

Digital Commerce and Agricultural Marketing: Examining the Role of E-Commerce Platforms in Improving Farmers' Income and Access to Nutritious Food

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Abstract

Agricultural marketing in India is undergoing a gradual transformation with the increasing use of digital technologies, online marketplaces and electronic payment systems. For many farmers, particularly small and marginal farmers, the traditional marketing system remains associated with limited access to market information, dependence on intermediaries, inadequate bargaining power, transportation difficulties and fluctuations in agricultural prices. Digital commerce offers an alternative mechanism through which producers can obtain information, identify buyers, participate in competitive markets and receive payments electronically. The present article examines the role of e-commerce and digital agricultural marketing in improving farmers' income and strengthening access to nutritious food. The study is based on secondary information obtained from government sources, institutional reports and relevant academic literature. Particular attention is given to the National Agriculture Market (e-NAM), Farmer Producer Organisations (FPOs), digital payments and emerging digital commerce arrangements. The discussion indicates that digital platforms can improve price transparency, widen market access, reduce information gaps and facilitate faster settlement of transactions. At the same time, digital agricultural commerce has relevance for consumers because improved distribution channels may increase the availability of fruits, vegetables, pulses, millets and other nutritious agricultural products. However, digitalisation alone cannot solve the structural problems of agricultural marketing. Poor internet connectivity, inadequate storage and transport facilities, limited digital literacy, quality concerns, transaction costs and unequal participation can restrict the benefits available to farmers. The article concludes that digital commerce should be developed as an inclusive agricultural marketing system supported by FPOs, rural infrastructure, digital literacy, transparent market practices and appropriate policy support. Such an approach can contribute to stronger farm incomes as well as a more diverse and nutrition-sensitive food system.

Keywords: Digital commerce, agricultural marketing, e-commerce, farmers' income, e-NAM, Farmer Producer Organisations, nutrition security, digital agriculture, food markets, India

1. Introduction

Agriculture has a central place in the Indian economy and continues to support a large section of the rural population. It provides employment, generates income and supplies food and raw materials to several industries. However, the economic condition of farmers is determined not only by agricultural production but also by the manner in which farm produce is marketed. A

farmer may obtain a good harvest but still receive a modest return if the produce is sold at an unfavourable price or if marketing costs are high.

Agricultural marketing in India has traditionally developed around local markets, regulated mandis, traders, commission agents, wholesalers and retailers. These institutions perform important functions, but farmers do not always have equal access to information and buyers. Small farmers generally market relatively small quantities and may have limited storage facilities. Under such circumstances, they may prefer immediate sale rather than waiting for a better price.

The development of information and communication technology has created new possibilities for agricultural marketing. Mobile phones, internet services, digital payments, electronic auctions and online marketplaces have reduced some of the geographical limitations associated with conventional markets. Digital technologies can improve farmers' access to information and markets and may help smallholders participate more effectively in value chains. The Food and Agriculture Organization has also recognised the potential of digital technologies to improve the functioning of food markets and strengthen the participation of small farmers in agricultural value chains.

India's National Agriculture Market (e-NAM) is an important example of this transformation. e-NAM is a pan-India electronic trading platform connecting existing agricultural markets with the objective of reducing information asymmetry, promoting transparent price discovery and facilitating wider agricultural trade. The importance of digital agricultural commerce has increased further with the expansion of online retail and digital payment systems. Farmers and Farmer Producer Organisations can increasingly use digital channels to reach institutional buyers, retailers and consumers. These developments have implications not only for farm income but also for the availability and distribution of food.

The relationship between agricultural marketing and nutrition is particularly important. A food system that provides adequate quantities of food but does not make diverse and nutritious foods accessible to consumers cannot fully address the problem of nutrition security. FAO emphasises that positive nutritional outcomes depend upon how food is produced, processed, distributed, marketed and consumed. Against this background, the present article examines digital commerce as an emerging component of agricultural marketing and considers its possible contribution to farmers' income and access to nutritious food in India.

2. Objectives of the Study

- To examine the changing role of digital commerce in agricultural marketing in India.
- To analyse the ways in which e-commerce platforms can improve farmers' access to markets.
- To examine the possible contribution of digital agricultural marketing to farmers' income.
- To understand the relationship between digital food markets and access to nutritious food.
- To identify the major barriers to the adoption of digital agricultural commerce.

- To suggest measures for making digital agricultural markets more inclusive and farmer-oriented.

3. Research Methodology

The present article is descriptive and conceptual in nature. It is based on secondary information collected from government publications, official agricultural-market portals, institutional reports and published academic literature.

The analysis focuses on the following dimensions of digital agricultural commerce:

- access to market information;
- price discovery;
- electronic trading;
- digital payments;
- market expansion;
- farmer aggregation;
- logistics and supply-chain management;
- direct marketing;
- availability of nutritious food; and
- challenges associated with digital adoption.

The study does not claim primary survey findings or independently measured changes in farmers' income. The discussion is therefore intended to explain the mechanisms through which digital commerce may influence agricultural marketing and food-system outcomes.

4. Traditional Agricultural Marketing and Its Limitations

Agricultural commodities are different from many manufactured goods because production is seasonal, quantities are often uncertain and several products are highly perishable. Farmers therefore need an efficient marketing system that can move produce from farms to consumers within a reasonable period.

The traditional agricultural marketing chain may involve:

Farmer → Local Trader → Commission Agent → Wholesaler → Retailer → Consumer

Every stage can perform a useful economic function. Traders may provide aggregation, transportation, storage and credit. Wholesalers distribute commodities across markets, while retailers make products available to consumers. However, when several layers are involved, the farmer's share of the final consumer price may become relatively low.

Information asymmetry is another important issue. A farmer who does not know prices prevailing in other markets may have difficulty negotiating with local buyers. Similarly, a farmer who lacks storage facilities may be compelled to sell immediately after harvest. Small

and marginal farmers face these difficulties more strongly because their individual marketable surplus may be small. They may also have limited capacity to transport produce to distant markets.

Digital commerce does not eliminate these constraints, but it can reduce some of them by improving access to information and connecting sellers with a larger group of potential buyers.

5. Meaning and Scope of Digital Commerce in Agriculture

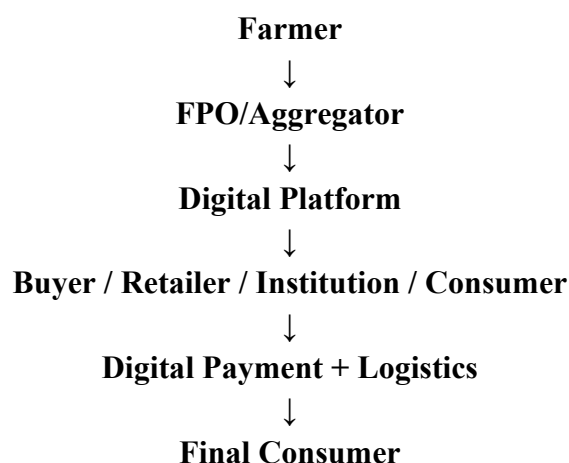
Digital commerce in agriculture refers to the use of electronic platforms and digital communication systems for activities associated with buying, selling, payment, information exchange and coordination of agricultural goods and services. Its scope is wider than simply selling agricultural products through a website or mobile application.

It includes:

- online price information;
- electronic auctions;
- digital procurement;
- direct-to-consumer sales;
- online wholesale trade;
- digital payment;
- online logistics;
- digital inventory management;
- quality and traceability systems;
- digital marketing by FPOs; and
- consumer-oriented online food retailing.

Thus, digital commerce can operate at several points between production and consumption.

Figure 1. Conceptual Flow of Digital Agricultural Commerce



This arrangement can shorten information gaps even where the physical supply chain continues to involve several participants.

6. National Agriculture Market (e-NAM) and Agricultural Marketing

The National Agriculture Market was introduced to create a more integrated electronic market for agricultural commodities. The platform links existing APMC mandis and seeks to improve market integration, transparency and price discovery.

The official e-NAM platform identifies several benefits for farmers, including access to more buyers and markets, real-time price and arrival information, transparent bidding and electronic payments. The significance of e-NAM has increased considerably over time. According to a Government of India update issued in April 2026, 1,656 mandis across 23 States and 4 Union Territories had been integrated with e-NAM by March 2026. The platform had more than 1.80 crore registered farmers, 2.73 lakh traders and 4,724 Farmer Producer Organisations. Cumulative trade since its launch in 2016 was reported at 13.25 crore metric tonnes with a value of ₹4.84 lakh crore.

These figures indicate that digital agricultural trading is no longer a small experimental activity. It has developed into an important part of India's agricultural marketing infrastructure. The e-NAM system also incorporates digital gate entry, lot identification, quality assessment, competitive bidding, bid tracking and electronic payment. However, participation in an online platform does not automatically ensure higher income. Farmers still require quality produce, adequate marketable quantities, reliable logistics and knowledge of how the platform works.

7. Digital Commerce and Farmers' Market Access

Market access is one of the most important determinants of farm income. A farmer with access to several buyers is in a stronger position than one dependent on a single local buyer. Digital platforms can improve market access in three ways.

7.1 Access to Information

Information about prices and arrivals enables farmers to make better marketing decisions. e-NAM provides price and arrival information through its digital platform and mobile services. The importance of information should not be underestimated. If farmers know the prices prevailing in different markets, they can compare the likely benefits of selling locally with the cost of transporting produce elsewhere.

7.2 Access to More Buyers

Electronic markets can increase the number of potential buyers. According to the e-NAM framework, transparent bidding and participation of buyers from different markets are intended to strengthen competition and improve price discovery.

7.3 Access to Institutional Markets

Digital systems can also connect farmers and FPOs with processors, retailers, restaurants, exporters and other institutional buyers. This is particularly useful for commodities that require regular supply and standardised quality.

8. Digital Commerce and Price Discovery

Price discovery is a fundamental function of a market. It refers to the process through which the price of a commodity is determined through interaction between demand and supply. In a conventional local market, the number of buyers may be limited. An electronic marketplace can increase the visibility of a commodity to a wider group of buyers.

The process may be represented as:



e-NAM specifically aims to promote real-time price discovery based on demand and supply and transparent auction procedures. Nevertheless, price discovery must be considered along with transaction costs. A higher price in a distant market may not result in higher net income if transportation, loading, packaging and other expenses are excessive.

Therefore:

$$\text{Net Farmer Income} = \text{Sale Value} - \text{Marketing Costs} - \text{Other Transaction Costs}$$

This distinction is important when assessing the actual economic benefit of digital agricultural commerce.

9. Digital Payments and Financial Inclusion

The payment mechanism is another important component of agricultural commerce. Delayed payment can create liquidity problems for farmers, particularly immediately after harvest when they may need money for household expenditure and the next agricultural cycle. Digital platforms can facilitate electronic settlement. e-NAM supports payment through electronic modes including NEFT, RTGS and BHIM UPI.

Digital payments may provide several advantages:

- faster settlement;
- transaction records;
- reduced dependence on cash;
- greater financial transparency;
- easier tracking of payments; and
- potential improvement in access to formal financial services.

The development of digital payment systems therefore complements the transformation of agricultural markets.

10. Role of Farmer Producer Organisations in Digital Commerce

Individual small farmers may face difficulties in meeting the requirements of large buyers. Farmer Producer Organisations can address some of these difficulties by bringing farmers together.

An FPO can perform functions such as:

- aggregation of farm produce;
- grading and sorting;
- packaging;
- storage;
- transportation;
- collective bargaining;
- digital marketing;
- buyer identification;
- payment coordination; and
- brand development.

The role of aggregation is particularly important for e-commerce. Online buyers may require consistent quantities and quality, which a single small farmer may not be able to provide. FAO's work on digital agriculture in India also notes the role of FPOs in using digital innovations to improve access to services and e-commerce and to strengthen market opportunities.

Therefore, the more practical model for smallholder digital commerce may be:

Small Farmers + FPO + Digital Platform + Logistics + Buyer

rather than expecting each farmer to independently operate an online business.

11. Direct-to-Consumer Agricultural Marketing

Digital commerce can also provide opportunities for direct marketing.

A simplified conventional chain may be:

Farmer → Trader → Wholesaler → Retailer → Consumer

A digital direct-marketing model may become:

Farmer/FPO → Digital Platform → Consumer

The second model may reduce the number of commercial intermediaries, but this does not mean that all intermediaries become unnecessary. Transportation, storage, packaging, quality control, payment processing and customer service still require specialised functions. Therefore,

the main economic advantage of direct digital marketing is not simply the removal of intermediaries. It is the possibility of reorganising the value chain so that unnecessary transaction costs are reduced and farmers retain a greater share of the value created.

12. Digital Commerce and Nutritious Food

Food security has traditionally been discussed in terms of food availability. However, nutrition security requires a broader approach. Consumers need access to diverse, safe, affordable and nutritious foods. FAO emphasises the importance of food markets and food environments in making diversified nutritious foods, particularly fresh fruits and vegetables, available and affordable to consumers. Digital commerce may contribute to this objective in several ways.

12.1 Wider Distribution of Perishable Foods

Fruits and vegetables often require efficient supply chains because of their short shelf life. Digital ordering systems combined with improved logistics can help coordinate supply and demand.

12.2 Greater Visibility for Local Products

Digital platforms can help farmers and FPOs market local products such as:

- millets;
- pulses;
- vegetables;
- fruits;
- spices;
- traditional grains; and
- other region-specific foods.

12.3 Improved Consumer Choice

Online markets allow consumers to compare products, prices and suppliers. This may increase consumer access to a wider range of foods.

12.4 Reduction of Some Supply-Chain Inefficiencies

Better coordination between producers, buyers and logistics providers may reduce unnecessary handling and delays. However, digital commerce should not be considered a direct solution to malnutrition. Nutrition outcomes depend on income, food prices, household preferences, awareness, availability and several social factors.

13. Digital Commerce and Farmers' Household Food Security

Farmers' income and household food security are closely connected. When farmers receive more stable returns from agricultural production, they may have greater capacity to purchase food and invest in education, health and farm inputs. Better market access can therefore indirectly influence household welfare. The relationship may be expressed as:



The word **potential** is important because higher income does not necessarily result in a healthier diet. Household expenditure choices and food preferences also influence nutritional outcomes.

14. Digital Agriculture and the Food Value Chain

Digital commerce is not an isolated activity. It is part of a wider agricultural value chain.

Table 1. Digital Applications Across the Agricultural Value Chain

Value-chain stage	Digital application	Expected benefit
Production	Mobile advisory and information	Better farm decisions
Harvesting	Digital demand information	Better timing of harvest
Aggregation	FPO management systems	Collective marketing
Grading	Digital quality records	Better quality differentiation
Marketing	Online marketplace	Wider buyer access
Price discovery	Electronic bidding	Greater transparency
Payment	Digital settlement	Faster transaction
Logistics	Digital transport coordination	Better movement of produce
Retail	Online food commerce	Wider consumer access
Consumption	Digital product information	Greater consumer choice

The value-chain approach is important because digitalisation at only one stage cannot compensate for weaknesses elsewhere. For example, an online marketplace may successfully generate an order for fresh vegetables, but without adequate cold storage and transport the produce may deteriorate before reaching the consumer.

15. Major Benefits of Digital Agricultural Commerce

The principal potential benefits are summarised below.

Table 2. Potential Benefits of Digital Commerce for Farmers

Area	Potential benefit
Market information	Timely information about prices and demand
Buyer access	Wider choice of buyers
Price discovery	Greater transparency in bidding
Bargaining power	Improved negotiating position
Payments	Faster and traceable settlement
Market reach	Access to distant markets
FPO marketing	Collective selling and aggregation
Quality	Better documentation and grading
Logistics	Improved coordination
Consumer connection	Possibility of direct marketing

The benefits are interconnected. Better information can improve marketing decisions, while wider buyer access can strengthen competition.

16. Challenges and Limitations

Despite the opportunities, digital agricultural commerce faces several limitations.

16.1 Digital Divide

Not every farmer has equal access to smartphones, reliable internet connectivity or digital services. Differences in digital access may create a new form of inequality.

16.2 Digital Literacy

Farmers need practical knowledge of online registration, product listing, price comparison, digital payments and complaint mechanisms. Recent research on small farmers' access to e-NAM has also identified knowledge of smartphones and applications as an important factor associated with awareness of online trading systems.

16.3 Rural Infrastructure

Weak roads, inadequate warehouses, limited cold-chain facilities and insufficient collection centres can reduce the effectiveness of online agricultural commerce.

16.4 Quality Standardisation

Online buyers need reliable information about the quality of agricultural produce. Grading and assaying systems are therefore important.

16.5 Perishability

Fresh agricultural commodities cannot always be stored for long periods. A digital order must be supported by timely physical delivery.

16.6 Transaction Costs

Packaging, transportation, platform charges, grading and other costs may reduce the farmer's final return.

16.7 Trust

Both farmers and consumers need confidence in the identity of trading partners, payment systems, product quality and dispute-resolution mechanisms.

16.8 Unequal Market Power

Digitalisation does not automatically guarantee equal bargaining power. If a platform becomes dominated by a limited number of large buyers, farmers may continue to face weak negotiating positions.

17. Role of Government and Institutional Support

The success of digital agricultural commerce requires cooperation among government institutions, farmers, FPOs, financial institutions and private digital platforms.

Government support should focus on:

- improving rural internet connectivity;
- promoting digital literacy;
- strengthening FPOs;
- improving agricultural warehouses and cold chains;
- encouraging quality testing and grading;
- strengthening digital payment infrastructure;
- supporting regional-language digital services;
- improving cybersecurity and consumer protection;
- encouraging transparent platform governance; and
- developing reliable grievance-redress mechanisms.

The continued expansion of e-NAM demonstrates that public digital infrastructure can play an important role in creating a common framework for agricultural trade.

18. Proposed Model for Inclusive Digital Agricultural Commerce

A farmer-centred digital agricultural marketing model may be developed around six components:

1. Farmer

The farmer remains the central participant and beneficiary.

2. FPO

The FPO aggregates produce and provides collective marketing capacity.

3. Digital Platform

The platform provides information, buyer connections and transaction facilities.

4. Financial System

Digital payment systems facilitate secure and timely settlement.

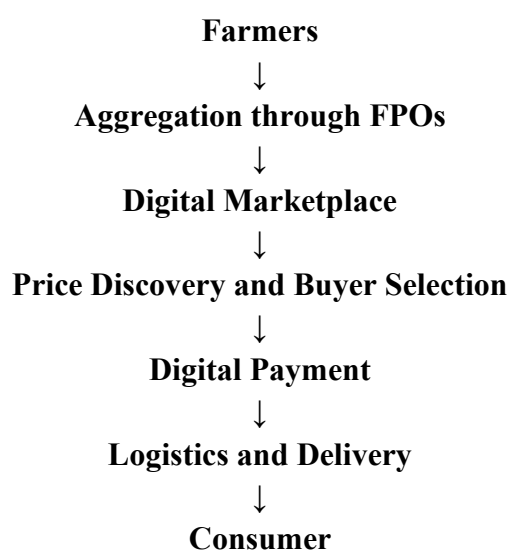
5. Logistics

Storage, transportation and delivery connect the digital order with the physical movement of goods.

6. Consumer

Consumers provide demand signals that influence agricultural production and marketing.

Figure 2. Inclusive Digital Agricultural Commerce Model



Feedback from consumers → Farmers/FPOs

The feedback mechanism is particularly valuable because consumer demand can influence decisions about crop choice, quality, packaging and product differentiation.

19. Commerce Perspective

From the perspective of Commerce, digital agricultural marketing should be studied not merely as an agricultural technology but as a change in market organisation.

Four aspects are particularly important.

19.1 Market Structure

Digital platforms can change the structure of agricultural markets by increasing the number of buyers and sellers who can interact.

19.2 Transaction Costs

The commercial value of digital platforms depends on whether they reduce the cost of obtaining information, finding buyers, negotiating and completing transactions.

19.3 Value Distribution

An important question is how the additional value created through digital commerce is distributed among farmers, aggregators, platforms, logistics providers and retailers.

19.4 Consumer Demand

Digital commerce can make consumer demand more visible. Information about purchasing patterns may help FPOs and farmers understand which products have greater market potential.

Therefore, the real success of digital agricultural commerce should be assessed through **net farmer income, market participation, transaction costs, price realisation, consumer access and value distribution**, rather than merely by counting registered users or online transactions.

20. Policy Recommendations

Based on the discussion, the following recommendations are proposed:

20.1 Digital Literacy at the Village Level

Training should be provided through agricultural extension centres, FPOs, universities and local institutions.

20.2 Strengthening FPOs

FPOs should receive support for digital cataloguing, branding, packaging, accounting and online marketing.

20.3 Better Rural Logistics

Digital commerce should be supported by adequate warehouses, cold storage, transportation and collection centres.

20.4 Regional Language Services

Digital agricultural platforms should provide simple interfaces in Hindi and other regional languages.

20.5 Transparent Pricing

Platforms should clearly display transaction charges, logistics costs and applicable commissions.

20.6 Support for Nutritious Foods

Special attention should be given to digital marketing of pulses, millets, fruits and vegetables and other nutrient-rich foods.

20.7 Farmer Protection

Digital marketplaces should provide accessible grievance mechanisms and protection against payment-related fraud.

20.8 Data Protection

Farmers' personal, financial and production information should be handled responsibly.

21. Future Research Scope

The present article provides a conceptual framework for understanding digital agricultural commerce. Several areas require further empirical investigation.

Future studies may examine:

- whether farmers using digital platforms obtain higher net returns;
- differences in income between digital and conventional marketing users;
- the role of FPOs in online agricultural trade;
- gender differences in digital agricultural participation;
- digital literacy among small and marginal farmers;
- the effect of digital commerce on post-harvest losses;
- consumer demand for direct farm products;
- the effect of online marketing on dietary diversity;
- transaction costs associated with e-commerce;
- adoption of digital commerce in Haryana; and
- the long-term effect of digital agricultural markets on rural income distribution.

A field-based study among farmers and FPOs in Haryana would be particularly useful because the state has a strong agricultural base and is geographically connected to major consumption markets in northern India.

22. Limitations of the Study

The article is based on secondary information and conceptual analysis. No primary survey has been conducted, and therefore the article does not estimate the precise increase in farmers' income resulting from the use of e-commerce platforms. Further, the effect of digital commerce differs according to commodity, farm size, location, infrastructure, digital literacy and market conditions. Consequently, digitalisation should not be treated as a uniform solution applicable to every farmer. Future empirical research using household surveys, FPO-level data and econometric techniques can provide more precise evidence regarding the relationship between digital commerce, farm income and nutrition security.

23. Conclusion

Digital commerce is gradually changing the structure of agricultural marketing in India. The traditional agricultural marketing system remains important, but digital platforms are creating additional opportunities for farmers to access information, buyers and payment systems. The experience of e-NAM demonstrates the growing scale of digital agricultural markets. By March 2026, the platform had integrated 1,656 mandis and registered more than 1.80 crore farmers, indicating that digital agricultural trading has moved beyond the experimental stage. The most important contribution of digital commerce is not simply the creation of an online marketplace. Its broader value lies in reducing information gaps, improving transparency, expanding market choice and facilitating coordination between farmers, buyers and service providers.

For small and marginal farmers, however, participation is likely to be more effective when digital platforms are combined with collective institutions such as FPOs. Aggregation can improve the quantity, quality and regularity of supply and make it easier for farmers to participate in organised markets. Digital commerce also has relevance for nutrition security. Better organised food markets can improve the distribution of fruits, vegetables, pulses, millets and other nutritious products. FAO has recognised the role of digital technologies in strengthening food-system processes and improving the availability of safe, nutritious and affordable food. At the same time, digital technology cannot replace physical infrastructure or human institutions. Poor connectivity, inadequate logistics, low digital literacy, quality problems and unequal bargaining power can limit the gains from online agricultural markets.

Therefore, the future strategy should not be based on technology alone. Digital platforms, farmer organisations, financial services, physical infrastructure and appropriate regulation must develop together. A farmer-centred digital agricultural marketing system can help ensure that the benefits of technological change reach producers as well as consumers. From a Commerce perspective, the ultimate measure of success should be whether digitalisation creates a more efficient, transparent and inclusive agricultural market in which farmers receive a fairer share of the value generated by their produce and consumers obtain reliable access to diverse and nutritious food.

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