higher prices for paddy, onion, potato, tomato, and brinjal in Odisha, particularly noting a significant increase in the price of paddy due to e-NAM.

Normal paddy prices also increased modestly, with a real price of Rs.1527.96 per quintal, marking an absolute gain of Rs.77.96 and a relative increase of 5.38 per cent. Green gram and bajra showed moderate benefits as well, with real prices of Rs.5246.97 and

Rs.1307.71 per quintal, respectively. These correspond to relative changes of 11.59 and 10.21 per cent, highlighting the potential of e-NAM in enhancing price realization for select pulses and coarse cereals.

However, the data also reflect limitations. Sorghum experienced a significant negative impact, with its real price dropping to Rs.1213.95 per quintal—a decrease of Rs.564.81 and a relative decline of -31.75 per cent. This aligns with the findings of Nuthalapati *et al.* (2020b), who noted that while many commodities benefited from e-NAM in terms of pricing, some experienced price declines post-implementation. This underlines the need for commodity-specific interventions and policy refinements within e-NAM.

Overall, while e-NAM has generally contributed to better price realization for a range of commodities, its benefits are not uniform across all crops. The significant gains for commodities like mustard, basmati paddy and guar reflect its transformative potential. However, the marginal increases for cotton and normal paddy, along with the sharp decline in sorghum prices, point to the need for targeted

**TABLE 6**  
**Degree of competition as reflected by average number of bids received per lot from 2016 to 2021**

Name of APMC	Number of lots Traded	Number of bids	Average number of bids per lot
Sirsa	329655	410339	1.3
Gohana	285057	490676	1.8
Fatehabad	128727	276315	2.4
Julana	204199	561659	2.9
Adampur	278092	719909	2.7
Ellanabad	222267	557368	2.6
Taraori	97068	188007	2.4
BarwalaHisar	125800	323122	2.7

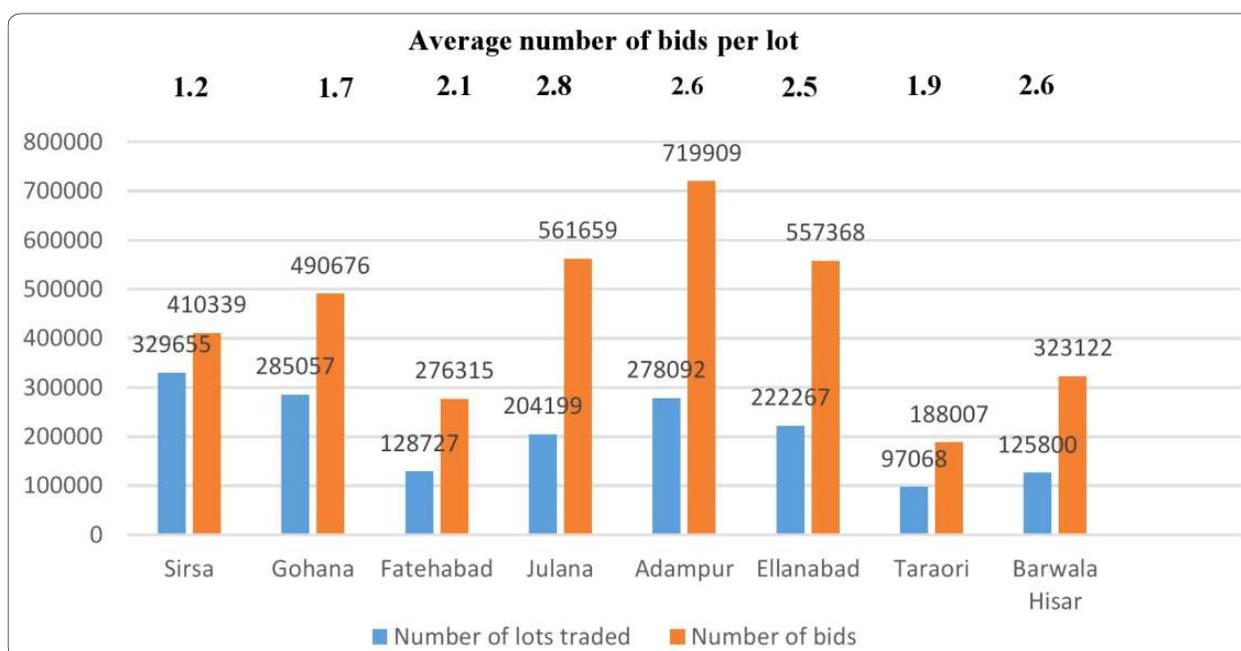


Fig. 4 : Average number of bids per lot

Source : E-NAM office, Chandigarh

improvements in infrastructure, better market integration and localized support mechanisms to ensure that all farmers can fully benefit from the digital marketplace.

Fig. 4 presents data on the degree of market participation for all types of commodities in APMCs from 2016 to 2021, as indicated by the average number of bids received per lot. The data shows relatively low competition across all markets, despite

some variation. Sirsa has the lowest average number of bids at 1.2, indicating very minimal competition. Gohana has a slightly higher average at 1.7 bids per lot. Fatehabad shows moderate competition with an average of 2.1 bids per lot. Julana has the highest competition among the APMCs with an average of 2.8 bids per lot, followed closely by Adampur and Barwala Hisar, each averaging 2.6 bids per lot and Ellanabad with 2.5 bids per lot. Taraori shows moderate competition with an average of

1.9 bids per lot. Although there is variation in the average number of bids, the overall competition on the demand side, as indicated by bidding activity, is significantly low.

One significant reason for low bidding in e-NAM stems from resistance among traditional traders and commission agents who perceive e-auctions as lacking advantages over conventional physical transactions (Reddy, 2018). This resistance is amplified by concerns regarding the taxation of online transactions, which can deter participation and contribute to lower bids (Reddy, 2018). A lack of awareness among farmers about the advantages of e-NAM and the e-tendering process can also lead to apprehensions about receiving lower prices for their produce, further exacerbating the issue of low bidding (Kalamkar *et al.*, 2019). Studies also show that farmers are generally not showing much interest in e-auctions and prefer traditional open auctions instead. This preference is influenced by factors such as their loan sources, family background, level of education, family size, annual income and age (Patil *et al.*, 2024).

Therefore, the Figure highlights the significance of bidding performance within the e-NAM framework as a crucial determinant of its success. The primary objective of e-NAM is to converge buyers and sellers onto a unified platform, fostering increased competition and facilitating genuine price discovery. However, the transition towards real-time online bidding, a key feature of e-NAM, has been gradual. Presently, most transactions still occur through offline auction systems, with winning traders subsequently updating the data on the e-NAM platform. This discrepancy arises from traders' preference for physical inspection of produce, reflecting concerns regarding quality assurance and perceived risks associated with online bidding. Therefore, while the data in the Figure indicates varying levels of market activity, it also underscores the ongoing evolution of agricultural markets towards digital platforms and the necessity of addressing traders' apprehensions to enhance e-NAM's effectiveness.

In conclusion, the implementation of e-NAM in Haryana reflects a mix of notable progress and enduring challenges in transforming agricultural marketing. The Haryana State Agricultural Marketing Board (HSAMB) has made commendable efforts in providing essential infrastructure across selected APMCs. However, inconsistencies in facilities such as storage godowns, banking services, firefighting stations and canteens point to the need for further infrastructural enhancement to support seamless e-NAM operations. While stakeholder participation shows significant farmer registration, the limited engagement of FPOs and uneven trader presence suggest a skewed market structure that may hinder fair competition and price realization.

Digital infrastructure has seen partial improvement through the introduction of digital gate entry and assaying facilities. Nevertheless, the absence of integrated weighing systems and fully functional digital payment mechanisms indicates that the transition to a fully digital marketing ecosystem is still incomplete. Despite these constraints, e-NAM has had a positive effect on market arrivals in several APMCs, with a few recording substantial growth. The price analysis demonstrates that commodities such as mustard, guar and basmati paddy have experienced notable real price gains following the adoption of e-NAM, whereas crops like cotton and sorghum exhibit a more limited impact.

From these empirical findings, several policy insights emerge. Firstly, there is a need for targeted investments to upgrade and standardize physical and digital infrastructure across all mandis. Secondly, greater incentives and support mechanisms are necessary to boost FPO participation and ensure consistent engagement from traders, fostering a more competitive and inclusive market environment. Thirdly, mandating end-to-end digital integration-including weighing, payment and logistics can reduce transaction times and enhance transparency. Finally, robust training and capacity-building initiatives for farmers, FPOs and traders are essential to increase operational familiarity with e-NAM modules and ensure effective usage.

Overall, while e-NAM has contributed positively to agricultural marketing in Haryana by improving market arrivals and price discovery for certain commodities, its broader effectiveness hinges on addressing infrastructure gaps and institutional shortcomings through focused, evidence-based policy actions.

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