



# Agro Vision AI: A Web-Based Intelligent Agricultural E-Commerce Platform

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**Abstract:** Agriculture is a key sector for economic growth, but farmers face problems such as low profits, limited market access, and inefficient supply chains. Modern technologies like cloud computing, artificial intelligence, and e-commerce create opportunities to improve traditional farming systems.

This paper presents **Agro Vision AI**, a web-based platform that directly connects farmers and merchants. The system supports product listing, online payments, order tracking, and delivery management. It removes intermediaries and increases transparency in agricultural trade. The platform uses modern web technologies for scalability and efficiency. Results show faster transactions, better pricing for farmers, and improved user experience.

## 1. INTRODUCTION

Agriculture is a major sector of economic development, especially in countries like India, where many people depend on farming for income. It supports GDP, employment, and food security. However, the sector faces challenges such as low productivity, poor market access, weak supply chains, and dependence on intermediaries, which reduce farmers' profits.

Traditional agricultural markets are often unorganized, involving middlemen, high transaction costs, delayed payments, and lack of real-time market information. Poor logistics and tracking systems also cause wastage and inefficiency.

With the growth of digital technologies, e-commerce, AI, and cloud computing offer new ways to modernize agriculture. These technologies improve transparency, decision-making, communication, and supply chain management. However, many existing platforms still lack secure payments, order tracking, delivery management, and farmer-friendly interfaces. To solve these issues, this research proposes **Agro Vision AI**, a smart web-based platform connecting farmers directly with merchants. It allows product listing, online purchasing, secure payments, real-time order tracking, and delivery management.

The main goal of Agro Vision AI is to remove intermediaries, ensure fair trade, increase farmer income, reduce inefficiencies, and support the digital transformation of agriculture.

## 2. LITERATURE REVIEW

### 2.1. Digital agriculture

Digital agriculture refers to the use of modern and advanced technologies integrated into a single system to help farmers and other stakeholders improve food production. Compared to traditional and sensor-based methods, digital agriculture enables farmers to monitor and manage farming activities more effectively in real time. It provides scientific knowledge and smart solutions that support better decision-making and improved agricultural practices. As a result, digital agriculture has a significant impact on increasing crop yield and overall productivity.

Digital agriculture provides a user-friendly platform where farmers can share ideas and learn modern cultivation methods used worldwide. It helps them improve farming skills, business knowledge, and update traditional practices with new technologies. Historical data can also be reviewed to support better decision-making.

To increase crop yield, low-cost and efficient automated systems are required. Agricultural automation such as smart machinery, irrigation systems, greenhouse control, animal management, and fruit production systems helps improve productivity and reduce crop damage.



Figure 1. The concept of digital agriculture [10]

**2.2. Smart farming**

Smart Farming focuses on using Information and Communication Technology (ICT) in modern farm management. It is considered the next stage of agricultural development and supports efficient, productive, and profitable farming practices. In India, agriculture needs to shift from traditional methods to smart farming for sustainable growth. Also known as the Internet of Agriculture Technology (IoAT), it helps farmers monitor farming conditions, maintain optimum productivity, reduce effort, and increase cost benefits. Smart farming models are simple, effective, and easy for farmers to adopt.

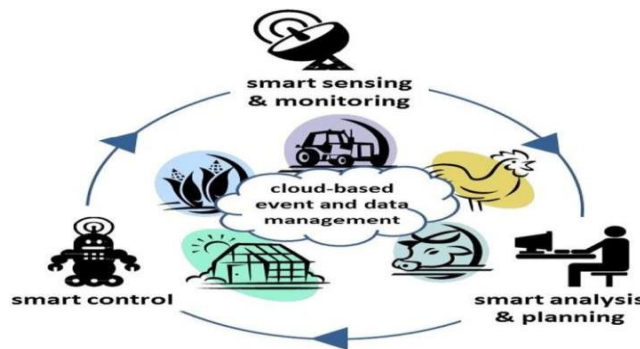


Figure 2. The concept of smart farming representing the cyber-physical system based management cycle

**2.3. Supply chain strategies**

Food security is a major global concern, and the growing population may create serious food shortages in the future. With limited cultivable land, it is necessary to reduce food losses and improve supply chains through automation.

Automation is useful in all farming stages such as seed selection, planting, crop protection, nutrient and water supply, harvesting, storage, processing, and transportation. These methods help increase productivity and reduce wastage.

Food safety measures also improve consumer trust and product acceptance. Automated food supply systems can enhance business opportunities, improve farmers' reputation, and encourage more people to adopt agriculture.

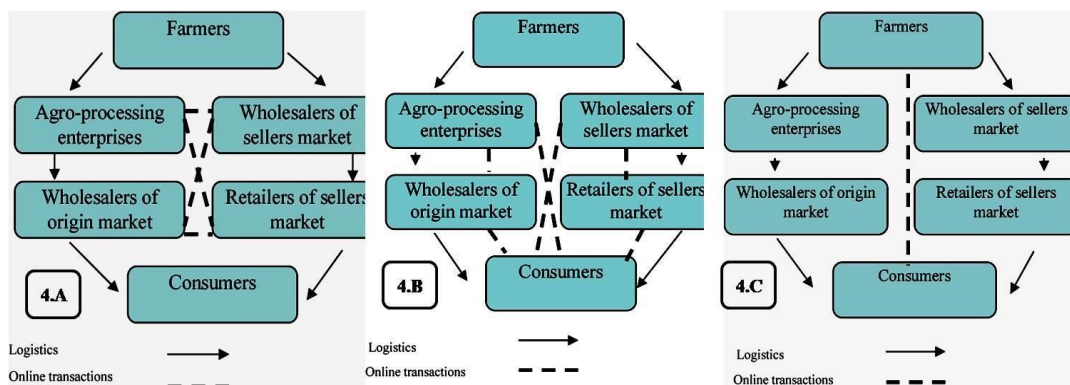


Figure 3. Models practiced in supply chain strategies of agriculture practices, (a) B2B model, (b) B2C model, (c) C2C model



#### 2.4. Data mining and analytics

Decision Support Systems (DSS) in agriculture are supported by data mining tools that extract useful information from available datasets and convert it into an understandable format for better decision-making.

Data mining helps farmers study soil fertility and choose suitable crop varieties for higher yield. It is also used for soil classification, fertilizer recommendations, and predicting factors that affect crop production. Modern techniques such as GPS, K-means, SVM, and K-nearest methods improve accuracy and reduce time and cost compared to traditional testing methods.

Soil testing laboratories analyze fertility, impurities, and nutrient deficiencies. Based on the results, suitable fertilizers are recommended, helping farmers use the right inputs for specific crops and seasons.

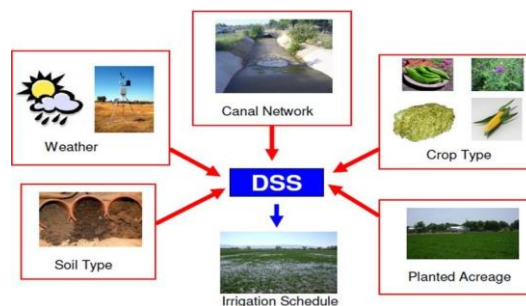


Figure 4. An architecture of decision support system (DSS) applied in the field of agriculture

#### 2.5. Weather forecasting techniques

Climate change is one of the biggest challenges for agriculture and directly affects crop production. Unlike sectors such as e-commerce, the use of Big Data in environmental studies is still limited due to the complex nature of climate data.

In India, climate change impacts plant growth, crop duration, pest attacks, and overall yield. Rising temperatures increase crop respiration and reduce productivity. Changes in rainfall and temperature patterns also affect farming seasons.

By analyzing past climate data such as rainfall and temperature using big data tools, useful insights can be obtained. Sensors also help farmers test the effectiveness of seeds and fertilizers in different farm areas. Software-based guidance supports farmers in selecting suitable seed varieties for better crop yield.



Figure 5. Sensors applied in the field of agriculture [26]

#### 2.6 Integration of digital technologies in agriculture

The use of digital technologies in agriculture has increased in recent years, especially through e-commerce platforms and intelligent systems. Many researchers have studied agricultural e-commerce systems to improve supply chains and increase farmer profits.

Liu (2022) proposed a cloud-based agricultural platform that improves data processing, scalability, and real-time transactions. Dan and Song (2009) introduced a multi-agent B2B e-commerce system that improves communication and transactions between buyers and sellers.

Recent studies also focus on AI and recommendation systems. Malinowski (2024) explained how recommendation algorithms can provide personalized product suggestions and improve user experience. Babar and Akan (2024) highlighted the role of AI, IoE, and predictive analytics in smart agriculture.



However, many existing agricultural platforms still have limitations such as lack of secure payments, order tracking, delivery management, poor user interfaces, and limited access for rural farmers. Most systems also fail to provide direct farmer-to-merchant interaction.

Therefore, there is a need for a complete and user-friendly platform. **Agro Vision AI** addresses these gaps by offering direct farmer-merchant trade, secure transactions, real-time tracking, and intelligent features in one unified system.

### 3. PROBLEM STATEMENT

The agricultural sector faces many challenges that reduce growth and efficiency. A major issue is the lack of direct communication between farmers and buyers, as intermediaries reduce farmer profits and increase costs.

Farmers also face unfair pricing due to limited market information and weak bargaining power. In addition, the sector lacks proper digital systems for online selling, order management, and tracking.

Poor logistics cause delays, wastage, and higher costs. Limited secure payment options also lead to delayed transactions. Therefore, a simple digital platform is needed to connect farmers and merchants directly, ensure fair pricing, secure payments, and real-time order tracking.

### 4. PROPOSED SYSTEM

**Agro Vision AI** is a web-based agricultural e-commerce platform that connects farmers directly with merchants. It removes intermediaries and creates a transparent, efficient marketplace.

Farmers can register and list products, while merchants can browse items and place orders. The platform supports secure online payments, real-time order tracking, and delivery management.

It is easy to use and can be upgraded with AI features like price prediction and demand forecasting.

Overall, **Agro Vision AI** improves agricultural trade using modern digital technology.

### 5. METHODOLOGY

#### 5.1 Proposed Methodology

**Agro Vision AI** is designed as an efficient agricultural e-commerce platform that combines web technologies, secure payments, and real-time tracking. It enables direct interaction between farmers and merchants with transparency and ease of use.

Farmers can upload product details such as price, quantity, and category through a web interface. The data is stored in a centralized database for easy management. Merchants can browse products, place orders, and complete transactions through a secure payment gateway.

The system also provides real-time order tracking and user profile management, making it simple and accessible for all users.

#### 5.2 Development Model: Iterative Waterfall Model

The development of **Agro Vision AI** follows an Iterative Waterfall Model, which combines the structured and sequential approach of the traditional waterfall model with iterative improvements. This approach enables systematic development while allowing continuous refinement based on testing and user feedback.

##### 1. Requirements Gathering (Initial Phase)

All functional and non-functional requirements of the system are identified and documented. Key features such as user registration, product listing, order management, secure payment integration, order tracking, and delivery management are defined. User requirements for both farmers and merchants are analyzed to ensure system usability and effectiveness.

##### 2. System Design (Initial Phase)

The overall system architecture is designed, including frontend, backend, and database components. Data flow between modules such as authentication, product management, and transaction processing is defined. Appropriate technologies and tools are selected for implementation.

##### 3. Implementation (Iterative Phase)

The development process begins with core modules such as user authentication and product management. Additional functionalities such as product browsing, order placement, payment integration, and tracking are implemented in phases. Iterative development is carried out to improve system performance and functionality.



#### 4. Testing (Iterative Phase)

Comprehensive testing is performed on individual modules and the integrated system. This includes unit testing, integration testing, and system testing. Issues identified during testing are resolved through iterative refinement to ensure system reliability and accuracy.

#### 5. Integration (Iterative Phase)

All developed modules are integrated into a unified system. Proper interaction between frontend, backend, and database components is ensured. The system is tested to verify seamless data flow and consistent performance.

#### 6. User Feedback (Iterative Phase)

User feedback is collected through testing sessions and pilot usage. Based on feedback, improvements are made to enhance usability, responsiveness, and functionality of the system.

#### 7. Documentation (Ongoing Phase)

Detailed documentation is maintained throughout the development process. This includes system architecture, design specifications, user manuals, and code documentation to support future maintenance and scalability.

#### 8. Deployment (Final Phase)

The fully developed system is deployed in a production environment. All features, including product management, payment processing, and tracking systems, are tested to ensure proper functionality. Continuous monitoring is performed to maintain system performance and user satisfaction.

#### 9. Maintenance and Update (Post-Deployment Phase)

After deployment, regular maintenance and updates are performed to ensure smooth system functioning, fix bugs, improve security, and enhance features. User feedback is used to improve performance, usability, database management, and compatibility with new technologies, keeping Agro Vision AI efficient and reliable.

## 6. SYSTEM ARCHITECTURE

The system architecture of **Agro Vision AI** follows a three-layer client–server model for scalability, flexibility, and efficient data processing. It consists of the presentation layer, application layer, and data layer.

The **presentation layer** is the frontend developed using HTML, CSS, and JavaScript. It provides user features such as registration, product browsing, order placement, and tracking through a simple interface.

The **application layer** is the backend that handles business logic, user requests, transactions, and communication with the database. It includes modules for authentication, product management, payment processing, and delivery coordination.

### 6.1 E-R Diagram

Figure 1 E-R Diagram

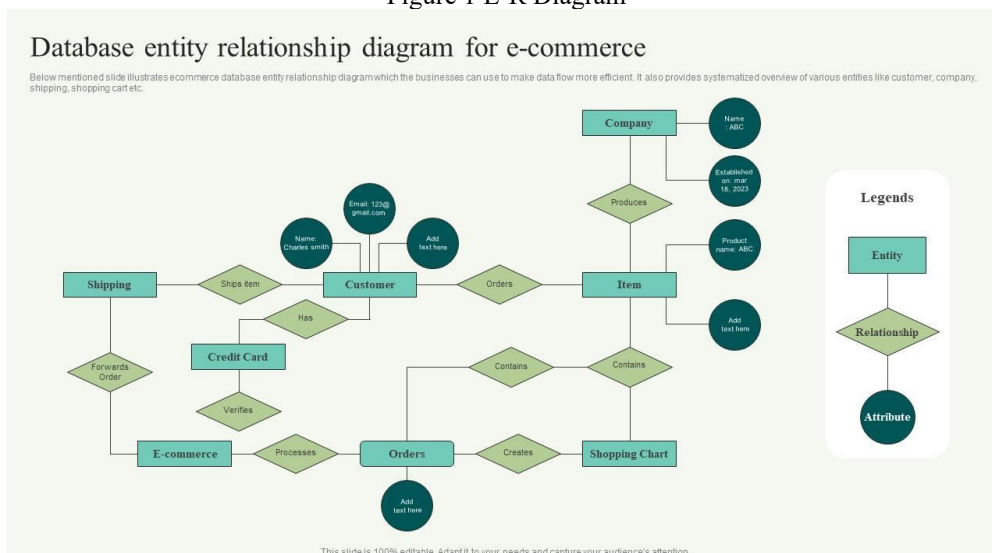




Figure 2 DFD 0 Level

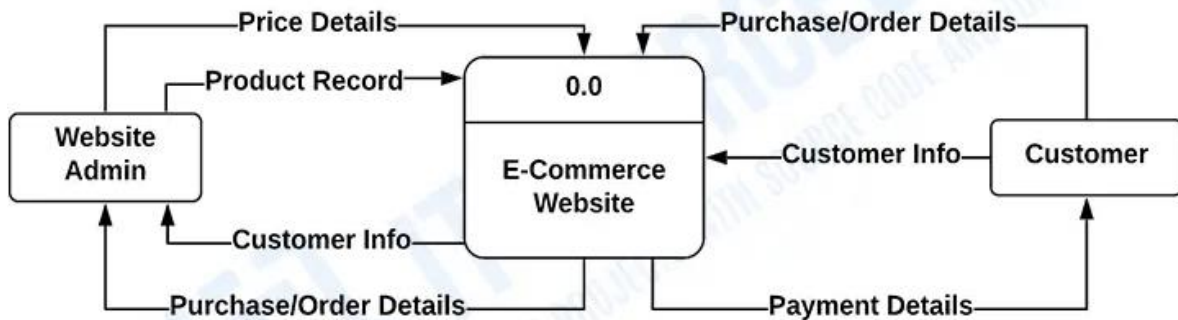
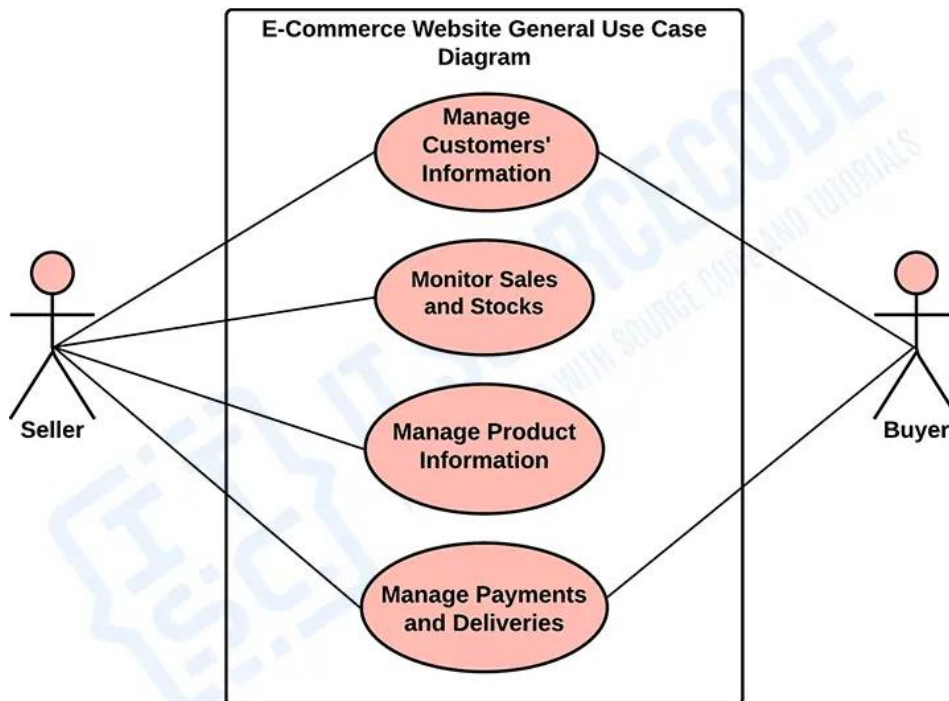


Figure 3 Use Case Diagram



## GENERAL USE CASE DIAGRAM

### 7. IMPLEMENTATION

Implementation is the phase where the proposed system is converted into a working application using selected tools and technologies.

In AgroVision AI, the frontend was developed using HTML, CSS, and JavaScript, while the backend was built using Java Spring Boot. MySQL was used for storing user, product, order, and payment data. Razorpay was integrated for secure online transactions.

Modules such as farmer dashboard, merchant dashboard, admin panel, product management, and order tracking were implemented successfully.

Thus, the implementation phase converted the system design into a functional and user-friendly application.

### 8. RESULTS AND DISCUSSION

Although **Agro Vision AI** provides an effective solution for digital agricultural trading, there are several opportunities for future enhancement. Artificial intelligence and machine learning can be integrated for crop price prediction, demand



forecasting, and personalized recommendations. Weather forecasting features can help farmers plan activities and reduce risks. A mobile application with regional language support can improve accessibility and usability, especially for rural users. A chat system can enable direct communication between farmers and merchants, improving trust and negotiation. The platform can also be linked with government schemes and subsidy programs to provide additional support to farmers. Overall, these improvements will make Agro Vision AI more intelligent, scalable, and user-friendly.

## 8. FUTURE WORK

Although Agro Vision AI is an effective platform, it has strong future potential. AI can be added for price prediction, demand forecasting, and recommendations, while weather updates can help farmers plan activities. A mobile app with regional language support can improve accessibility. A chat feature can connect farmers and merchants directly, and integration with government schemes can provide extra benefits. These enhancements will make Agro Vision AI smarter, scalable, and more user-friendly.

## 9. CONCLUSION

In this paper, **Agro Vision AI**, a web-based agricultural e-commerce platform, was proposed to solve challenges in traditional agriculture such as intermediaries, lack of transparency, and weak digital infrastructure. The system enables direct interaction between farmers and merchants through features like product listing, secure payments, order tracking, and delivery management. Results show improved trading efficiency, lower costs, higher farmer profits, and better user experience. Its scalable design also supports future upgrades such as AI integration, mobile apps, and analytics. Overall, Agro Vision AI is a practical solution that promotes transparent, efficient, and sustainable agricultural trade.

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