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Digital Transformation in Agricultural Marketing: Analyzing the Progress of e-NAM in Haryana, India

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Abstract

This research evaluated the progress of the e-National Agricultural Market (e-NAM) in Haryana, India focusing on market distribution, infrastructure availability and marketing trends. Launched in 2016, e-NAM aimed to unify fragmented agricultural markets across India. The study analyzed district-wise market coverage, revealing disparities that impacted farmer's accessibility with some areas being underserved. Using data from 2016-17 to 2020-21, the findings indicated a mixed level of adoption of e-NAM features across Haryana. Essential components like electronic gate passes, bidding and e-payments saw widespread implementation, showcasing a positive shift towards digital engagement. However, the adoption of other key features, such as electronic displays, integration of weighment and warehouse facilities, remained insufficient. This lack of comprehensive infrastructure hindered the full potential of e-NAM. The analysis also showed progress in assaying labs and the use of SMS communication for bid announcements, indicating improved transparency and quality assessment in agricultural transactions. Despite these advancements, fluctuating registration levels among farmers, traders and agents pointed to varying engagement, suggesting a need for better outreach and training initiatives to encourage participation. The study concluded that while e-NAM has contributed to digitalizing agricultural marketing in Haryana, significant infrastructure gaps remained, particularly in integrating critical facilities. Addressing these gaps through targeted investment is crucial for enhancing market access, reducing transaction costs and ensuring equitable opportunities for all stakeholders. These insights are valuable for policy makers aiming to foster a more inclusive and efficient agricultural marketing system.

Keywords : e-NAM, e-NAM facilities, Progress, Trends, Market distribution, Arrivals, Trades, e-payments, Stakeholder registrations, Digital adoption, Agricultural marketing

Agriculture stands as the backbone of India's economy with the primary sector engaging a substantial 42.86 per cent of the total workforce (Neill, 2024). This sector's significance is under scored by India's standing as the second-largest global producer of food grains, contributing 25 per cent to the global production, second to China (Bisen and Kumar, 2018). Veeranjaneyulu (2014) noted that over 50 per cent of India's workforce is employed in agriculture, making a growing contribution to the GDP. India lacked self-sufficiency in numerous crops and its agricultural marketing system lacked organization. Acknowledging the critical need to improve the agricultural sector for increased productivity, efficiency and farmer well-being, several reforms have been implemented over time. One such significant reform was the introduction of the Agricultural Produce Marketing Committee (APMC) act, which was initiated in the 1950s by state governments, aimed to protect farmers

from exploitation, ensuring fair prices, reliable market information flow, rule enforcement and fostering trust among market players. The marketing of agricultural commodities faced numerous inefficiencies and challenges like licensing requirements, stock limits and movement restrictions under the previous APMC Acts. To tackle these issues, the Model APMC Act of 2003 was introduced to improve the system. Despite its intentions, the implementation of this model act was irregular across states, leading to the need for a comprehensive solution. This prompted the Indian government to launch the e-National Agricultural Market (e-NAM) platform in 2016, aiming to create a unified national market for agricultural produce. This electronic trading platform integrates 585 physical APMC market places into a cohesive national market, eliminating the need for distinct physical handlings and reducing market costs. The introduction of the e-NAM initiative owes its feasibility to the advancements in digitization, the availability of cheap internet and enhanced internet accessibility. These technological strides have paved the way for initiatives like e-NAM. Alavion and Taghdisi (2021) highlight that the transformative impact of information technology and digital interactions in agricultural marketing. Electronic marketing with its cost-effective nature and expansive market reach facilitated by diminished middlemen (Shaltoni and West, 2010), stands out as a crucial component in navigating the dynamic realm of customer engagements shaped by smart phones, rapid internet connectivity and social media platforms. However, unethical practices by traders and commission agents, such as collaboration to bid at lower prices, late payments and excessive middlemen have plagued the agricultural market (Aggarwal *et al.,* 2017). The e-NAM by fostering transparency, well-regulated markets, farmer-to-consumer engagement and fair pricing, seeks to enhance the existing state of the agricultural market. The platform's reach as of February 29, 2024, includes 1389 registered markets, engaging around 1.77 crore farmers, 2.56 lakh traders, 1.12 lakh commission agents and 3,625 farmer producer organizations (National Agriculture Market, 2024). Despite increased FPO registrations, Farmer Producer Companies still face challenges like limited input access and financial support (Keerthi and Basavaraj, 2024). Factors such as younger age, better education, and gender inclusion could boost FPO performance, allowing e-NAM to strengthen its impact through FPO partnerships (Krishn and Murthy, 2024). Each state demonstrates varying levels of e-NAM effectiveness with the rural community emerging as the most vulnerable in the agricultural marketing chain (Reddy, 2016). Not with standing the disparity in the progress of the initiative across various states, research on the progress within individual states is not enough and correct to portray the state of the affairs of the e-NAM. Therefore, it is of outmost importance for a state-wise investigation into the progress of e-NAM in India. This motivated the current study. Therefore, our research aims to investigate the current status of the distribution of regulated agricultural markets in Haryana, the availability of e-NAM facilities within APMCs and the progress of e-NAM in terms of arrivals, trades, e-payments and stakeholder registrations.

Material and Methods

The research methodology employed in this study involved a descriptive analysis of the status and progress of the e-NAM (National Agriculture Market) platform within the context of Haryana's agricultural marketing landscape. According to e-NAM officials, Haryana had 113 APMCs in 2019-20. The e-NAM directory (2021) states that 81 of these APMCs were included in the e-NAM scheme. A purposive sampling approach was used to select APMCs with the highest commodity arrivals among the 81 covered under e-NAM. The APMCs chosen for this study include Sirsa, Ellenabad, Fatehabad, Adampur, Barwala, Julana, Taraori and Gohana. Data collection involved both primary and secondary sources, including on-site assessments at e-NAM APMCs in Haryana and data from e-NAM officials in Panchkula (Chandigarh). The analysis focused on three main aspects: the distribution of regulated agricultural markets in Haryana, the availability of e-NAM

facilities within APMCs and the progress of e-NAM based on diverse quantitative metrics like arrivals, trades, e-payments and stakeholder registrations. This analysis spanned from 2016-17 to 2020-21 with the exclusion of data for 2017-18. This exclusion was necessary due to the introduction of a separate e-kharid platform for recording transactions of procurement through Minimum Support Price (MSP), which led to a sudden spike in metrics.

Results and Discussion

District-wise Number of Regulated Markets in Haryana

The Fig. 1, 2 and 3 present a comprehensive overview of the regulated agricultural markets across various districts of Haryana, offering valuable insights into the state's agricultural infrastructure and trade networks. The data reveals significant variations in market density, accessibility and geographical spread across districts, highlighting several meaningful outcomes. Districts like Rewari exhibit a lower density of markets but cover a larger area, indicating potential challenges in market accessibility for rural communities residing in remote areas. Conversely, districts such as Sonipat boast a higher density of markets relative to their size, suggesting better market access for local farmers. The average number of villages served per regulated market indicates the extent of market reach with higher numbers implying broader accessibility to agricultural trading facilities. Conversely, lower figures may signal potential gaps in market access, particularly in rural hinterlands. The distribution of sub-yards across districts provides insights into variations in market infrastructure and capacity which could influence

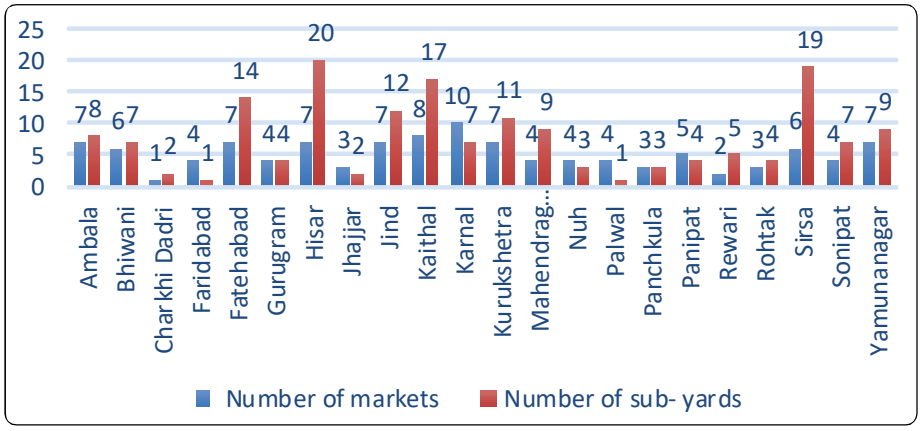

Fig. 1 : District-wise number of regulated markets in Haryana

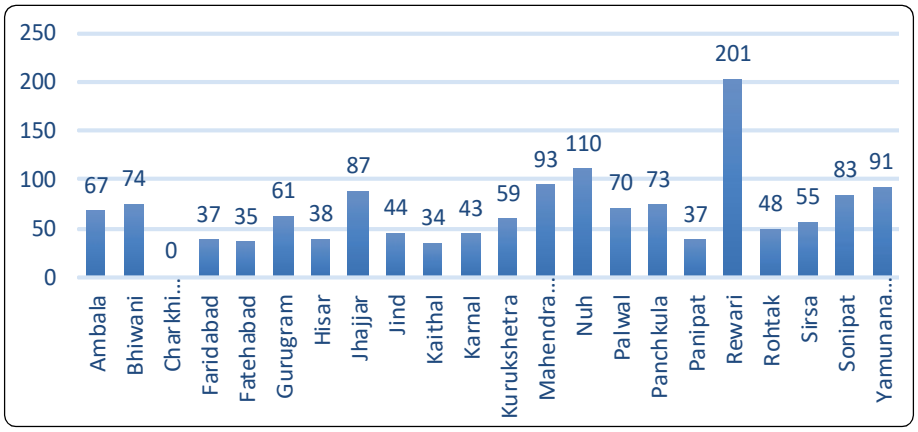

Fig. 2 : Average number of villages served per regulated market

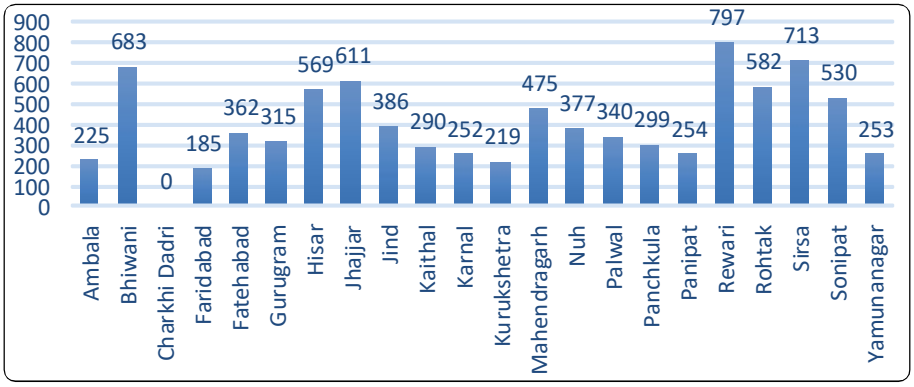

Fig. 3 : Average area served per regulated market (Sq.Kms.)

Source (Fig. 1-3) : Statistical Abstract of Haryana, 2019-20 (2021); @ Information included in district Bhiwani

trading dynamics and farmer participation. Moreover, the average area served per market reflects the geographical spread of agricultural trade networks, underscoring the diverse spatial patterns of agricultural activities within Haryana.

This analysis aligns with previous research findings that emphasize the importance of agricultural market infrastructure and accessibility in fostering rural development and enhancing farmer livelihoods. For instance, Harriss (1980) underscored regulated markets contribute to a fair and competitive trading environment, support small farmers, raise producer prices and facilitate efficient distribution and retailing. Wanmali (1980) highlighted the importance of considering both regulated and periodic markets as complementary systems rather than advocating for the complete exclusion of one over the other for rural development. Similarlarly, Purohit (2013) under scored the significance of regulated markets, particularly through the Agricultural Produce Markets Committee (APMC) Act in India. It highlights that these regulations play a pivotal role in shaping agricultural growth, productivity and poverty outcomes across different states. By emphasizing the importance of understanding the legal framework and political economy dynamics behind these regulations, it suggests that effective regulation can help address regional disparities and improve overall agricultural performance. However, Khan and Khan (2012) found that the Local rural markets are the preferred option for marginal and small farmers to dispose of their perishable surplus and get quick returns. According to Shilpi and Umali-Deininger (2007), improvements in market facilities and reductions in travel time from villages to markets significantly increase the likelihood of sales at the market. The findings of this study complement existing literature by providing empirical evidence on the distribution and characteristics of regulated agricultural markets in Haryana, thereby contributing to a deeper under standing of agricultural market dynamics and informing targeted policy interventions for enhancing market access and rural development initiatives.

Thus, the district-wise distribution of regulated markets in Haryana revealed a diverse landscape of agricultural trade infrastructure across the state. While some districts host a higher number of markets, indicating potentially robust agricultural activities, others have fewer markets, suggesting different agricultural dynamics or reliance on neighbouring districts for trade. The variation in service coverage metrics underscores the diverse geographical and agricultural landscapes within Haryana. Under standing these nuances is crucial for informed decision-making by policymakers, agricultural organizations and farmers, ultimately contributing to the sustainable growth and development of Haryana's agricultural sector.

As per e-NAM officials, there were 1,000 Agricultural Produce Market Committees (APMCs) in India during

the 2019-20 period. In Haryana specifically, there were 113 APMCs and 169 sub-yards. By March 2021, 81 APMCs in Haryana had been integrated with the e-NAM platform, representing 71.7 per cent of APMCs in the state and 8.1 per cent of all e-NAM APMCs across India, according to the e-NAM directory (2021).

Availability of e-NAM Facilities in the Selected APMCs

Data in Table 1, illustrates the percentage availability of various e-NAM facilities within APMCs (Agricultural Produce Market Committees), showcasing the extent of technological integration and modernization within agricultural markets. Electronic gate passes and bidding systems are universally adopted, in line with the Ministry of Agriculture & Farmers Welfare's focus on digitalization in market management, supported by substantial financial assistance provided through the 1 lakh crore financing facility from the Agriculture Infrastructure Fund (AIF) introduced in the Union Budget 2021-22, aimed at enhancing post-harvest facilities such as sorting and grading units, cold storages and warehouses (Ministry of Agriculture & Farmers Welfare, 2021). Similarly,

Table 1

Availability of e-NAM facilities in e-NAM APMCs in Haryana

Particulars	Percentage
Electronic gate passes	100
Electronic Bidding	100
Electronic Display	62.5
Exit passed generated	37.5
E-Agreement	100
Generation of sales receipt	87.5
Assaying lab	100
Announcing highest bid price to farmer by SMS	62.5
Integration of weighment with e-NAM portal	0
Integration of assaying with e-NAM portal	100
Online settlement	100
Warehouse integration	0

Authors own computation

e-agreements and online settlement methods are widely embraced across all APMCs, reflecting comprehensive utilization of electronic platforms for transactional processes. However, the adoption rates for other features vary. Electronic displays, crucial for conveying market information are present in 62.5 per cent of APMCs, indicating moderate implementation, as highlighted by Singh and Singh (2023), who stressed the necessity of addressing infrastructure issues to enhance market functionality and profitability for farmers. Additionally, only 37.5 per cent of APMCs have systems for generating exit passes electronically, underscoring a gap in electronic communication regarding market exits, as noted by Kumar *et al.* (2022), who found dissatisfaction among farmers with various infrastructure aspects related to the National Agriculture Market (e-NAM), including inadequate storage facilities for unsold produce and subpar loudspeakers and broadcasting systems.

Moreover, integration with the e-NAM portal for weighment and warehouse facilities remains at 0 per cent, indicating significant areas for improvement in electronic integration for managing agricultural logistics and storage. It is recommended, as emphasized by Singh and Singh (2023), to invest in improved infrastructure to address issues such as a lack of market information, storage problems, price fluctuations and marketing losses, which can ultimately maintain produce quality, reduce losses and boost marketing efficiency, benefiting farmers. Enhanced market information and transportation access lower costs and increase informed farmer's profits. It's worth noting that all APMCs have assaying labs integrated with the e-NAM portal, indicating universal adoption of quality assessment mechanisms within electronic platforms. Additionally, communication with farmers through SMS for announcing the highest bid price sees a 62.5 per cent adoption rate, indicating moderate utilization of electronic communication methods.

Overall, while there is a strong foundation of electronic infrastructure within e-NAM APMCs, there are opportunities for further enhancement,

particularly in areas with lower adoption rates. These findings under score the importance of ongoing efforts to modernize agricultural markets through comprehensive digitalization, aligning with recommendations for further development, particularly in prioritizing areas with lower adoption rates, such as electronic display systems and integration with the e-NAM portal for weighment and warehouse facilities.

Progress of e-NAM in Haryana during the Period from 2016-17 to 2020-21

The electronic National Agriculture Market (e-NAM) has been instrumental in transforming agricultural trading practices in Haryana, as reflected in the data from 2016-17 to 2020-21. The table outlines the key metrics of e-NAM adoption and its progress in commodities arrivals, commodities trade, e-Payment, and Stake holder's registrations in the state, excluding the data for 2017-18 due to the introduction of a separate e-kharid platform for recording transactions of procurement through Minimum Support Price (MSP), which had caused sudden hike in metrics.

Progress of e-NAM in Haryana: Arrivals Analysis (2016-17 to 2020-21)

Over the specified period, there has been a consistent increase in the number of lots arrived at the e-NAM platform, as indicated in Fig. 4, indicating a growing acceptance and utilization of the digital market place by farmers and traders alike. However, the quantity of agricultural commodities arriving at the market, shown in Fig. 5, experienced fluctuations, initially declining in 2018-19 but showing signs of recovery in subsequent years.

Fig. 4 : Lots arrived in number

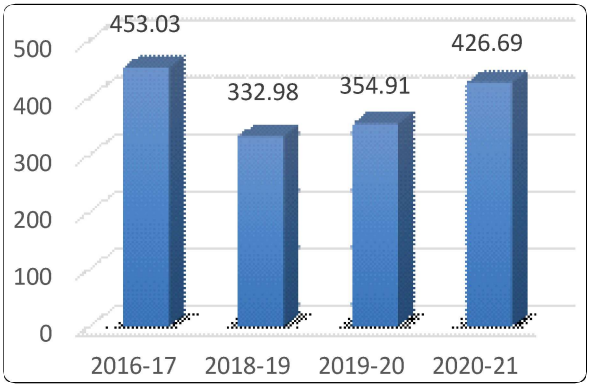

Fig. 5 : Arrived quantity in lakhs tonnes

Source (Fig. 4&5) : e-NAM officials, Chandigarh

Progress of e-NAM in Haryana: Trade Analysis (2016-17 to 2020-21)

The Figures illustrate the dynamics of traded lots and their corresponding quantities across four fiscal years from 2016-17 to 2020-21. Traded lots represent the count of transactions, while traded quantity measures the volume of goods exchanged, presented in lakh tonnes. In 2016-17, 914,423 lots were traded, amounting to a total traded quantity of 365.38 lakh tonnes. Subsequently, there was a dip in both traded lots and quantity in 2018-19 with figures dropping to 739,304 lots and 199.81 lakh units, respectively. However, from 2019-20 onwards, a reversal occurred, indicating a period of recovery and growth. By 2020-21, traded activity had surged with 1,047,086 lots exchanged and the traded quantity expanding to 311.14 lakh tonnes. These fluctuations reflect changing market dynamics and trading behaviours over the observed period with a notable upward trend in traded activity evident from

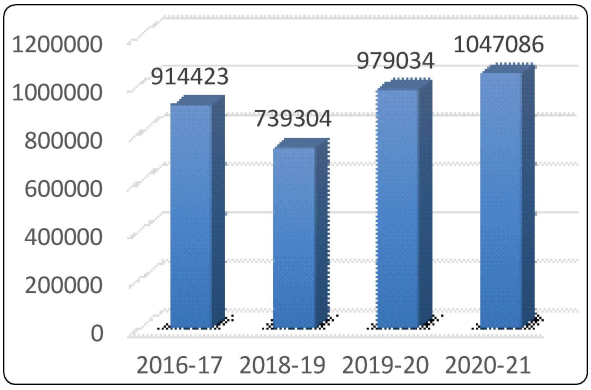

Fig. 6 : Traded lots no. in lakhs

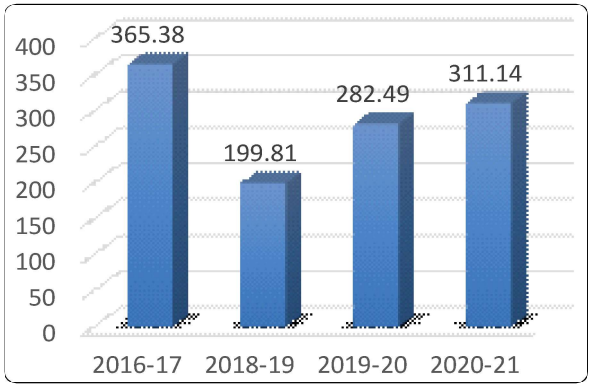

Fig. 7 : Traded quantity in lakhs tonnes

Source (Fig. 6&7) : e-NAM officials, Chandigarh

2019-20 onwards. Despite the fluctuations observed in traded lots and their corresponding quantities across the four fiscal years, there appears to be an overall growth trend in traded activity.

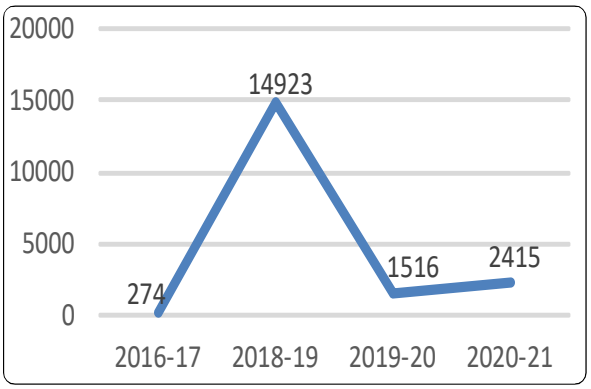

Fig. 8 : e-Payment in number

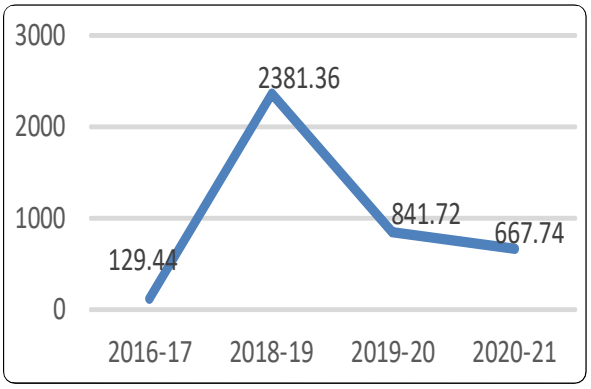

Fig. 9 : e-Payment in Rs. lakhs

Source (Fig. 8&9) : e-NAM officials, Chandigarh

Progress of e-NAM in Haryana: e-Payment Analysis (2016-17 to 2020-21)

One of the significant advancements facilitated by e-NAM is the adoption of electronic payment methods. Both the number and value of transactions conducted through e-payment witnessed substantial growth, reflecting a shift towards cashless transactions and improved financial inclusivity within the agricultural sector. There was a significant increase in e-Payments from 2016-17 to 2018-19 with the number of transactions skyrocketing from 274 to 14,923 and the volume of transactions surging from Rs.129.44 Lakhs to Rs.2,381.36 lakhs. However, in subsequent years, there was a slight decrease in both transaction count and volume, indicating a potential adjustment or stabilization in e-Payment activities. Overall, this trend underscores the efficiency and convenience offered by digital payment systems, which streamline financial transactions and reduce the reliance on traditional cash-based payments.

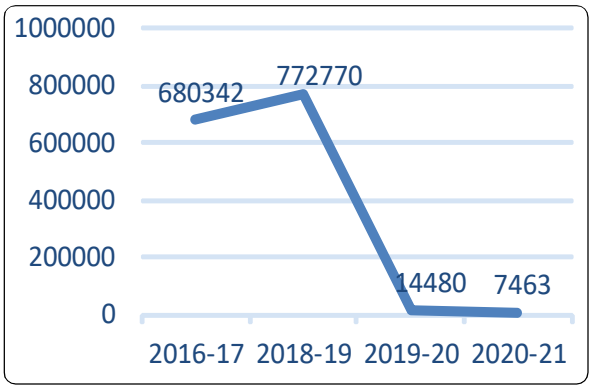

Fig. 10 : Farmer's registration in number

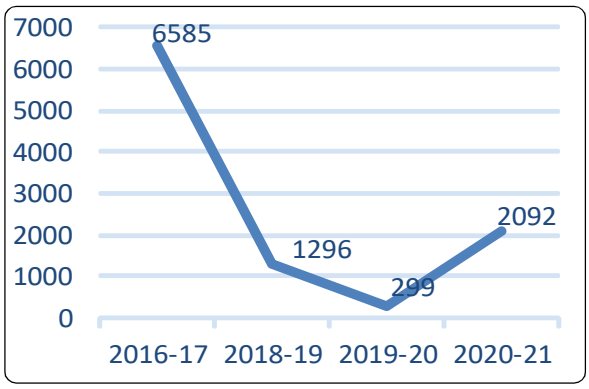

Fig. 11 : Trader's registration in number

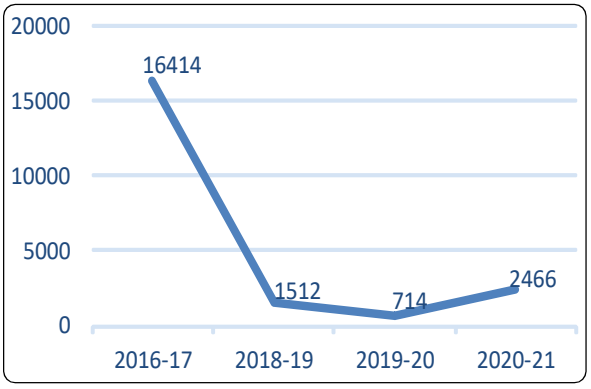

Fig. 12 : Commission agent's registration in number

Source (Fig.10-12) : e-NAM officials, Chandigarh

Progress of e-NAM in Haryana: Stakeholder's Registrations Analysis (2016-17 to 2020-21)

Furthermore, the data indicates fluctuations in the registration numbers of farmers, traders and commission agents on the e-NAM platform. While there was an initial surge in registrations, particularly among farmers and commission agents, the numbers experienced a decline in subsequent years. This fluctuation suggests varying levels of engagement and awareness among stakeholders regarding the benefits and functionalities of the e-NAM platform. Efforts to enhance outreach and training programs may be necessary to encourage broader participation and utilization of e-NAM services among agricultural stakeholders. In conclusion, the analysis of e-NAM metrics such as lots arrived, traded lots, traded quantity, e-payments and registrations of farmers, traders and commission agents in Haryana demonstrates a dynamic landscape of agricultural trading. Despite fluctuations, there is an evident trend towards increased digital marketplace acceptance. However, there was a notable dip in the quantity traded in 2018-19 compared to 2016-17. According to e-NAM officials, this decline was due to the formation of a separate e-kharid platform for recording transactions of procurement through the Minimum Support Price (MSP). Nonetheless, this resilience underscores e-NAM's transformative impact on fostering transparency and efficiency in Haryana's agricultural sector.

Trend in Quantity of Commodities Traded through e-NAM Platform from 2016-17 to 2020-21 in Haryana (Quantity: In Lakhs Tonnes)

The Fig. 13 presents commodity-wise data on the quantity traded through the e-NAM (National Agriculture Market) platform in Haryana from the financial years 2016-17 to 2020-21. The quantities are measured in lakhs tonnes and the values are in crores of rupees. In 2016-17, the total quantity of commodities traded was Rs.365.39 lakhs tonnes with food grains being the most significant contributor at Rs.341.1 lakhs tonnes. However, by 2018-19, the total quantity traded decreased to 199.81 lakhs tonnes, indicating a decline in trading activity. This decrease was mainly due to a significant drop in the quantity of food grains traded which reduced to 156.31 lakhs tonnes. However, from 2019-20 onwards, there was a notable increase in trading activity with the total quantity traded rising to 282.49 lakhs tonnes in 2019-20 and further to 311.14 lakhs tonnes in 2020-21. This increase was primarily driven by a resurgence in the trading of food grains, which saw quantities of 200.59 lakhs tonnes and 228.53 lakhs tonnes in 2019-20 and 2020-21, respectively. Additionally, other commodities such as oilseeds, fruits and vegetables also experienced fluctuations in trading volumes over the years. Overall, the data suggests a fluctuating trend in commodity trading through the e-NAM platform in Haryana with varying quantities being traded across different categories over the years. It is worthy to note that the values in Fig. 14 is summarized in Table 1c in the appendix for clarity.

Trend in Value of commodities traded through e-NAM platform from 2016-17 to 2020-21 in Haryana (Value: Rs. in Crores)

The Fig. 14 presents commodity-wise data on the value of commodities traded through the e-NAM platform in Haryana from the financial years 2016-17 to 2020-21. The quantities are measured in

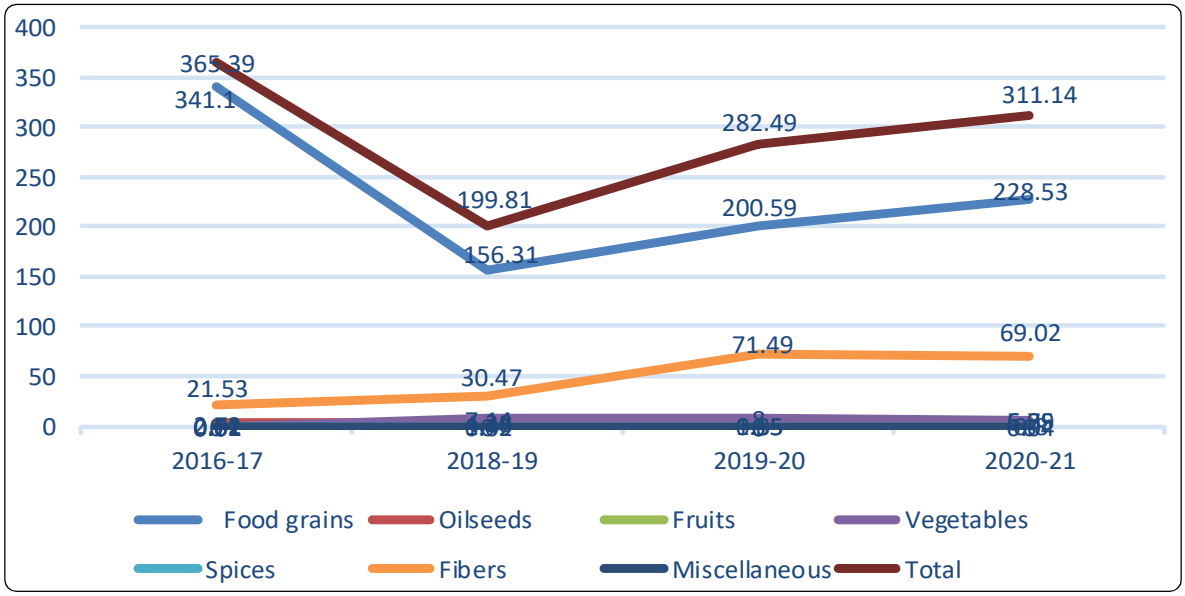

Fig. 13 : Quantity of commodities traded through e-NAM *(Source* : e-NAM, Chandigarh)

lakhs tonnes, while the values are in crores of rupees. In 2016-17, the total value of commodities traded was 7551.85 crores with food grains contributing the most significant share at 6329.67 crores. Oilseeds and fibers also made substantial contributions to the total value traded with values of Rs.94.24 crores and Rs.1127.29 crores, respectively. However, there was a decrease in the total value of commodities traded in 2018-19, amounting to Rs.6883.43 crores. This decline was primarily driven by decreases in the values of food grains, oilseeds, and fibers. Notably, the value of oilseeds traded saw a significant drop from Rs.157.46 crores in 2018-19 to Rs.56.49 crores. From 2019-20 onwards, there was a notable increase in the total value of commodities traded, reaching Rs.9549.35 crores in 2019-20 and further increasing to Rs.10233.81 crores in 2020-21. This upward trend was driven by increases in the values of food grains, oilseeds, fruits, vegetables and fibers. It is noteworthy that the values in Fig. 14 is summarized in Table 1d in the appendix for clarity.

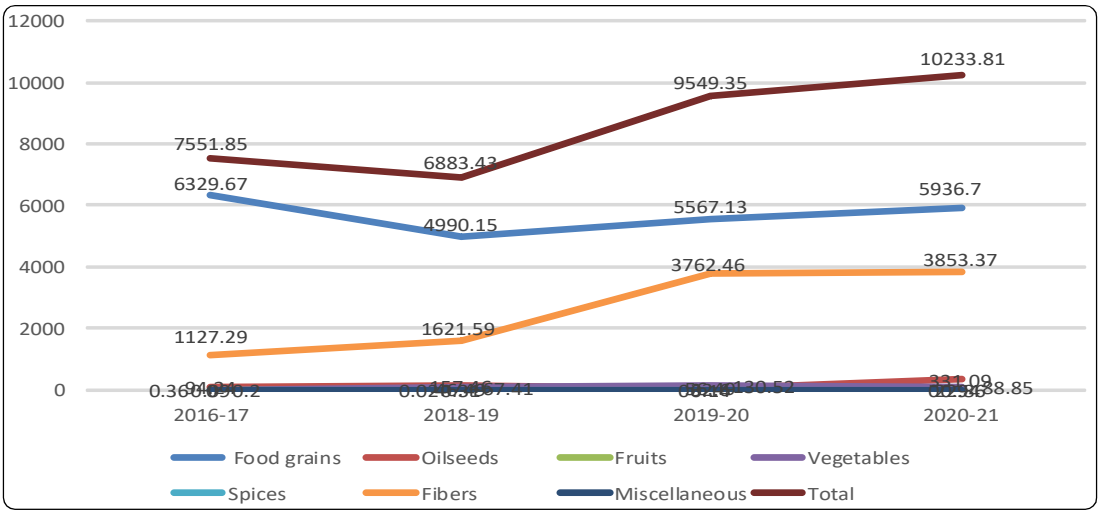

Fig. 14 : Value of commodities traded through e-NAM

Source : e-NAM, Chandigarh

The analysis of the Digital Transformation in Agricultural Marketing through the e-NAM initiative in Haryana underscores the pivotal role of technological integration in enhancing agricultural trade practices. The findings reveal a complex and evolving landscape of regulated markets across the state, marked by significant disparities in market density, accessibility and the adoption of digital facilities. While certain districts demonstrate robust agricultural infrastructure and higher market access, others face challenges due to lower market density and limited reach, particularly impacting rural communities. The study's insights into the functionalities of Agricultural Produce Market Committees (APMCs) highlight the considerable strides made in digitalizing agricultural processes, evidenced by the widespread implementation of electronic gate passes, bidding systems and e-agreements. Nevertheless, the gaps identified in the adoption of essential features such as electronic displays and integration with logistics systems emphasize the need for continued investment in infrastructure and technology. Addressing these deficiencies is crucial for optimizing market functionality and ensuring equitable access for farmers, particularly those in remote areas. The progress of e-NAM from 2016-17 to 2020-21 reveals a fluctuating yet generally positive trend in the volume of traded commodities, alongside an encouraging shift toward electronic payment systems. Despite the setbacks observed in specific years, the overall trajectory indicates a growing acceptance of digital platforms among farmers and traders. This evolution not only fosters transparency and efficiency in agricultural transactions but also contributes to improved financial inclusivity within the sector. The analysis also highlights the necessity for targeted out reach and training programmes to bolster awareness and engagement with the e-NAM platform among stakeholders. By enhancing understanding of the benefits and functionalities of digital marketing tools, policymakers can further stimulate participation and ensure that the advantages of e-NAM reach a broader audience.

Thus, the findings of this study contribute to a deeper understanding of the challenges and opportunities within Haryana's agricultural marketing framework. They serve as a foundation for informed policy interventions aimed at enhancing market access, infrastructure and digital literacy among farmers. As Haryana continues to navigate the digital transformation of its agricultural sector, ongoing evaluation and adaptation will be essential to realize the full potential of e-NAM, ultimately promoting sustainable agricultural growth and improving the livelihoods of farmers across the state.

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