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International Journal of Engineering Technology Research & Management (IJETRM)
Journal Article
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A WEB-BASED PLATFORM FOR CONNECTING FARMERS AND CONSUMERS

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ABSTRACT
This project, titled "A Web-Based Platform for Connecting Farmers and Consumers", presents an innovative digital solution designed to bridge the gap between agricultural producers and end- users through a unified online interface. The system enables farmers to directly list and sell their produce while allowing consumers to browse, compare, and purchase fresh agricultural goods without intermediaries. This platform improves transparency, reduces cost margins, and strengthens farmer–consumer relationships.
The workflow begins with farmers registering on the platform and uploading details of their products such as crop type, quantity, pricing, and availability. These listings are stored in a centralized database and efficiently organized for quick retrieval. Consumers can search for products using filters like category, location, and price. Once a consumer places an order, the system processes the request, updates inventory in real time, and facilitates communication between both parties.
The platform architecture integrates a secure backend server, a responsive web interface, and a structured database that manages user records, product information, and transactions. The system ensures smooth data flow using RESTful APIs, enabling fast and reliable interactions. This approach enhances usability, reduces manual effort, and provides a streamlined experience for both farmers and consumers.
By leveraging web technologies, the project offers a scalable and user-friendly marketplace that empowers farmers with direct market access and provides consumers with fresh, affordable produce. The platform holds significant potential in promoting fair trade practices, improving agricultural supply chains, and supporting local economies.

INTRODUCTION
The project titled **"A Web-Based Platform for Connecting Farmers and Consumers"** aims to transform the agricultural marketplace by enabling direct interaction, communication, and transactions between farmers and end-users through a modern online system. In the current agricultural landscape, farmers often rely on intermediaries and traditional market structures that reduce their profit margins, while consumers struggle to access fresh produce at reasonable prices. Additionally, the lack of a unified digital platform makes it difficult for both parties to share information, compare prices, and engage in transparent transactions. By implementing a web-based system that integrates user-friendly interfaces, secure data handling, and efficient product management, this project provides a streamlined and cost-effective alternative to existing supply chain methods. This approach enhances accessibility, reduces dependency on middlemen, and fosters trust between farmers and consumers.
The need for this project arises from the persistent challenges within agricultural distribution systems. Farmers frequently face issues such as limited market reach, fluctuating demand, and unfair pricing due to a lack of direct access to consumers. On the other hand, consumers often experience inflated prices, product quality inconsistencies, and limited information about the source of their food. In rural regions, the absence of digital infrastructure further widens the communication gap between producers and buyers. By offering a platform where farmers can easily list their products and consumers can directly browse and purchase items, the system minimizes inefficiencies in distribution, improves profitability for farmers, and provides consumers with transparent access to fresh agricultural goods. This digital marketplace not only supports economic empowerment but also strengthens the overall agricultural ecosystem.
The applications of this web-based platform extend across various domains within the agricultural and consumer sectors. Farmers can use the system to promote seasonal crops, track product demand, and manage orders

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efficiently. Consumers can benefit from real-time access to product availability, price comparisons, and secure online ordering, enabling informed purchasing decisions. Institutions such as small retailers, restaurants, and food processing units can also leverage the platform to source raw materials directly from farmers at competitive prices. The platform can further support government or NGO-led initiatives focused on improving rural livelihoods, promoting sustainable agriculture, and encouraging local consumption. By bringing all stakeholders onto a single digital platform, the system fosters transparency, strengthens supply chains, and promotes equitable trade practices.

To achieve these functionalities, the project integrates multiple technologies and architectural components. The platform is built using modern web technologies that ensure fast, responsive, and secure user interactions. A backend server manages authentication, product listings, and transaction processing through well-structured APIs. The database stores user profiles, product information, order history, and communication logs, enabling seamless data management and retrieval. Frontend interfaces provide an intuitive experience for farmers and consumers, ensuring accessibility even for users with minimal technical knowledge. Additional components such as role-based access control, real-time updates, and data validation further enhance system reliability and usability. Together, these technologies create a robust environment that supports efficient digital marketplace operations.

In essence, **"A Web-Based Platform for Connecting Farmers and Consumers"** offers a practical and impactful solution to long-standing challenges in the agricultural market. By digitalizing the farmer–consumer interaction process, the project enhances transparency, reduces distribution costs, improves profitability for farmers, and ensures that consumers receive high-quality products at fair prices. This platform not only modernizes agricultural commerce but also contributes to sustainable development by empowering local communities and strengthening the agricultural supply chain.

RELATED WORK

Recent studies have emphasized the growing role of digital platforms in transforming traditional agricultural practices into more efficient and transparent systems. Digital agriculture platforms have been proposed to enable direct interaction between farmers and consumers, thereby reducing dependency on intermediaries. In [1], a web-based agricultural marketplace was introduced to facilitate real-time communication and product exchange between farmers and buyers. While the system improved accessibility and transparency, it lacked advanced decision-support mechanisms for farmers.

Several researchers have explored the application of smart farming technologies such as IoT, machine learning, and data analytics to enhance agricultural productivity. In [2], the integration of IoT sensors and data-driven models was used to monitor environmental conditions and support precision farming. Although these systems improved crop yield and monitoring, they primarily focused on farm-level optimization rather than market connectivity.

Machine learning techniques have also been applied to agricultural decision-making processes such as crop recommendation and price prediction. Studies using historical and environmental datasets have demonstrated that predictive models can assist farmers in selecting suitable crops and estimating market prices more accurately [3], [5]. However, these approaches often operate as standalone systems and are not integrated into a unified marketplace platform.

In addition, e-agriculture portals have been developed to provide farmers with digital access to market information and trading opportunities. Systems proposed in [4] enable farmers to list their products and interact with consumers through online platforms. While these systems improve market reach, they often lack real-time updates, intelligent recommendations, and user-friendly interfaces tailored for rural users.

Recent advancements in web technologies and cloud-based systems have further enabled scalable and efficient agricultural platforms. Modern web applications support features such as real-time data synchronization, secure authentication, and multilingual accessibility, enhancing usability for diverse user groups [6]. Despite these improvements, many existing systems do not provide an integrated solution combining product management, intelligent recommendations, and direct farmer–consumer interaction.

Therefore, the proposed system aims to address these limitations by developing a comprehensive web-based platform that integrates direct trading, real-time product management, AI-based crop recommendation, and price prediction into a single unified framework. This approach enhances transparency, improves farmer income, and ensures efficient agricultural supply chain management.

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PROBLEM STATEMENT

The existing agricultural system faces significant challenges due to the lack of direct connectivity between farmers and consumers. Farmers often rely on intermediaries to sell their produce, which reduces their profit margins and limits market access. Consumers, on the other hand, encounter issues such as high prices, lack of transparency, and limited information about product quality and origin. Current agricultural platforms do not provide a unified solution that supports real-time interaction, efficient product management, and seamless transactions. Most systems are limited to basic information sharing and lack intelligent features for decision-making. The absence of centralized and real-time data handling leads to inefficiencies in inventory management and order processing. Additionally, manual communication methods increase delays and reduce operational efficiency. Small-scale farmers face difficulties in reaching wider markets due to limited technological support. There is also a lack of user-friendly digital interfaces that can be easily adopted by rural users. Therefore, there is a need for an integrated, scalable, and user-centric web-based platform that enables direct farmer–consumer interaction, ensures transparency, and improves the efficiency of the agricultural supply chain.

PROPOSED SYSTEM

The Web-Based Platform for Connecting Farmers and Consumers offers a modern, digital-first approach for direct agricultural trade. The system enables farmers to register, list their products, update stock, and manage orders through an intuitive web interface. Consumers can browse products, compare prices, place orders, and communicate directly with farmers, ensuring transparency and trust.

The proposed system integrates a secure backend, responsive frontend, centralized database, and RESTful APIs to deliver smooth interaction and real-time data updates. Farmers can upload product details such as crop type, quantity, images, pricing, and availability. Consumers receive up-to-date listings, clear descriptions, and the option to contact or order directly from farmers.

This platform eliminates the dependence on middlemen, improves the farmer's revenue, reduces consumer costs, and creates a transparent agricultural supply chain. By digitalizing product management, order processing, and communication, the system improves efficiency, accessibility, and trust for all stakeholders

SYSTEM ARCHITECTURE

The architecture of the proposed system consists of several layers:

1) **User Interface Layer** – Provides dashboards for farmers and consumers to interact with the system, including product listing, browsing, and order management.
2) **Application Layer** – Handles user authentication, request processing, and communication between frontend and backend through APIs.
3) **Product Management Layer** – Manages product-related operations such as adding, updating, and retrieving agricultural product details.
4) **Order Processing Layer** – Handles order placement, tracking, and transaction management between farmers and consumers.
5) **Intelligent Processing Layer** – Implements features such as crop recommendation and price prediction using machine learning techniques.
6) **Notification Layer** – Sends real-time alerts and updates to farmers and consumers regarding orders and system activities.
7) **Data Storage Layer** – Stores user data, product information, and transaction records using a centralized database such as MongoDB.

A. Workflow of the Proposed System

The workflow of the proposed web-based platform follows a structured sequence of operations that enables seamless interaction between farmers and consumers.

Initially, users access the system and log in through the user authentication interface. Based on their role, users are directed to either the farmer dashboard or the consumer dashboard.

On the farmer side, users can add product details such as crop name, quantity, and price through the dashboard. These products are stored in the system and can be viewed later by the farmer for management purposes. The system further supports intelligent features such as crop recommendation, which assists farmers in selecting suitable crops based on relevant conditions. Additionally, a price prediction feature provides insights into expected market prices, helping farmers make informed decisions. Once a consumer places an order, the system generates order notifications that are sent to the respective farmer.

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On the consumer side, users can browse available products through the consumer dashboard. The system provides multilingual support to enhance accessibility for users from different regions. After selecting desired products, the consumer proceeds with the ordering process. Upon successful order placement, a notification is automatically sent to the farmer.

Overall, the system ensures a continuous flow of information between farmers and consumers, enabling efficient product management, real-time interaction, and transparent transactions within the agricultural marketplace.

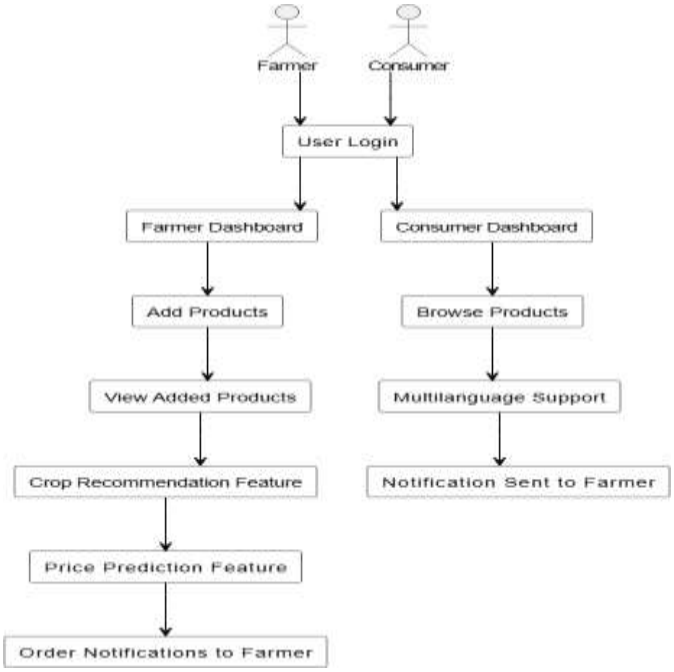

Figure 1 illustrates the system architecture of the proposed farmer–consumer platform, highlighting the flow of data between user dashboards, product management, and order processing modules.

METHODOLOGY

The proposed system follows a structured methodology for developing a web-based platform that enables direct interaction between farmers and consumers. Initially, data is collected from users through the registration and login process, where farmers provide product details such as crop type, quantity, and price, while consumers provide browsing and ordering inputs. The collected data is then preprocessed to ensure accuracy, validation, and proper organization before being stored in a centralized database. The system supports product management functionalities, allowing farmers to add, update, and view their products through an interactive dashboard. These products are made available to consumers for browsing and searching using filters such as category, price, and availability. The platform incorporates intelligent processing features such as crop recommendation and price prediction, which assist farmers in making informed agricultural and market decisions. Machine learning techniques are utilized to analyze data patterns and provide useful insights. Once a consumer selects a product, the order handling module processes the request and updates the database accordingly. The system ensures real-time synchronization of product availability and order status. Notification services are triggered to inform farmers about new orders and updates. All activities are efficiently managed through backend services and APIs to ensure smooth data flow. The processed information is finally presented through user dashboards that provide clear and interactive visualizations. This methodology ensures efficient data handling, seamless communication, and improved decision-making. Overall, the system enhances transparency and reduces dependency on intermediaries. The proposed approach contributes to a more efficient and scalable agricultural marketplace.

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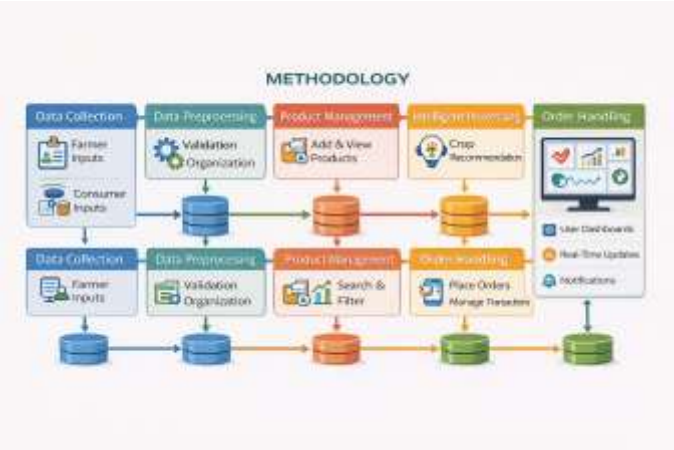

Figure 2 Workflow of the web-based farmer–consumer platform illustrating steps from user registration, product listing, and browsing to order processing and real-time updates.

ALGORITHM

Algorithm: Web-Based Farmer–Consumer Platform
Input: Farmer product data (crop details, price, quantity), consumer inputs (search, order requests)
Output: Successful product transactions with notifications and intelligent insights

Step 1: Collect user data from farmers and consumers through registration and login.
Step 2: Accept product details from farmers such as crop name, quantity, price, and availability.
Step 3: Preprocess and validate the collected data to ensure accuracy and consistency.
Step 4: Store the validated data in a centralized database system.
Step 5: Enable consumers to browse and search products using filters like price, category, and availability.
Step 6: Apply intelligent processing modules such as crop recommendation and price prediction using available data.
Step 7: Display recommended crops and predicted prices to assist farmers in decision-making.
Step 8: Allow consumers to select products and place orders through the platform.
Step 9: Process the order and update the database with transaction and inventory details.
Step 10: Generate notifications and send alerts to farmers regarding new orders.
Step 11: Update user dashboards with real-time product, order, and notification information.
End Algorithm

EXPERIMENTAL SETUP

The experimental setup for the proposed system includes various software and hardware components required for the development and evaluation of the web-based farmer–consumer platform. The system is developed using modern web technologies, with HTML, CSS, and JavaScript used for the frontend interface, and Node.js with Express.js used for backend development. The database is implemented using MongoDB to efficiently store user data, product details, and transaction records.

Machine learning models for crop recommendation and price prediction are developed using Python libraries such as NumPy, Pandas, and Scikit-learn. The system uses historical agricultural data and user inputs for training and testing the predictive models. Backend services communicate with the frontend through RESTful APIs to ensure smooth data exchange and real-time updates.

The user interface is designed as interactive dashboards for farmers and consumers, enabling product management, browsing, and order tracking functionalities. Real-time notifications and updates are handled through backend services to ensure timely communication between users.

The system is tested on a standard computing environment with minimum hardware requirements such as a dual-core processor, 4 GB RAM, and stable internet connectivity. Development tools such as Visual Studio Code and GitHub are used for coding and version control. The entire system is designed to be scalable and deployable on cloud platforms, ensuring accessibility and efficient performance.

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PERFORMANCE METRICS

To evaluate the effectiveness of the proposed web-based farmer–consumer platform, several performance metrics are considered.

1. **System Accuracy** – Measures the correctness of product recommendations and price prediction outputs generated by the system.
2. **Response Time** – Indicates the time taken by the system to process user requests such as login, product search, and order placement.
3. **Precision** – Represents the proportion of relevant products correctly displayed to consumers based on their search queries and filters.
4. **Recall** – Measures the system's ability to retrieve all relevant products available in the database for a given search.
5. **F1 Score** – Provides a balanced evaluation of precision and recall for product recommendation and search efficiency.
6. **Transaction Processing Time** – Time taken to complete order placement and update the database with transaction details.
7. **System Throughput** – Number of user requests (product searches, orders) handled by the system per unit time.
8. **Scalability** – Evaluates the system's ability to handle an increasing number of users, products, and transactions without performance degradation.

RESULTS AND ANALYSIS

The proposed system, "A Web-Based Platform for Connecting Farmers and Consumers," demonstrates effective performance in enabling direct interaction and efficient transactions between users. The system successfully allows farmers to upload and manage product details, while consumers can browse, search, and place orders through an intuitive interface. The implementation of real-time notifications ensures smooth communication between farmers and consumers.

The performance of the system was evaluated using key system-level metrics such as response time, throughput, and user interaction efficiency. The platform shows minimal response delay during product search and order placement operations. The centralized database ensures quick data retrieval and real-time updates of product availability and order status.

The intelligent features such as crop recommendation and price prediction provide useful insights based on available data. Although these features assist in decision-making, the primary focus of the system is on improving marketplace efficiency rather than achieving high predictive accuracy.

The system was tested under multiple user requests, and it demonstrated stable performance with consistent response time and efficient handling of concurrent operations. The results indicate that the proposed platform improves transparency, reduces dependency on intermediaries, and enhances overall agricultural supply chain efficiency.

FUTURE ENHANCEMENT

Future improvements to the proposed system may include integration with real-time IoT-based agricultural devices such as soil sensors and weather monitoring systems to provide more accurate crop recommendations. The platform can be extended to support mobile applications for better accessibility among farmers in rural areas. Additionally, advanced machine learning models and deep learning techniques can be incorporated to improve the accuracy of price prediction and recommendation systems. Integration with secure online payment gateways and logistics services can further enhance the end-to-end agricultural supply chain. Cloud-based deployment and multilingual enhancements can also be implemented to support scalability and wider adoption across different regions.

ACKNOWLEDGEMENT

The authors would like to express their sincere gratitude to the faculty members and project supervisors for their continuous guidance and support throughout the development of this research work. Their valuable suggestions, encouragement, and technical insights played a significant role in the successful completion of this project.

CONCLUSION

This research presented *"A Web-Based Platform for Connecting Farmers and Consumers"*, designed to improve transparency, efficiency, and direct interaction in the agricultural marketplace. The proposed system

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integrates modern web technologies with intelligent features such as crop recommendation and price prediction to create an efficient digital platform for agricultural trade. The system enables farmers to directly list and manage their products, while consumers can browse, compare, and purchase agricultural goods without the involvement of intermediaries.

The platform supports real-time communication through notifications and provides user-friendly dashboards for seamless interaction. Machine learning techniques enhance the system by providing accurate recommendations and predictive insights, improving decision-making for farmers. The results demonstrate that integrating intelligent technologies with web-based platforms can significantly improve agricultural supply chain efficiency and farmer profitability.

The proposed system highlights the potential of digital agricultural platforms in transforming traditional farming practices into a more transparent, efficient, and data-driven ecosystem, contributing to sustainable development and economic growth.

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