

## Digital Payments and Agricultural Trade: A Study of UPI in Azadpur Mandi, India

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Abstract:

The agricultural marketplace in India, particularly wholesale mandis like Azadpur, represents a complex ecosystem where farmers, traders, commission agents, and logistics providers interact in high-volume commodity sales. The adoption of digital payments — especially the Unified Payments Interface (UPI) — has transformed financial transactions across urban and rural India. Yet, its specific impact on mandi operations and agricultural trade involves unique challenges and opportunities. This research investigates the role of UPI in supporting or transforming agricultural trade at Azadpur Mandi — Asia's largest fruit and vegetable wholesale market — highlighting trends in payments, operational functions, inclusion hurdles, and recommendations for digital integration. Azadpur Mandi, Delhi—Asia's largest wholesale fruit and vegetable market—plays a vital role in India's agricultural supply chain, connecting farmers, commission agents, traders, transporters, and retailers. Traditionally, mandi trade has been dominated by cash-based transactions, informal credit, and manual record-keeping, which often lead to delayed settlements, lack of transparency, and financial insecurity for small stakeholders. In this context, the rapid expansion of the Unified Payments Interface (UPI) has introduced a major shift in the way agricultural payments can be executed, recorded, and monitored. This study examines the adoption, usage patterns, and perceived impact of UPI on agricultural trade in Azadpur Mandi. The research highlights the role of UPI in improving transaction speed, reducing dependency on cash, strengthening payment traceability, and supporting financial inclusion among farmers and small traders. At the same time, challenges such as digital illiteracy, network issues, reluctance due to traditional credit cycles, and limited institutional integration of digital payment systems remain significant barriers. The study concludes that UPI has strong potential to modernize mandi-based trade, but its full impact depends on policy support, stakeholder training, digital infrastructure improvements, and integration with market-level digital trading systems for efficient and transparent settlement mechanisms.

**Keywords:** UPI, Digital Payments, Agricultural Trade, Azadpur Mandi, APMC Market, Farmers, Traders.

### INTRODUCTION

India's agricultural marketing system is one of the largest in the world, supporting the livelihood of millions of farmers and enabling the movement of food commodities across states and regions. A major part of this system operates through regulated wholesale markets, commonly known as APMC mandis, where agricultural produce is brought by farmers or aggregators and sold to traders, wholesalers, retailers, and institutional buyers. These mandis serve as a critical link between agricultural production and consumption, ensuring supply chain continuity, price discovery, and market access. However, despite their economic importance, many mandis in India continue to function with traditional methods of trade execution, settlement, and record maintenance, where cash remains the dominant mode of payment. In this context, the emergence of digital payment systems has introduced a transformative opportunity for agricultural trade. Among various digital payment methods, the Unified Payments Interface (UPI) has become one of the most widely adopted financial technologies in India due to its real-time transfer capability, ease of use, low transaction cost, and widespread availability through smartphones and QR-based payment systems. UPI enables instant bank-to-bank transfers without requiring physical cash, making it a powerful tool for improving transaction efficiency and transparency. Over the last few years, UPI has rapidly expanded from urban retail transactions into semi-urban and rural markets, including agricultural trading environments. Azadpur Mandi, located in Delhi, is widely recognized as Asia's largest wholesale market for fruits and vegetables, handling enormous volumes of produce daily. It functions as a key hub for agricultural trade, not only for Delhi but also for several northern states, as traders procure fruits and vegetables from across India and distribute them to local markets and distant retail networks. Due to the mandi's large scale, multi-layered stakeholder structure, and high transaction frequency, the market provides an ideal setting to study the practical adoption of UPI in agricultural trade. While digital payments have increased in India, mandi transactions still face structural barriers such as commission-based settlement systems, reliance on informal credit, lack of standardized digital billing, and uneven digital literacy among farmers and small traders.

This research paper examines the role and impact of UPI in Azadpur Mandi by analyzing its adoption level, usage patterns, perceived benefits, and operational challenges. The study focuses on how UPI influences settlement time, transparency, record generation, trust among stakeholders, and the overall efficiency of agricultural trade. It also evaluates the limitations that restrict wider adoption and suggests policy and market-level interventions that can strengthen the integration of UPI in mandi operations. By exploring UPI's practical role in one of India's most important wholesale markets, the study contributes to the broader understanding of digitalization in agricultural marketing and offers insights for policymakers, mandi administrators, and stakeholders aiming to modernize agricultural trade systems in India.

### Agriculture Trade and Market Structure

Agricultural trade in India is organized through a multi-layered market structure that connects producers (farmers) with end consumers through several intermediaries and institutional mechanisms. The most prominent system governing this structure is the Agricultural Produce Market Committee (APMC) framework, under which regulated mandis operate as designated trading centers for agricultural commodities. These mandis serve as the primary platforms for bulk transactions of food grains, fruits, vegetables, and other agricultural produce. The mandi system is intended to ensure fair trade practices, transparent price discovery,

standardized weighing, and protection of farmers from exploitation. However, in practice, the structure is often characterized by strong intermediary influence, limited bargaining power for small farmers, and heavy dependence on informal trade practices. In a typical mandi transaction, farmers or their representatives bring produce to the mandi yard, where the commodities are assessed for quality and auctioned through a bidding process. The buyers are generally wholesalers or traders who purchase in bulk and later distribute the goods to retailers, institutional buyers, or other markets. A key feature of this structure is the role of commission agents (arhtiyas), who act as intermediaries between farmers and buyers. These agents facilitate auctions, arrange weighing, provide storage support, and often offer short-term credit to farmers. The commission agent earns a fixed percentage as commission, making them an influential stakeholder in mandi operations. In many cases, farmers receive payments after a delay, depending on the buyer's settlement cycle and the agent's internal financial arrangements. Azadpur Mandi, situated in Delhi, is a major example of this structured yet complex agricultural market system. It is widely regarded as one of the largest wholesale fruit and vegetable markets in Asia, with thousands of traders, commission agents, transporters, and laborers operating daily. The mandi handles large inflows of produce from states such as Himachal Pradesh, Jammu & Kashmir, Uttar Pradesh, Bihar, Maharashtra, Karnataka, and Andhra Pradesh, along with imports of fruits from international sources. The market operates through multiple specialized blocks, each dedicated to different categories of fruits and vegetables. Transactions occur in high volume, often involving multiple buyers and sellers within a single day, making the mandi a high-frequency trade environment.

### **UPI in India**

The Unified Payments Interface (UPI) is India's most widely used digital payment system, developed by the National Payments Corporation of India (NPCI) to enable instant, secure, and real-time bank-to-bank money transfers through mobile phones. Introduced in 2016, UPI allows users to send and receive money using simple identifiers such as mobile numbers, QR codes, or UPI IDs, without requiring bank account details. Its popularity has grown rapidly due to its convenience, low transaction cost, 24×7 availability, and easy integration with apps like Google Pay, PhonePe, Paytm, and BHIM. UPI has significantly strengthened India's digital economy by promoting cashless transactions across urban and rural areas, improving financial inclusion, supporting small businesses and informal traders, and creating a transparent digital trail of payments. Today, UPI plays a major role in everyday transactions ranging from retail purchases to service payments and is increasingly expanding into sectors such as agriculture, transport, and wholesale trade.

### **LITERATURE REVIEW**

The literature on digital payments in India has expanded significantly in recent years, especially after the introduction of the Unified Payments Interface (UPI). Researchers have explored UPI's role in financial inclusion, reduction of cash dependency, and modernization of business transactions. However, studies focusing specifically on agricultural mandis and wholesale markets remain limited, making this research on Azadpur Mandi both relevant and timely. The existing literature can broadly be categorized into four major themes: (i) digital payments and economic efficiency, (ii) digital adoption in agriculture and rural markets, (iii) mandi reforms and agricultural marketing digitization, and (iv) barriers to UPI adoption among informal sector stakeholders.

Several studies highlight that digital payment systems reduce transaction costs and improve speed and convenience in business operations. Researchers argue that UPI has emerged as a revolutionary payment platform because it enables real-time settlement and requires minimal infrastructure beyond a smartphone and internet connectivity. Digital payments are also considered beneficial for increasing transparency, reducing leakage, and generating electronic records that can support credit access and financial planning. Scholars note that UPI's user-friendly interface, QR-based payment acceptance, and integration with multiple banks have strengthened its adoption among small merchants, informal workers, and micro-businesses, which are traditionally cash dependent.

In the context of agriculture, studies on rural financial systems suggest that digital payments have the potential to enhance farmers' access to formal financial services. Researchers emphasize that the digitalization of agricultural transactions improves traceability and reduces exploitation by middlemen, especially where cash-based settlements allow manipulation or delays. Some studies indicate that digital payment platforms can improve farmers' bargaining position by ensuring timely payment and providing proof of transactions. Literature also discusses the impact of digital financial services on rural inclusion, noting that UPI, combined with Jan Dhan accounts and Aadhaar-linked banking, has supported wider participation in formal payment systems. However, these benefits are often uneven due to infrastructure gaps and varying levels of digital literacy.

Another important stream of literature focuses on agricultural market reforms such as eNAM (Electronic National Agriculture Market) and mandi modernization. Researchers argue that while eNAM aims to create integrated national markets, its implementation has faced challenges due to state-level regulations, resistance from mandi intermediaries, and limited technological readiness. Studies reveal that digitization of mandis cannot succeed only through trading platforms; it also requires digital payment integration, digital weighing, standardized billing, and dispute resolution mechanisms. Scholars highlight that mandis like Azadpur, despite being highly commercialized, often operate through traditional systems where credit-based trading and commission agent dominance remain strong.

The literature also identifies multiple barriers affecting the adoption of UPI and digital payments in informal and semi-formal markets. Major constraints include lack of trust in digital systems, fear of fraud, inadequate smartphone ownership, poor internet connectivity, limited awareness of UPI features, and reluctance among traders who benefit from cash-based opacity. Researchers note that commission agents and wholesalers may resist full digitalization because digital payments create transaction trails that can increase tax visibility and reduce flexibility in informal credit operations. Additionally, studies emphasize that digital adoption is influenced not only by technology availability but also by social factors such as peer influence, local business culture, and institutional support.

Overall, the literature suggests that UPI has strong potential to transform agricultural trade through faster settlement, transparency, and inclusion. However, the adoption of UPI in large mandis is shaped by complex trade structures, informal credit systems, and stakeholder resistance. The gap in existing research lies in the limited mandi-specific studies that examine UPI usage

in high-volume wholesale markets like Azadpur. Therefore, this study contributes to the literature by offering a focused understanding of UPI adoption and its implications for agricultural trade operations within one of India's most important wholesale markets.

### **OBJECTIVES OF THE STUDY**

1. To examine the level of adoption and usage pattern of UPI among key stakeholders (farmers, commission agents, traders, and retailers) in Azadpur Mandi.
2. To assess the impact of UPI-based payments on agricultural trade efficiency in Azadpur Mandi, particularly in terms of transaction speed, transparency, and settlement practices.

### **RESEARCH METHODOLOGY**

This study follows a descriptive and analytical research design to understand the role of UPI in agricultural trade at Azadpur Mandi. Both primary and secondary data are used to achieve the objectives. Primary data is collected through a structured questionnaire and informal interviews with mandi stakeholders such as farmers, traders, commission agents (arhtiyas), and retailers operating within Azadpur Mandi. The questionnaire includes questions related to UPI usage frequency, payment preferences, perceived benefits, challenges, trust issues, and transaction experience. A purposive and convenience sampling method is used due to the high-volume and time-sensitive nature of mandi operations, ensuring representation of different stakeholder categories. Secondary data is collected from reports published by NPCI, RBI, Government of India, research articles, and mandi-related publications to support contextual analysis. The collected data is analyzed using descriptive statistical tools such as percentage analysis, frequency distribution, and ranking methods. The study also uses thematic interpretation to analyze qualitative responses regarding barriers and perceptions. This methodology helps in understanding both the adoption behavior and the practical trade-level impact of UPI in the mandi environment.

### **INTERPRETATION**

#### **Level of UPI Adoption among Stakeholders**

The survey findings indicate that UPI adoption in Azadpur Mandi has increased significantly, particularly among traders and retailers. A large proportion of respondents reported using UPI either regularly or occasionally for trade-related payments. This suggests that UPI has become a preferred digital payment mode in mandi operations, especially for small-value transactions and quick settlements. However, a notable segment still depends primarily on cash, especially among farmers and older commission agents. This highlights that while digital payments are gaining momentum, the mandi ecosystem remains partially cash-driven due to traditional trading practices and the dominance of informal settlement systems.

#### **Frequency of UPI Usage in Agricultural Transactions**

The analysis of frequency patterns shows that most respondents use UPI for daily or weekly payments, indicating that UPI is becoming embedded in routine mandi trade. Regular usage is higher among retailers and transporters, as they engage in frequent transactions and benefit from instant payment confirmation. Farmers, on the other hand, reported comparatively lower frequency of UPI use, largely due to limited smartphone access, lack of confidence in digital systems, and preference for cash payments at the time of sale. This indicates that UPI usage is influenced by the type of stakeholder and the nature of transactions they engage in.

#### **Purpose of UPI Use in the Mandi**

The study reveals that UPI is most commonly used for:

- payments to transporters and laborers,
- purchase of small stock quantities,
- advance payments, and
- retail-level transactions.

Large wholesale payments continue to be dominated by cash or bank transfers due to higher transaction amounts and the involvement of commission agents. This suggests that UPI is currently functioning as a supporting payment mechanism rather than a complete replacement for traditional settlement systems in Azadpur Mandi.

#### **Impact of UPI on Transaction Speed**

A major finding of the study is that UPI has positively influenced transaction speed. Most respondents agreed that UPI helps in instant settlement, reduces waiting time, and enables smooth flow of trade. Unlike cash payments, which require physical availability and counting, UPI ensures faster completion of transactions. The digital confirmation also minimizes disputes. Therefore, the adoption of UPI has contributed to improved operational efficiency within the mandi.

#### **Impact of UPI on Transparency and Record Keeping**

The data indicates that respondents perceive UPI as improving transparency in trade transactions. Since UPI generates digital records, it reduces ambiguity in payment settlement and acts as proof during disputes. Traders and commission agents acknowledged that UPI helps maintain transaction history, which can be useful for accounting and financial planning. However, many stakeholders still do not systematically use these digital records for formal bookkeeping, suggesting that digital payment adoption has not yet fully translated into complete digital financial management.

#### **Reduction in Cash Dependency**

The study shows that UPI has contributed to a reduction in cash dependency, but not uniformly across all participants. Retailers and small traders reported a significant shift towards UPI, especially after demonetization and post-COVID digital push. Farmers and commission agents, however, continue to rely heavily on cash due to trust issues, habit, and the role of cash in informal credit systems. Hence, the mandi is moving toward a hybrid payment environment where both cash and UPI coexist.

#### **Challenges in UPI Usage**

The survey responses highlight several challenges affecting UPI usage in Azadpur Mandi:

- Network and connectivity issues inside mandi premises, especially during peak hours.
- Digital literacy gaps among farmers and older stakeholders.
- Fear of fraud and wrong transfers, leading to mistrust.
- Preference for cash due to informal credit and settlement cycles.
- Lack of institutional digital payment integration at the mandi system level.

These challenges indicate that the adoption of UPI is not only a technological issue but also a behavioral and institutional one.

#### **Stakeholder Perception toward UPI Expansion**

Overall perception toward UPI is positive. Most respondents believe that UPI will become more common in the mandi in the coming years, especially if training, infrastructure improvements, and formal mandi-level digital systems are introduced. Respondents also suggested that the mandi administration and government should support digital payment adoption through awareness programs, stable internet connectivity, and integration of UPI into mandi billing and settlement processes.

#### **Challenges in Practice**

- Farmers and smaller traders frequently exhibit lower comfort with digital platforms, impacting consistent UPI use.
- Many mandi participants lack smartphones or reliable internet, restricting the *practical* use of UPI.
- Traditional mandi functionaries and middlemen may perceive digital payments as disruptive to established credit and cash cycles.
- To enable UPI at scale, Azadpur Mandi could integrate digital trade execution (similar to eNAM) with a secure payment settlement layer anchored on UPI.
- Training programs for farmers and traders can improve digital payment literacy and confidence.
- Introducing POS terminals and QR codes at transaction points supports those without smartphones.
- Subsidizing digital adoption costs for participants and offering rewards for UPI settlements can accelerate behavior change.

#### **CONCLUSION**

The study concludes that the Unified Payments Interface (UPI) has emerged as a significant driver of digital transformation in agricultural trade, particularly within high-volume wholesale markets such as Azadpur Mandi. The findings indicate that UPI is increasingly being used by traders, retailers, and transport-related stakeholders due to its convenience, real-time settlement, and ease of transaction through QR codes and mobile applications. UPI has contributed positively to improving transaction speed, reducing the dependency on physical cash for small and medium-value payments, and enhancing transparency through digital transaction records. These advantages support smoother mandi operations, reduce payment-related disputes, and encourage more organized financial practices among market participants.

However, the study also highlights that UPI adoption in Azadpur Mandi remains uneven and limited in certain segments, especially among farmers and traditional commission agents, where cash-based practices and informal credit systems continue to dominate. Challenges such as digital illiteracy, fear of fraud, network connectivity issues within mandi premises, and resistance to change due to established settlement cycles restrict the complete shift toward digital payments. Therefore, while UPI has strong potential to modernize mandi trade and strengthen financial inclusion, its full impact can be achieved only through improved digital infrastructure, awareness and training programs, stakeholder support, and integration of UPI with mandi-level billing and settlement systems. Overall, UPI represents a powerful tool for enhancing efficiency and transparency in agricultural trade, but systematic efforts are required to ensure inclusive and sustainable digital adoption across all stakeholders in Azadpur Mandi.

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