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# A Review Paper on Mobile Web Application for Farmer to Retailers by using Matching Algorithm

**Trupti P. Suryawanshi[1], Prof. Prashant Shimpi[2]**

*[1]Lecturer, KCES, COEM, Jalgaon, India, 425001:* *0009-0002-4267-1913*
*[2]Assistant Professor, Godavari College of Engineering, Jalgaon, India, 425001*

*Email of Corresponding Author:**Truptisuryawanshi1234@gmail.com***

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***Abstract** – The agricultural industry faces considerable obstacles in efficiently linking farmers to retailers, ensuring prompt delivery of fresh produce to market. This mobile web application seeks to address these challenges by employing advanced matching techniques, specifically Multi-Criteria Decision Analysis (MCDA) and Bipartite Graph Matching Algorithm, to effectively connect farmers with retailers. The platform enables farmers to showcase their available produce, while retailers can indicate their specific needs regarding quantity, quality, and produce type. The matching algorithm evaluates both datasets and recommends optimal connections, taking into account factors such as proximity, price, demand, and availability. By streamlining the matching process, the application reduces manual effort, minimizes waste, and enhances overall supply chain efficiency. This innovative solution benefits both farmers, who gain access to a broader customer base, and retailers, who secure a dependable and steady supply of fresh produce. The mobile web application, designed for user-friendliness and accessibility, empowers farmers and retailers to make well-informed decisions, boost profitability, and contribute to a more sustainable agricultural ecosystem. The application facilitates smooth and transparent transactions between farmers and retailers. It not only improves operational efficiency but also promotes sustainability by ensuring timely delivery of fresh produce to the appropriate retailer, thereby increasing profitability for both parties involved. This mobile web application serves as a bridge between farmers and retailers, optimizing the supply chain process and addressing significant challenges in the agricultural sector.*

***Keywords-** Matching algorithm, Farmer, Retailer, Bipartite Graph Matching, Multi-Criteria Decision Analysis, Web application*

## INTRODUCTION

In recent times, there has been an increasing demand for creative solutions that tackle the intricate and frequently ineffective supply chains in the agriculture industry. One such solution is the creation of mobile web applications aimed at simplifying the connection process between farmers and retailers. These platforms can significantly contribute to the removal of intermediaries, guaranteeing better pricing for farmers, and enhancing the quality and accessibility of agricultural products for retailers. By utilizing cutting-edge technologies like matching algorithms, these applications can assist in automating and refining the distribution process, leading to a market that is more efficient, transparent, and equitable. This article investigates the idea of a mobile web application intended to link farmers with retailers, concentrating on the employment of matching algorithms to aid this connection. It will elaborate on how such a platform functions, the advantages it provides, the technology behind the matching algorithms, and the possible effects on the agricultural value chain. According to the Bangladesh National Agricultural Census, there are approximately 16.5

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million farming families in Bangladesh. The research was published during an event held by the Bangladesh Bureau of Statistics (BBS) at the BBS auditorium in Dhaka [13]. The creation of a mobile web application aimed at enhancing connections between farmers and retailers through a sophisticated matching algorithm signifies a noteworthy development in agricultural trade. A farmer is an individual who supplies food for us but does not earn enough to cover their production expenses. This situation arises due to the impact of third parties who purchase the goods at a lower price and sell it to consumers at a higher price [5-9]. For this reason, we developed an app on Android and a website that would benefit both sides while also offering the highest level of security. Farmers and customers can interact directly with each other without the necessity for an intermediary using this method. This application seeks to optimize the supply chain by allowing farmers to effectively reach possible buyers, thereby improving market access and minimizing food waste. By utilizing data-driven algorithms, the platform can pair farmers with retailers based on different criteria such as product type, quantity, and location, ensuring that both parties can enhance their operations. This innovative strategy not only cultivates direct connections between producers and consumers but also encourages transparency and sustainability in the agricultural sector. As the application progresses, it holds the potential to revolutionize traditional market dynamics, empowering both farmers and retailers to excel in a competitive environment.

## LITERATURE REVIEW

This literature review explores various studies and research that relate to mobile web applications, matching algorithms, and the role of technology in bridging the gap between farmers and retailers.

The document [1] "Spry Farm: A Portal for Connecting Farmers and End Users" by Sneha Iyer et al. investigates the creation of an online platform known as Spry Farm, which seeks to link farmers directly with end-users. The writers assert that Spry Farm holds the promise to revolutionize the agriculture sector by offering a space for farmers to access a broader market and engage directly with end-users. Moreover, the platform can contribute to minimizing waste and enhancing efficiency by allowing farmers to sell their products straight to customers without intermediaries. The authors conclude that the establishment of platforms like Spry Farm can aid in fostering a more sustainable and fair food system for everyone. The framework outlined in document [1] comprises a web application designed using CSS, JavaScript, and SQLite3 for the direct selling of farmers' goods to the customer, yet it lacks support for local languages.

The paper "Krishi Portal: Web Based Farmer Help Assistance" by Md Iqbal et al. [2] discusses the development of an online portal called Krishi Portal, which aims to provide assistance and support to farmers. The authors argue that Krishi Portal has the potential to transform the agriculture industry in India by providing farmers with access to information and resources that can help them to improve their operations and increase their productivity. Additionally, the portal can help to create a more sustainable and equitable food system by providing small-scale farmers with the support they need to compete in a global market, but local language support is missing in this system.

The development of a mobile application to encourage the consumption of locally grown, organic food is described in the article "Agro App: An application for healthy living" by Aggarwal et al. [3]. The authors contend that the application can help close the gap between farmers and consumers by offering a platform for direct communication and interaction. The system in the paper [3] provides information on crop prices in nearby and distant markets, as well as weather forecasting information.

[4] The design and construction of a web portal intended to facilitate e-trading between farmers and purchasers is described in "Design of Web Portal for E-Trading for Farmers" by Vishi Purushottam Paliwal et al. The writers of this piece [4] also stress how crucial it is to teach farmers about e-trading and give them the assistance and training they require.

Agriculture E-Commerce benefits farmers by enabling them to promote their goods on a bigger market and reach the end customer regardless of their location. Once agricultural E-Commerce is effectively implemented, it will help the producers economically and contribute to the country's economic development [10-12].

KT Ganesh Kumar and Gunna Kamal Abhishek[14] developed an application designed to inform farmers about government schemes and local weather conditions. The application utilizes a straightforward database and includes a microphone feature that allows farmers to record details about their products.

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An overview of the idea of e-mandi, a web-based platform for bringing together farmers and end users in the agricultural market, may be found in the paper [16] "Survey Paper on E-Mandi A Market Exchanging Between Farmers and End-user" by Sheetal Bhagwat et al. E-mandi, according to the authors in [16], has the ability to solve a number of problems that farmers and end users have, including price volatility, restricted market access, and a lack of transparency. All things considered, the study offers insightful information about how e-mandi could revolutionize the Indian and global agriculture industries.

## METHOLOGY

The development of a mobile web application that connects farmers to retailers using a matching algorithm involves multiple phases: problem identification, system design, algorithm development, implementation, testing, and evaluation. This methodology outlines the systematic steps required to design and implement a mobile web application that efficiently connects farmers and retailers.

In Figure 1, the system's block diagram is detailed. It features three participants: admin, farmer, and consumer. The farmer and the purchaser will obtain a username and password upon successful registration. To input product details, the farmer must log in using the correct credentials. The customer can choose any available product they require and place an order. All the latest news and updates concerning various products or agricultural fairs in progress will be showcased on the portal. Additionally, the list of current market prices for specific products will be accessible on the portal. Thus, this portal will serve as a standard for all producers to enhance their profits, consequently boosting the economy of our country.

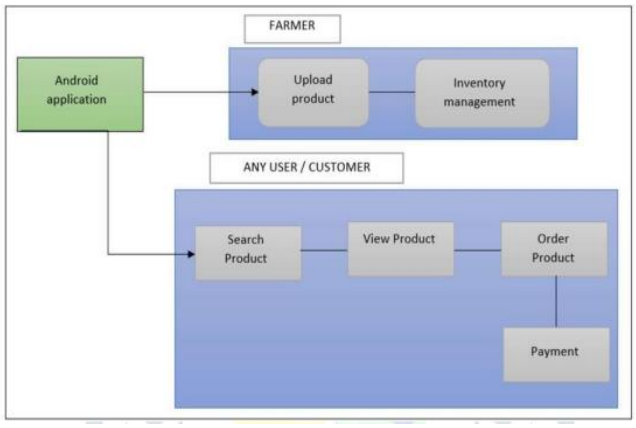


Figure1. Block diagram of system

Primary goal is to execute in order to enable communication between consumers and farmers. The entire ordering process is transparent from start to finish, which distinguishes us from others. Conversely, the proposed method ensures farmers' asking prices and removes the monopolistic control of intermediaries or wholesalers. We also do not generate any profit. Buyers will pay the farmer's base price.

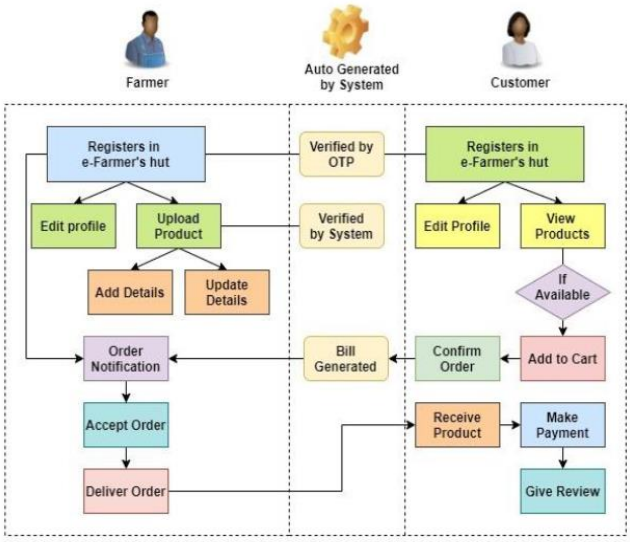


Figure2. System's workflow diagram

1) System Design and Architecture

1.1. Mobile Web Application Architecture

The mobile web application will consist of two main components:

1) Front-End (User Interface):

Accessible on mobile browsers.

Simple and intuitive design for both farmers (who may not be tech-savvy) and retailers.

Responsive design to ensure compatibility across different devices (smartphones, tablets).

2)Back-End (Server-Side):

Cloud-based server hosting the database and logic of the application.

Data storage for farmer and retailer profiles, product listings, and transactions.

API endpoints for data exchange between the front-end and back-end.

1.2. Database Design

Farmer Database: Stores farmer details such as location, produce information, prices, and quantities.

Retailer Database: Stores retailer profiles, location, product preferences, and order history.

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Transaction Database: Tracks transactions between farmers and retailers, including payment, product quantity, and delivery.
Matching Data: Stores parameters used for matching such as price range, delivery timelines, and product types.

2) Development of the Matching Algorithm: The core of the mobile web application is its matching algorithm, which pairs farmers with retailers based on specific criteria.

2.1. Inputs for Matching Algorithm
Product Availability: Farmers list available products with details such as quantity and price.
Location Proximity: Farmers and retailers within close geographic proximity are prioritized to minimize transportation costs and delays.
Price and Quality: The algorithm should account for market prices and quality standards. Retailers often prefer competitive prices while ensuring the quality meets their requirements.
Delivery Preferences: Some retailers may prefer faster delivery times, while others are more flexible.

2.2. Matching Criteria
Geographical Proximity: A location-based matching model helps reduce transportation costs and delivery time.
Formula: Euclidean distance between the farmer and retailer's geocoordinates.

Price Matching: Price-based matching ensures that farmers and retailers are aligned within an acceptable price range.
Formula: Price matching within a 5-10% variance range based on market trends.

Quality Matching: Retailers may have specific quality requirements for produce. These can be input into the system, and the algorithm filters options based on quality standards.

Volume and Availability: Retailers may require large volumes of a product, while farmers may only have limited quantities available.
Formula: Matching based on minimum volume requirements.

2.3. Algorithm Design
Step 1: Data Preprocessing: Gather data from both farmers and retailers (e.g., product lists, location, and price data). Standardize the input data.
Step 2: Matching Logic:Use weighted decision criteria for each factor (location, price, volume, and quality). For example:
Location Proximity: 40% weight
Price: 30% weight
Product Quality: 20% weight
Delivery Preference: 10% weight
Calculate a compatibility score for each potential match.
Step 3: Optimization: Use dynamic matching based on real-time supply and demand. The system can recommend the top matches, allowing farmers and retailers to filter results further based on preferences.

2.4. Machine Learning Integration (Optional)
For future iterations, machine learning models can be trained to improve match accuracy by learning from past transactions. This allows the system to predict which farmers and retailers are most likely to form successful partnerships based on historical data.

3) Implementation
3.1. Technology Stack
Frontend:HTML, CSS, and JavaScript for responsive design.
Framework: React or Angular for building the dynamic web interface.
Backend:Node.js with Express.js or Django for creating RESTful APIs.
Python (Flask) or JavaScript (Node.js) for the matching algorithm implementation.
Database: MySQL, PostgreSQL, or MongoDB for storing data.
Mobile-Responsive:The app should be mobile-optimized, so farmers can use it easily on their smartphones.

3.2. Integration of Payment Gateway
A secure payment gateway (e.g., Stripe or PayPal) is integrated to handle financial transactions between farmers and retailers.

3.3. Deployment
The application is deployed on cloud platforms such as AWS, Microsoft Azure, or Google Cloud to ensure scalability and reliability.

4) Testing and Evaluation
4.1. Functional Testing

Test each functionality of the app (profile creation, product listing, matching algorithm, messaging, and payment systems).

4.2. Usability Testing

Conduct usability testing with a sample group of farmers and retailers to ensure the application is user-friendly, especially for users with limited tech experience.

4.3. Performance Testing

Assess the performance of the matching algorithm under heavy load to ensure it can scale as the user base grows.

4.4. A/B Testing

Test different variations of the matching algorithm, such as varying weights for matching criteria, to optimize the results.

5) Deployment and Maintenance

5.1. Deployment

The mobile web application will be deployed in phases:

Phase 1: Limited launch for farmers and retailers in select regions to gather feedback.

Phase 2: Full-scale launch across multiple regions after addressing initial issues.

5.2. Maintenance and Updates

Regular updates to improve the matching algorithm's accuracy.

Ongoing technical support to handle bug fixes and user queries.

Addition of new features based on user feedback (e.g., integration with weather data, seasonal produce suggestions).

## CONCLUSION

The creation of a mobile web application intended to connect farmers with retailers via a matching algorithm signifies a groundbreaking advancement in the modernization of agricultural supply chains. By utilizing technology, this application offers an effective, clear, and direct link between farmers and retailers, diminishing dependence on intermediaries and encouraging equitable pricing for both sides. The matching algorithm, which refines the connection procedure based on aspects such as location, cost, product quality, and quantity, guarantees that the supply aligns with the demand in a manner that is advantageous for both farmers and retailers. By simplifying the process, farmers obtain improved access to retail markets, boosting their profitability, while retailers gain a dependable, economical source of fresh produce. Furthermore, the mobile web application serves not only as a means to enhance market access but also builds trust and transparency through features such as real-time communication, feedback mechanisms, and secure payment integration. With these capabilities, the application elevates the overall user experience, enabling both farmers and retailers to make well-informed choices.

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