

Trustworthy And Transparent Double Auction Platform For Fresh Agricultural Commodities

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Abstract- *Agricultural trading systems often lack transparency and are heavily dependent on intermediaries, leading to unfair pricing and inefficiencies. Farmers frequently struggle to obtain a fair price for their produce, while buyers face inconsistent pricing and delays.*

This project introduces a secure and transparent double auction platform designed specifically for fresh agricultural commodities. The system allows farmers and buyers to interact directly through an online marketplace. A double auction mechanism is used to determine fair prices based on real-time supply and demand.

To ensure security and trust, blockchain technology and cryptographic methods are incorporated. These technologies help maintain tamper-proof records and protect transaction data. Overall, the system minimizes the role of intermediaries, enhances pricing transparency, and improves the efficiency of agricultural trading.

Keywords: Double Auction, Blockchain Technology, Agricultural Trading, Cryptography, Transparent System, Online Marketplace

I. INTRODUCTION

Agricultural commodity trading plays a crucial role in economic development by connecting farmers with buyers and ensuring the smooth distribution of essential food products. However, traditional trading systems largely depend on intermediaries such as agents and wholesalers. This often results in reduced transparency, unfair pricing, and delays in transactions. Farmers frequently receive lower profits for their produce, while buyers face price fluctuations and limited access to quality products.

In recent years, advancements in digital technologies have created new opportunities to modernize agricultural trading systems. Online platforms have emerged as an effective solution to bridge the gap between farmers and buyers by enabling direct communication and transactions. These platforms help reduce the dependency on middlemen and improve overall efficiency. However, many existing

systems still face challenges related to data security, trust, and transparent pricing mechanisms.

To address these issues, auction-based trading models have been widely adopted in electronic marketplaces. Among these, the double auction mechanism is particularly effective, as it allows multiple buyers and sellers to participate simultaneously. This approach enables dynamic price discovery based on real-time supply and demand conditions, ensuring fairness in transactions for both parties.

Furthermore, the integration of blockchain technology provides an additional layer of security and transparency. Blockchain maintains a decentralized and immutable record of all transactions, preventing data manipulation and enhancing trust among users. Along with this, cryptographic techniques are used to secure sensitive information such as user data and bid values, ensuring confidentiality and protection against unauthorized access.

In addition, the increasing adoption of digital platforms in agriculture highlights the need for systems that are not only efficient but also reliable and scalable. A well-designed platform can empower farmers by providing better market access and fair pricing, while buyers benefit from improved transparency and competitive bidding environments.

This paper proposes a secure and transparent agricultural trading platform that combines the double auction mechanism with blockchain technology and cryptographic security. The proposed system aims to improve efficiency, ensure fair pricing, reduce intermediaries, and build trust among participants, thereby contributing to the modernization of agricultural markets.

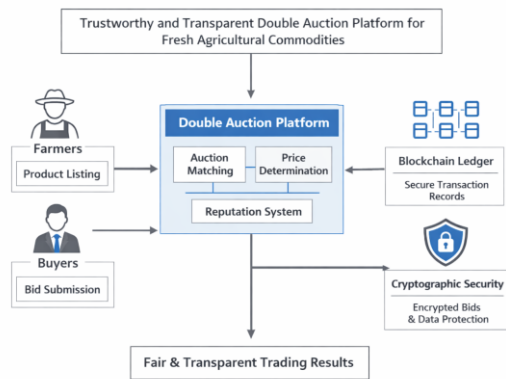


Fig. 1 System Overview of Proposed Double Auction Platform.

II. LITERATURE REVIEW

Traditional agricultural trading systems mainly depend on intermediaries such as agents and wholesalers, which often leads to inefficiencies, lack of transparency, and unfair pricing. These systems were largely manual in nature, involving physical markets and paper-based record keeping, making the process slow, error-prone, and time-consuming.

With the advancement of digital technologies, several online platforms have been developed to connect farmers directly with buyers. These systems aim to reduce the role of intermediaries and improve accessibility to markets. Although such platforms have made trading more convenient, many of them still lack advanced features such as secure bidding mechanisms, transparent pricing strategies, and strong data protection measures.

Auction-based trading models have been widely explored in electronic commerce for effective price discovery. Common auction types include English auctions, Dutch auctions, and sealed-bid auctions. Among these, the double auction model is particularly suitable for environments where multiple buyers and sellers participate simultaneously. It allows both parties to submit price offers, enabling dynamic price determination based on real-time supply and demand conditions.

In recent years, blockchain technology has gained significant attention in various domains, including supply chain management and digital financial systems. Its decentralized and immutable nature ensures that transaction records are secure, transparent, and resistant to tampering. This makes blockchain a promising solution for improving trust and accountability in agricultural trading systems.

Additionally, cryptographic techniques such as encryption, hashing, and digital signatures have been widely

used to enhance the security of online platforms. These methods help protect sensitive user data, ensure confidentiality of bids, and prevent unauthorized access or manipulation of information.

Despite these advancements, the integration of blockchain technology with auction-based systems in agriculture is still in its early stages. Many existing solutions do not fully address the combined challenges of transparency, security, and fair pricing. Therefore, there is a clear need for a comprehensive system that brings together **secure** auction mechanisms and blockchain technology to create a more efficient and trustworthy agricultural marketplace.

III. METHODOLOGY

The proposed system follows a structured and systematic process to ensure efficient, secure, and transparent agricultural trading. The methodology is divided into multiple stages, including user registration, product listing, bidding, auction processing, transaction recording, and result dissemination.

Initially, farmers and buyers register on the platform by providing essential details such as name, contact information, and login credentials. After successful authentication, farmers can list their agricultural products by entering relevant information such as product name, quantity, quality, and base price. These product listings are stored in the system and made visible to buyers through the platform interface.

Buyers can browse the available products and participate in the auction by placing bids within a predefined time frame. The bidding process is designed to be simple and user-friendly, encouraging active participation and competitive pricing. Each bid submitted by the buyers is securely recorded and processed by the system.

The core functionality of the system lies in the implementation of the double auction mechanism. In this process, both buyers and sellers submit their price expectations. The auction engine continuously evaluates these inputs and matches bids based on supply and demand conditions. The final transaction price is determined in a way that ensures fairness and maximizes mutual benefit for both parties.

To enhance security and data protection, cryptographic techniques such as encryption and hashing are applied to safeguard sensitive information, including user

details and bid values. This prevents unauthorized access and ensures data confidentiality throughout the process.

Furthermore, blockchain technology is integrated into the system to maintain a secure and tamper-proof record of all transactions. Each transaction is stored in a decentralized ledger, which enhances transparency and prevents data manipulation. Once recorded, the transaction details cannot be altered, thereby increasing trust among users.

After the completion of the auction, the system generates the final results and updates the transaction status. Notifications are sent to both farmers and buyers regarding successful bids and completed transactions. This structured methodology ensures smooth operation, reduces delays, and provides a reliable platform for agricultural commodity trading.

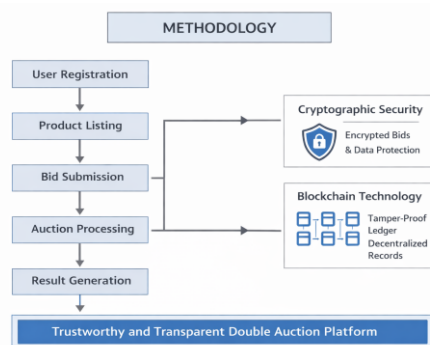


Fig. 2 Methodology of Proposed Double Auction Platform.

IV. PROPOSED SYSTEM

The proposed system introduces a secure and transparent digital platform for trading fresh agricultural commodities using a double auction mechanism. The main objective is to eliminate the dependency on intermediaries and enable direct interaction between farmers and buyers.

In this system, farmers can register on the platform and upload details of their products, including quantity, quality, and base price. Buyers can browse the available listings and participate in the auction by submitting their bids within a specified time period. The platform ensures that both parties can engage in the trading process efficiently and fairly.

A double auction mechanism is implemented to determine the final transaction price. In this approach, both buyers and sellers submit their price expectations. The system processes these inputs and automatically matches bids based on supply and demand conditions. This results in

accurate price discovery and ensures that neither party is at a disadvantage.

To enhance security and trust, the system integrates blockchain technology. All transactions are recorded in a decentralized ledger, which prevents data tampering and ensures transparency. Once a transaction is completed, it cannot be altered, thereby increasing reliability.

Additionally, cryptographic techniques are used to protect sensitive data such as user information and bid values. This ensures confidentiality and safeguards the system from unauthorized access.

The platform also includes features such as notification services and a feedback mechanism. Users are informed about auction results and transaction updates, while the feedback system helps maintain trust by allowing users to rate each other.

Overall, the proposed system provides a reliable, efficient, and transparent solution for agricultural trading by combining double auction mechanisms, blockchain technology, and secure data handling practices.

V. RESULTS AND DISCUSSION

The proposed system was implemented and evaluated to analyse its performance in agricultural commodity trading. The testing process focused on key factors such as efficiency, transparency, security, and user participation. The system successfully enabled farmers to register, upload product details, and manage their listings without difficulty. Similarly, buyers were able to access the platform, view available products, and actively participate in the bidding process.

During the experimentation phase, multiple transactions were carried out to observe the behaviour of the double auction mechanism. Farmers listed products with different base prices, and buyers placed competitive bids within the given time frame. The system effectively matched buyer bids with seller expectations and determined the most appropriate transaction price based on real-time supply and demand conditions. This ensured a fair and balanced pricing mechanism for all participants.

The integration of blockchain technology significantly improved the reliability of the system. All transaction records were stored in a decentralized ledger, making them secure, transparent, and resistant to tampering. This feature enhanced user confidence, as participants could verify transaction details without the risk of data manipulation.

In addition, cryptographic techniques were applied to protect sensitive data such as user credentials and bid values. This ensured confidentiality and safeguarded the system against unauthorized access and potential cyber threats. The secure handling of data contributed to the overall robustness of the platform.

The system also demonstrated improved efficiency compared to traditional agricultural trading methods. By reducing the involvement of intermediaries, the platform minimized delays and transaction costs. Farmers were able to receive better prices for their products, while buyers benefited from competitive bidding and clear pricing information.

Furthermore, features such as notifications and feedback mechanisms enhanced user experience and engagement. Users were promptly informed about auction results and transaction updates, while the feedback system helped in building trust among participants.

Overall, the results indicate that the proposed system provides a practical and effective solution for modern agricultural trading. It improves transparency, ensures secure transactions, enables fair price discovery, and enhances trust between farmers and buyers, making it suitable for real-world implementation.

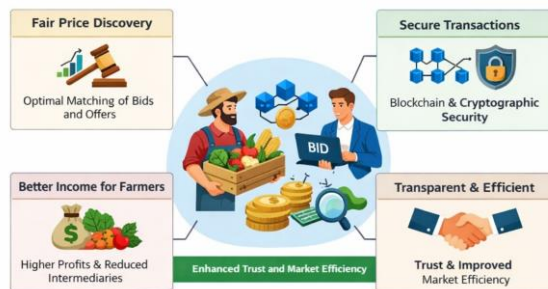


Fig. 3 Results of Double Auction Platform for Agricultural Trading

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VI. CONCLUSION

The proposed system presents a reliable and efficient solution for improving agricultural trading through a secure and transparent digital platform. Traditional agricultural markets often face challenges such as lack of transparency, unfair pricing, and heavy dependence on intermediaries, which negatively affect both farmers and buyers.

By incorporating a double auction mechanism, the system ensures fair and dynamic price discovery based on real-time supply and demand conditions. This allows farmers

to receive appropriate value for their products while enabling buyers to participate in a competitive and open bidding environment.

The integration of blockchain technology strengthens the system by providing a decentralized and tamper-proof record of all transactions, thereby increasing trust and accountability among users. In addition, cryptographic techniques play a crucial role in protecting sensitive data, ensuring confidentiality, and preventing unauthorized access.

Furthermore, the reduction of intermediaries improves overall efficiency and minimizes delays in the trading process. Farmers benefit from better pricing opportunities, while buyers gain access to transparent and reliable market information. The inclusion of features such as notifications and feedback mechanisms also enhances user experience and system credibility.

In conclusion, the proposed platform not only improves efficiency and transparency in agricultural trading but also supports the digital transformation of agricultural markets. It has the potential to create a fair, secure, and scalable environment that benefits all stakeholders involved.

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