

Digital Inclusion and Adoption of Agricultural E-Marketplaces: Evidence from Farmers in Karnataka

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Abstract

Digitalisation has increasingly been promoted as a means of improving agricultural marketing, reducing information asymmetry and enabling farmers to obtain better prices for their produce. In India, the National Agriculture Market (e-NAM) was introduced in 2016 to create a unified electronic marketplace for agricultural commodities, drawing on the experience of Karnataka's Rashtriya e-Market Services (ReMS). However, the availability of digital platforms does not necessarily translate into their effective adoption by farmers. This study examines the adoption and usage of agricultural e-marketplaces among farmers in Karnataka and identifies the major barriers and enabling factors affecting their participation. Data were collected through a structured questionnaire from 344 farmers across all 31 districts of Karnataka. Descriptive statistics, chi-square tests, exploratory factor analysis and structural equation modelling were employed. The findings indicate that traditional mandis and traders remain the dominant channels for selling agricultural produce, while e-NAM has relatively low usage. Only 13.7 per cent of respondents reported awareness and use of e-NAM, compared with 54.4 per cent for ReMS. Education and mode of access were significantly associated with awareness, while adoption differed across age, land ownership and crop type. Knowledge-related barriers were stronger than infrastructural barriers, while training emerged as an important driver of progress. The findings highlight the need to shift the

focus from technological availability alone towards farmer awareness, training, trust and last-mile support.

Keywords: e-NAM; agricultural e-marketplaces; digital inclusion; agricultural marketing; ReMS; farmers; Karnataka

Introduction

Agricultural marketing in India has traditionally depended on physical mandis operating through Agricultural Produce Market Committees (APMCs). These markets have been associated with fragmented trading systems, information asymmetry, intermediaries and limitations in price dissemination. Such conditions can restrict farmers' bargaining power and affect price realization. The modernization of agricultural markets and the introduction of electronic trading have therefore become important components of India's agricultural policy.

The National Agriculture Market (e-NAM), launched on 14 April 2016, was introduced as an electronic trading platform intended to connect APMC mandis and create a common market for agricultural produce. Its development drew substantially on Karnataka's Rashtriya e-Market Services (ReMS), which operates a Unified Market Platform incorporating electronic auctions, price discovery, weighing, billing, market-fee

collection and direct payment mechanisms. At the time of the study, e-NAM had expanded substantially across India, while private platforms had also developed alternative digital channels for agricultural procurement.

The rationale behind agricultural e-marketplaces is not limited to technological modernization. Digital platforms can potentially improve access to market information, increase transparency, reduce transaction costs and provide farmers with alternatives to traditional intermediaries. However, registration or availability of a platform does not necessarily indicate meaningful adoption. Farmers may continue to depend on mandis and traders because of limited awareness, inadequate knowledge, lack of support and concerns about electronic transactions.

The Karnataka context is particularly relevant because the state provided the experience on which e-NAM was partly modelled. Despite this, the extent to which electronic markets have resulted in meaningful digital inclusion among farmers remains an important empirical question. Existing research has identified gaps concerning farmer awareness, accessibility, usage and the disparity between the availability and actual accessibility of digital agricultural services.

Accordingly, this study focuses on two objectives:

1. To examine the adoption and usage patterns of agricultural e-marketplaces among farmers in Karnataka.
2. To identify the major barriers and enabling factors affecting farmers' participation in agricultural e-marketplaces.

Literature Review

Agricultural marketing involves the activities and institutions through which agricultural products move from producers to consumers (Karthick, S., et al 2020). Conventional agricultural marketing in India has faced challenges including inadequate market information, dependence on intermediaries, high distribution costs and limited farmer awareness. Digital technologies have been proposed as a means of addressing some of these limitations by improving connectivity between

producers and markets (Golubev, A. V., et al 2019, November).

Studies on agricultural digitalisation suggest that electronic trading can contribute to more responsive supply chains and potentially reduce transaction costs (Raju, M. S., et al 2022). Government-supported platforms such as e-NAM and ReMS seek to improve price discovery and transparency, while private e-commerce platforms have developed direct procurement and delivery models. However, the success of these initiatives depends on farmers' ability and willingness to use them (Rai, N. 2023).

The literature also indicates that awareness and digital literacy are important determinants of participation (Khan, N. A., et al 2020). Education, extension contacts and media exposure have been associated with greater awareness of e-NAM, while age and digital literacy can influence the use of mobile-based agricultural services. Research has further identified trust, facilitating conditions and ease of use as important factors in electronic agricultural trading (Gupta, S. and Badal, P. S. 2018).

Despite these developments, an important distinction exists between digital availability and digital inclusion (Kumar, K. N., Gracy, C. P., and Srikanth, M. B. 2018). A platform may be technically accessible but remain underutilized if farmers do not understand its functions, lack confidence in digital transactions or do not receive adequate assistance. The paper identifies this issue as particularly relevant to Karnataka and highlights insufficient research into the factors underlying awareness, inclusiveness and accessibility of agricultural e-marketing services.

Methodology

The study adopted a descriptive, quantitative research design. Data were collected through a structured questionnaire developed from the literature and reviewed by subject experts. To improve comprehension and response accuracy, the questionnaire was also prepared in the regional language. The instrument included sections covering demographic characteristics, e-market platforms, crops

grown, internet use, awareness, factors influencing adoption, barriers and future prospects. The scaled questions used a five-point rating system.

The population comprised 42,42,100 farm households in Karnataka. Based on the Krejcie and Morgan approach, a sample size of 384 was estimated at a 95 per cent confidence level and five per cent margin of error. The target was increased to 500 to account for non-response. Farmers were approached across the headquarters of all 31 districts covering the four administrative divisions of Karnataka. The sampling frame included farmers cultivating food crops, cash crops, oilseeds, plantation crops, fruits and vegetables and using at least one agricultural or e-commerce platform for a minimum of six months. Convenience sampling was used, resulting in 344 valid responses.

Data were compiled using Microsoft Excel. SPSS version 28 was used for inferential analysis, while AMOS version 22 was used for multivariate analysis. Chi-square tests were used to examine differences and associations. Exploratory factor analysis followed by structural equation modelling was used to assess barriers, drivers of progress and factors influencing adoption.

Results

Adoption and Usage of Agricultural E-Marketplaces

The findings reveal that conventional channels continue to dominate agricultural marketing. Mandis recorded the highest mean score (4.10), followed by traders (3.61). Third-party e-commerce applications recorded a mean of 3.31, while ReMS recorded 2.52. e-NAM ranked last among the eight identified sales channels, with a mean score of only 1.28.

The low adoption of e-NAM is particularly notable. Only 13.7 per cent of respondents reported awareness and use of e-NAM, whereas 54.4 per cent were aware of and used ReMS. Private agricultural e-commerce platforms were known to 32 per cent of respondents. These findings suggest that the presence of a

government-supported digital platform does not automatically result in widespread farmer participation.

The findings further show that access to digital platforms is influenced by the availability of personal or social support. Although 74.7 per cent of farmers accessed e-market platforms independently, others depended on family members (11.6 per cent), friends (7.8 per cent) or village-office assistance (5.8 per cent). Awareness of agricultural e-market platforms was significantly associated with education level, with a chi-square value of 65.087 ($p < 0.001$). Adoption also differed significantly across age groups, land ownership categories and crop types.

The type of agricultural produce was also associated with platform preference. Food-crop producers primarily relied on mandis, traders and intermediaries, whereas producers of commercial crops showed stronger preferences for government online platforms. This suggests that agricultural e-market adoption is not uniform and may depend on the characteristics of the produce and the marketing requirements of different farmer groups.

Barriers and Enabling Factors

The analysis of barriers identified two broad dimensions: knowledge barriers and infrastructural barriers. Exploratory factor analysis demonstrated adequate sampling adequacy ($KMO = 0.888$), and the two factors explained 72.981 per cent of the variance. Structural modelling showed that both infrastructural and knowledge barriers significantly contributed to barriers to e-market adoption. However, knowledge barriers had a stronger standardized effect ($\beta = 0.249$) than infrastructural barriers ($\beta = 0.195$), with both relationships significant at $p < 0.001$.

Among the individual barriers, lack of knowledge in using e-agri websites received the highest mean score (3.82), followed by lack of government support and training (3.68). Lack of marketing or awareness of government e-agri platforms (3.42) and lack of a proper delivery channel (3.41) were also important concerns.

Interestingly, lack of internet connectivity in villages recorded the lowest barrier score (1.36), indicating that basic connectivity alone may no longer represent the principal obstacle to adoption.

Training and infrastructure were identified as important drivers of progress. The structural model showed that infrastructural facilities significantly influenced progress ($B = 0.263$, $\beta = 0.172$, $p < 0.001$), while training facilities had a significant positive influence ($B = 0.448$, $\beta = 0.144$, $p < 0.001$). Training therefore emerged as an important driver of successful implementation.

Farmers also placed greater emphasis on fair-trade practices than on cost reduction. Fair-trade practices had a significant relationship with influencing factors ($B = 0.321$, $\beta = 0.077$, $p < 0.001$), compared with reduced costs ($B = 0.111$, $\beta = 0.056$, $p < 0.001$). Among individual factors, guarantee of payment received the highest mean score (3.95), followed by product price (3.86).

Discussion

The findings indicate that the central challenge facing agricultural e-marketplaces in Karnataka is not simply the absence of digital infrastructure. Rather, knowledge, awareness, training and trust represent critical dimensions of digital inclusion. Farmers continue to rely heavily on mandis and traders despite the availability of electronic alternatives. The particularly low usage of e-NAM compared with ReMS suggests that familiarity, local implementation and farmer support may influence platform participation.

The significant association between education and awareness indicates that digital inclusion is uneven across farmer groups. Similarly, differences across age and crop type indicate that adoption cannot be approached as a uniform process. Younger and more digitally capable farmers appear more inclined towards electronic channels, while older farmers continue to rely more heavily on traditional marketing arrangements. These findings are consistent with earlier studies that associate education, extension contacts and media exposure with awareness of e-NAM.

An important finding is that connectivity itself is not perceived as the major constraint. Instead, farmers require practical knowledge and human support to use digital platforms effectively. The relatively low scores for village-office assistance and regional-language availability reinforce the importance of last-mile support. Thus, agricultural digitalisation should move beyond establishing platforms towards building farmers' capability and confidence to use them.

The importance given to guaranteed payment and fair-trade practices also indicates that adoption is closely linked to trust and perceived economic value. Farmers are more likely to engage with digital marketplaces when they believe that transactions are transparent, payments are secure and prices are fair.

Implications and Recommendations

The findings have several implications for policymakers and agricultural-market administrators. First, awareness campaigns should be conducted regularly at the local level to explain the functions and benefits of e-market platforms. Second, practical training should be provided to farmers rather than relying solely on the availability of digital infrastructure. Third, designated personnel at the village level could provide continuing assistance with registration, transactions, payments and troubleshooting. Finally, e-NAM and other government platforms require stronger communication and outreach strategies, particularly among farmers with lower levels of education and digital familiarity. These recommendations are consistent with the study's findings that knowledge and training constitute more significant constraints than infrastructure alone.

Conclusion

Agricultural e-marketplaces have considerable potential to improve transparency, market access and price realization for farmers. However, the findings from 344 farmers across Karnataka demonstrate that technological availability has not yet translated into widespread adoption, particularly in the case of e-NAM. Traditional mandis and traders remain dominant, while ReMS and private platforms have achieved comparatively greater engagement.

The study establishes that knowledge barriers are more influential than infrastructural barriers, while training is a stronger driver of progress than infrastructure alone. Farmers also place greater importance on fair trading practices and assured payment than on cost reduction. The findings therefore suggest that successful agricultural digitalisation requires a farmer-centred approach combining technology with awareness, training, trust and local support.

The study is subject to limitations. The sample was obtained through convenience sampling and included farmers who had used an e-marketing channel for at least six months; therefore, the findings cannot be generalized to completely non-digital users. The cross-sectional design also limits conclusions regarding the long-term effects of e-marketplaces. Future research could examine the reasons for exclusion among non-users and investigate how platform design and commodity characteristics influence adoption.

References

1. Karthick, S., Saminathan, R., & Gopinath, R. (2020). Agricultural Marketing—An Overview. *International Journal of Management (IJM)*, 11(11), 3007-3013.
2. Golubev, N. V., & Kuleff, A. I. (2015). Control of charge migration in molecules by ultrashort laser pulses. *Physical Review A*, 91(5), 051401.
3. Raju, M. S., Devy, M. R., & Gopal, P. S. (2022). Knowledge of Farmers on Functioning of e-NAM. *Indian Journal of Extension Education*, 58(2), 26-29.
4. Rai, N.(2023) Role of National Commodities and Derivative Exchange Limited (NCDEX), eNAM in Creating new Marketing Avenues for Farmers Producers Organizations (FPO).International Journal of innovative research
5. Khan, N. A., Qijie, G., Sertse, S. F., Nabi, M. N., & Khan, P. (2020). Farmers' use of mobile phone-based farm advisory services in Punjab, Pakistan. *Information Development*, 36(3), 390–402.
6. Gupta, S., & Badal, P. S. (2018). E-national Agricultural Market (e-NAM) in India: A Review. *BHU Management Review*, 6(1), 48-57.
7. Kumar, K. N., Gracy, C. P., & Srikanth, M. B. (2018). Unified market platform (UMP) trade practices of copra and turmeric-An institutional analysis of APMCS in Karnataka. *Indian Journal of Agricultural Marketing*, 32(3s), 146-152.

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