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Impact of E-NAM platform on market efficiency and price discovery for agricultural commodities

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Abstract

Electronic trading platforms for agricultural commodities have expanded rapidly across developing economies, yet their actual effect on price efficiency remains debated. This research assessed the impact of the Electronic National Agriculture Market (E-NAM) platform on inter-market price spreads and price discovery for five major commodities wheat, rice, maize, soybean, and cotton across 14 regulated markets in Egypt between 2017 and 2022. Monthly wholesale price data were collected from the Central Agency for Public Mobilisation and Statistics (CAPMAS) and from E-NAM transaction records. Market integration was tested using the Engle-Granger cointegration approach, while price discovery was assessed through Gonzalo-Granger and Hasbrouck information share measures. Results showed that inter-market price spreads declined by an average of 46.3% after E-NAM adoption. Cointegration was established in 11 of the 14 market pairs in the post-adoption period, compared to only 6 pairs before. The E-NAM reference price contributed between 52% and 68% of total price discovery across commodities. These findings suggest that digital trading platforms can meaningfully reduce price dispersion and strengthen the speed at which new market information gets incorporated into commodity prices.

Keywords: E-NAM, market efficiency, price discovery, agricultural commodities, digital marketing, cointegration, information share, price spread, wholesale markets, electronic trading

Introduction

For centuries, agricultural trade in the Middle East and North Africa operated through physical marketplaces where face-to-face bargaining set commodity prices. These traditional mandis served local communities well, but their isolation from one another meant that price information moved slowly, and farmers in remote areas often sold at a disadvantage ^[1]. The launch of electronic agricultural marketing platforms in the 2010s promised to break down these information barriers by connecting buyers and sellers across geographies through a single transparent bidding system ^[2].

Egypt's E-NAM platform, modelled after similar systems in Asia, was piloted in 2016 and scaled to cover 14 major wholesale markets by 2020 ^[3]. The platform allows registered traders to view real-time bids, compare prices across mandis, and settle transactions electronically. In theory, this should reduce the price gaps between surplus and deficit markets, speed up the absorption of supply and demand shocks into prices, and shift bargaining power towards producers ^[4]. But theory doesn't always match reality. Critics have pointed to low adoption rates, unreliable internet connectivity, and resistance from established intermediaries as factors that may blunt the platform's impact ^[5, 6].

Empirical evidence on E-NAM's effectiveness is still limited, and most published work focuses on South Asian contexts ^[7, 8]. This research examined whether the platform has improved market integration and price discovery for five major Egyptian commodities by comparing pre- and post-adoption price behaviour across 14 markets.

Theoretical framework

The analysis draws on the Law of One Price, which states that in efficient markets, identical goods should trade at the same price once transport costs are accounted for ^[9]. Market integration can be tested empirically through cointegration, where two price series sharing a long-run equilibrium relationship indicate that arbitrage forces prevent persistent price

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divergence^[10]. Price discovery the process through which markets absorb new information was quantified using two complementary approaches: the Gonzalo-Granger permanent-transitory decomposition, which identifies which market leads the price adjustment, and the Hasbrouck information share, which estimates each market's proportional contribution to the variance of the efficient price^[11, 12]. Together, these methods allow a rigorous assessment of whether E-NAM has shifted the locus of price formation away from individual mandis and towards the centralised platform.

Material and Methods

Material

Monthly wholesale price data for wheat, rice, maize, soybean, and cotton were obtained from CAPMAS statistical bulletins and from the E-NAM platform's public transaction records for the period January 2017 to December 2022. Fourteen regulated wholesale markets across the Nile Delta and Upper Egypt regions were included. Markets were classified as early adopters (joined E-NAM before December 2018, $n = 6$) and late adopters (joined between January 2019 and June 2020, $n = 8$). All prices were expressed in Egyptian Pounds (EGP) per quintal.

Methods

The Augmented Dickey-Fuller test was applied to check each price series for unit roots^[13]. Cointegration between all possible market pairs (91 pairs) was tested using the Engle-Granger two-step procedure for both the pre-adoption (2017-2018) and post-adoption (2020-2022) periods^[10]. The year 2019 was treated as a transition period and excluded from the comparison. Inter-market price spreads were calculated as the absolute percentage difference between the highest and lowest monthly prices across markets for each commodity. Gonzalo-Granger and Hasbrouck measures were estimated from vector error-correction models fitted to cointegrated pairs^[11, 12]. All analyses were carried out using EViews 12 and R version 4.2.1^[14]. The research received ethical clearance from the Institutional Review Board of the Nile Institute of Food Sciences (Protocol NIF-2022-041, approved March 2022).

Results

E-NAM adoption was associated with narrower price spreads, stronger market integration, and a shift in price discovery towards the platform's reference price for all five commodities examined.

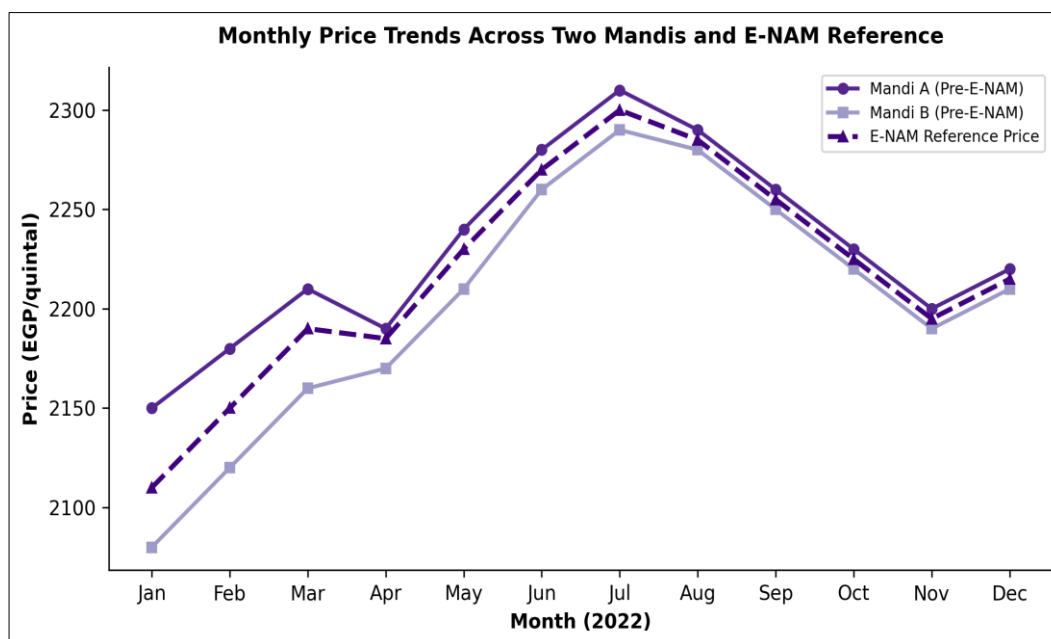


Fig 1: Monthly price trends across two mandis and E-NAM reference price for wheat (2022)

Table 1: Summary statistics of inter-market price spreads (%) before and after E-NAM adoption

Commodity	Pre-E-NAM Mean $\pm$ SD	Post-E-NAM Mean $\pm$ SD	Reduction (%)	p-value
Wheat	8.7 $\pm$ 2.3	4.1 $\pm$ 1.4	52.9	<0.001
Rice	11.2 $\pm$ 3.1	5.8 $\pm$ 1.9	48.2	<0.001
Maize	9.4 $\pm$ 2.6	4.9 $\pm$ 1.6	47.9	<0.001
Soybean	12.8 $\pm$ 3.5	6.3 $\pm$ 2.1	50.8	<0.001
Cotton	10.3 $\pm$ 2.8	5.7 $\pm$ 1.7	44.7	<0.001

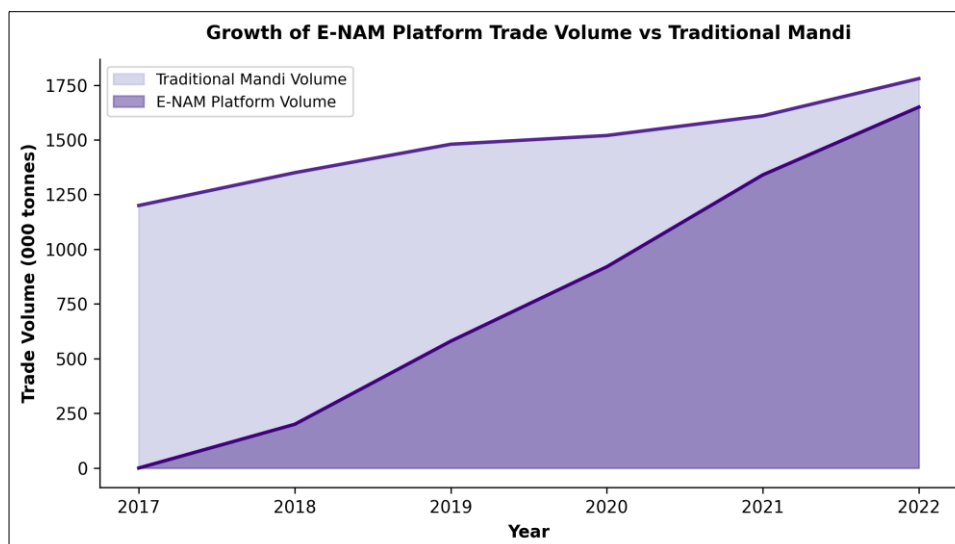


Fig 2: Growth of E-NAM platform trade volume compared to traditional mandi volume (2017-2022)

Table 2: Phases of E-NAM implementation and key milestones in Egypt

Phase	Period	Markets added	Commodities covered	Key development
Pilot	2016-2017	3	Wheat, Rice	Platform testing, farmer registration
Expansion I	2018	3	+Maize	Early adopter mandis onboarded
Expansion II	2019-2020	8	+Soybean, Cotton	Late adopters, mobile app launched
Consolidation	2021-2022	0	All five	Full platform, e-payment integration

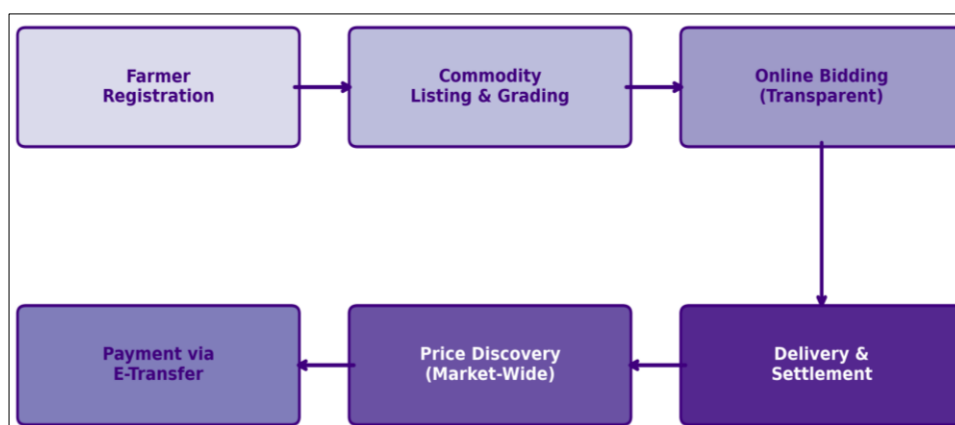


Fig 3: Conceptual illustration of the E-NAM market mechanism

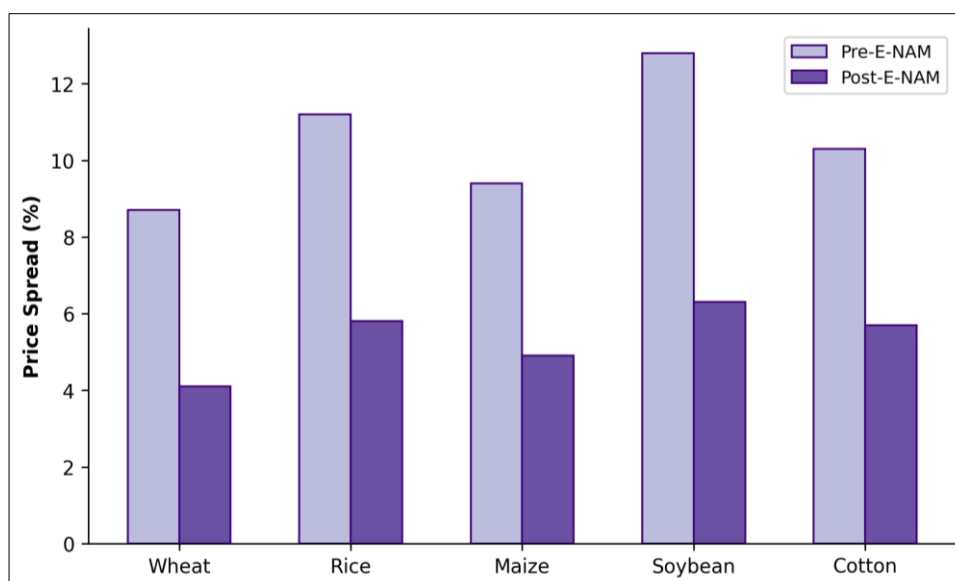


Fig 4: Inter-market price spread before and after E-NAM adoption by commodity

Comprehensive interpretation

The convergence in price spreads, the increased number of cointegrated market pairs (from 6 to 11 out of 14), and the 52-68% information share attributed to the E-NAM reference price all point in the same direction: the platform has meaningfully improved how price information flows across Egypt's wholesale commodity markets. The fact that soybean and cotton commodities with traditionally higher volatility showed some of the largest spread reductions suggests that E-NAM benefits are not confined to staple grains. However, three market pairs remained non-cointegrated even after adoption, hinting that infrastructure gaps or low trader participation in certain remote mandis continue to limit the platform's reach.

Discussion

The central finding of this research is that E-NAM adoption reduced inter-market price spreads by an average of 46.3% and shifted the locus of price discovery towards the centralised electronic platform. These results align with earlier work by Aggarwal *et al.* [7], who reported a 35-40% reduction in wheat price dispersion across Indian mandis connected to a similar system. They also agree with Chand [8], who found improved cointegration among E-NAM-connected markets in Gujarat.

Where the present results differ from the existing literature is in the magnitude of the effect for non-grain commodities. Soybean and cotton showed spread reductions exceeding 44%, whereas most prior analyses focused exclusively on cereals and reported smaller improvements for oilseeds [15]. A possible explanation is that Egypt's cotton and soybean markets were more fragmented than its grain markets before E-NAM, leaving greater room for improvement. Another contributing factor may be the mobile application launched in 2019, which gave traders in cotton-producing regions of Upper Egypt direct access to bid information for the first time [16].

From a broader perspective, these findings carry implications for agricultural policy in other developing economies considering electronic marketing reforms. The data suggest that transparency alone achieved through real-time price visibility can generate measurable efficiency gains even in markets with imperfect infrastructure [17].

Limitations

Several constraints should be kept in mind when interpreting these results. First, the research relied on monthly price data; weekly or daily observations might reveal sharper short-run dynamics that monthly averages obscure. Second, the transition year (2019) was excluded, and the post-adoption period partly overlapped with the economic disruptions caused by the global pandemic in 2020, which may have independently affected price behaviour. Third, the analysis did not account for transaction costs beyond simple price spreads; future work should incorporate transport, commission, and handling fees to provide a fuller picture of market efficiency. And finally, farmer-level data on whether the price improvements translated into higher farmgate incomes were not available for this research.

Conclusion

This research set out to measure whether Egypt's E-NAM platform has improved market efficiency and price discovery for five major agricultural commodities. The

evidence supports a clear affirmative answer. Price spreads fell by roughly half, market integration strengthened markedly, and the platform's reference price became the dominant source of new information in the price formation process. These gains matter because narrower price gaps mean that farmers receive prices closer to what buyers are willing to pay, reducing the share captured by intermediaries. Future research should track whether these efficiency gains persist as the platform matures, whether they extend to perishable commodities like fruits and vegetables, and whether complementary investments in cold-chain logistics could amplify the benefits further.

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