



# An Efficient Direct Market Access Mobile Application for Farmers using Secure Digital Trade & Smart Pricing Model

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**ABSTRACT:** Traditional agricultural markets create layers of intermediaries which reduce a farmer's profit margin and increase consumer prices. This paper proposes a Direct Market Access Mobile Application (DMAF App) that enables farmers to directly sell produce to buyers, retailers, and institutions without middlemen. The system ensures transparent pricing, secure digital payments, real-time demand forecasting, and logistics coordination. The DMAF app integrates Farmer Identity Verification, Digital Crop Listing, Dynamic Price Prediction using Machine Learning, Secure Payments, and a Buyer-Seller Matching Algorithm. The project focuses on improving farmer income, reducing post-harvest wastage, and ensuring supply chain transparency using a trusted rating-based system. Security modules ensure safe transactions through OTP login and fraud detection measures.

Furthermore, the system leverages open-access agricultural datasets such as Agmarknet, e-NAM, and government market feeds to support intelligent decision-making. The integration of predictive analytics enhances price stability by identifying seasonal variations, market demand patterns, and geographic trends. The DMAF platform also provides real-time communication, logistics route optimization, and personalized dashboards for farmers, which collectively enhance user experience and strengthen digital adoption in rural areas. The findings indicate that a unified, AI-driven digital ecosystem can significantly transform traditional agricultural marketing, creating an efficient, transparent, and scalable market infrastructure.

**KEYWORDS:** Direct Market Access, Farmer App, Smart Pricing, Secure Trading, Supply Chain, Digital Agriculture.

## I. INTRODUCTION

Agriculture remains the backbone of India's economy, yet farmers continue to face significant challenges. Agriculture contributes significantly to the livelihood of millions of farmers, yet the sector continues to suffer from fragmented markets, lack of transparency, and inefficient supply chains. Middlemen-driven pricing structures often deprive farmers of their rightful earnings, creating economic disparity and discouraging agricultural productivity. Although several digital initiatives have emerged in India, most farmers still lack access to real-time market data, structured buyer networks, and secure payment systems.

With the rapid adoption of smartphones and affordable Internet connectivity, digital agriculture platforms have become a viable tool for empowering farmers. Studies on machine learning-based agricultural forecasting, digital supply chain systems, and secure digital payments highlight the potential of ICT tools in strengthening agricultural commerce. Motivated by these advancements, the Direct Market Access Mobile Application (DMAF App) is designed to offer a unified digital ecosystem where farmers can directly connect with buyers, obtain dynamic price forecasts, access logistics support, and perform secure transactions.

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The DMAF system addresses key challenges such as market volatility, information asymmetry, and wastage due to delayed transportation. By leveraging AI-based recommendations, secure payment architectures, and user trust scoring, the DMAF platform improves transparency, enhances market participation, and fosters economic resilience among farmers. This paper discusses the system design, communication model, security mechanisms, and analytical results that demonstrate the DMAF App's effectiveness in real-world scenarios.

### II. SYSTEM MODEL AND ASSUMPTIONS

The DMAF system operates on a multi-layered digital architecture designed to facilitate seamless interaction among farmers, buyers, and logistics providers. At the core of the system is a centralized cloud-based infrastructure that manages user authentication, data processing, price prediction, and marketplace operations. Farmers interact with the application through an intuitive mobile interface that supports multilingual input, enabling them to upload produce details such as quantity, quality, expected price, and images. Once the data is submitted, the system evaluates the listing using embedded machine learning models that compare historical pricing trends, seasonal variations, and regional market data to generate dynamic price recommendations. This ensures that farmers are equipped with informed pricing decisions that align with real-time market fluctuations.

Buyers use a similar interface to explore available produce by applying filters related to location, pricing, commodity type, and delivery preferences. The backend system processes these queries and uses a recommendation mechanism to match buyers with the most suitable farmers based on proximity, demand-supply compatibility, and historical interaction patterns. Logistics partners play an essential role in the system by offering transportation availability, cost estimation, and route optimization, allowing for timely product movement and reduced post-harvest losses.

The architecture operates under the assumption that users possess basic internet access and smartphones capable of running the mobile application. The backend incorporates APIs from government portals such as Agmarknet and e-NAM to ensure that market prices remain accurate and relevant. All data exchanges occur through secure communication channels, enabling reliable and uninterrupted service even under fluctuating network conditions. The system's modular structure supports scalability, enabling it to handle increasing user loads and expanding agricultural datasets. Together, these integrated components create a cohesive and intelligent ecosystem that enhances agricultural trade by improving transparency, accessibility, and operational efficiency.

### III. EFFICIENT COMMUNICATION

Efficient communication is fundamental to the functionality of the DMAF system, as it ensures seamless interactions between farmers, buyers, and logistics partners. The communication layer is designed to support reliable and continuous information exchange even in low-bandwidth rural environments. Real-time synchronization enables instant updates whenever a farmer lists new produce, a buyer expresses interest, or a logistics provider confirms transportation availability. These interactions are processed through a cloud-driven event system that minimizes delays and maintains consistent message delivery.

To strengthen usability in areas with unstable connectivity, the system incorporates offline data caching and delayed synchronization techniques, allowing users to continue basic tasks even when the network is unavailable. Once connectivity is restored, the application automatically updates the server with the pending information, ensuring data consistency across the platform. The design also emphasizes efficient routing of information by transmitting only relevant and personalized notifications to users instead of broadcasting unnecessary messages. This reduces communication overhead and enhances user experience. By maintaining a streamlined communication flow, the DMAF App enables quick decision-making, reduces negotiation time, and significantly improves the overall speed and transparency of agricultural trade.

### IV. SECURITY

Security forms the foundation of the DMAF system, ensuring that all digital interactions remain trustworthy, protected, and tamper-proof. The platform adopts a multi-layered security framework, beginning with OTP-based authentication and identity verification to prevent unauthorized access. All data exchanged between users and the server is transmitted through encrypted communication channels, thereby safeguarding sensitive information such as personal details,

payment credentials, and transaction history. The application continuously monitors user behavior using intelligent fraud detection algorithms capable of identifying unusual patterns that may indicate fraudulent activity. These models evaluate factors such as frequent cancellations, abnormal pricing behavior, and suspicious login attempts to classify user actions as safe or potentially harmful.

In addition to algorithmic monitoring, the system employs a rating-based trust mechanism that gradually builds user credibility based on past performance and successful trades. This enhances the platform's security by promoting honest behavior and discouraging fraudulent practices. Transaction integrity is maintained using immutable digital logs that ensure all payments, orders, and delivery updates are permanently recorded and cannot be manipulated. Together, these integrated security measures create a resilient and dependable digital marketplace in which farmers and buyers can confidently conduct business without the risk of exploitation or data compromise.

## V. RESULT AND DISCUSSION

The evaluation of the DMAF system demonstrates significant enhancements in the efficiency and transparency of agricultural trading. The machine learning-based price prediction model shows high accuracy when tested against historical datasets, allowing farmers to make informed selling decisions and secure better income. These outcomes align with research findings that emphasize the potential of AI-driven forecasting in reducing market uncertainties. The direct trading approach implemented in the DMAF App eliminates intermediaries and enhances profitability, as farmers receive fair prices and buyers gain access to fresh produce at competitive rates.

User feedback also highlights improved satisfaction due to streamlined communication, reduced delays, and simplified logistics coordination. The system's secure transaction mechanisms further strengthen user confidence by ensuring that payments are reliable and traceable. The trust-based user rating system contributes to safer interactions by promoting accountable behavior among both farmers and buyers. Experimental results show that the platform reduces post-harvest losses through timely transportation and optimizes trading cycles by accelerating the negotiation and ordering processes. Overall, the DMAF App demonstrates a measurable positive impact on rural commerce, supply chain reliability, and digital adoption in agricultural markets.

## VI. CONCLUSION

The DMAF App provides a robust framework for transforming traditional agricultural marketing using digital technology. By integrating machine learning-based price forecasting, secure digital payments, efficient communication systems, and logistics assistance, the platform enables farmers to access markets directly and sell produce at fair prices. The system's emphasis on trust, transparency, and data-driven decision-making addresses long-standing agricultural challenges.

Through extensive testing and research-backed design, the DMAF system demonstrates significant improvements in efficiency, profitability, and user engagement. The platform lays the foundation for future enhancements such as blockchain-based traceability, IoT-based crop monitoring, and expanded nationwide market integration. Overall, the DMAF App presents a scalable, secure, and future-ready solution for modern agriculture.

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