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Agrivision: Transforming Farming With Insights, Trade And Community

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ABSTRACT

Agriculture remains a vital pillar of developing economies, yet a large number of farmers continue to face persistent challenges such as lack transparent market prices, overdependence on intermediaries, uncertain weather patterns, and insufficient awareness of government welfare schemes. These issues often lead to reduced income, poor decision-making, and limited access to opportunities. To overcome these challenges, Agrivision has been developed as an integrated digital platform that consolidates essential agricultural services into a single, user-friendly system.

Agrivision provides real-time mandi price information, enabling farmers to make informed selling decisions. It also offers a direct farmer-to-buyer marketplace that minimizes the role of middlemen and ensures fair pricing. The platform incorporates AI-based crop advisory systems that assist farmers in crop selection, disease management, and yield optimization, along with accurate weather forecasts to support timely farming activities. Additionally, it serves as a centralized portal for accessing information about government schemes and subsidies.

This report presents the system architecture, design methodology, implementation details, and performance evaluation of Agrivision. By integrating diverse datasets and machine learning models with a multilingual mobile interface, the platform is well-suited for rural users. Experimental results indicate improved decision-making, higher profitability, and reduced dependency on intermediaries. Future enhancements may include satellite-based crop monitoring, block chain-enabled trading, and advanced predictive analytics.

Keywords*:* Digital Agriculture, Real-Time Market Prices, AI Crop Advisory, Weather Forecasting, Government Schemes, Predictive Analytics, Farmer Empowerment.

1. INTRODUCTION

Agriculture is one of the strongest pillars of India's economy, and a large share of the population depends on farming for its livelihood. Despite its importance, the agricultural sector faces persistent challenges such as fluctuating market prices, poor market transparency, unpredictable weather, and limited awareness of government schemes. A major issue for many farmers is the absence of reliable real-time market price information. This often forces them to depend on middlemen, which reduces their bargaining power and ultimately lowers their profit margins. The lack of a direct communication channel between farmers and buyers further makes the selling process inefficient and uncertain.To overcome these gaps, this project proposes the development of a unified mobile application designed specifically to support farmers with real-time information and decision-making tools. The application provides access to live mandi prices, AI-driven crop advisory, direct farmer–buyer connectivity, information on government schemes, and solutions to common agricultural problems. By integrating trusted government data sources such as Agmarknet and eNAM, the platform ensures the availability of accurate and up-to-date pricing information from markets across India.

In addition to price updates, the application offers personalized crop advisory based on weather conditions, soil parameters, and seasonal factors. This guidance helps farmers make informed decisions on irrigation scheduling, pest and disease management, and fertilizer planning. The direct farmer–buyer communication feature reduces reliance on intermediaries, enabling farmers to negotiate better prices and expand their market reach. The platform also compiles detailed information on government schemes, subsidies, and loan programs in a simple and accessible format, ensuring that farmers are well-informed about available benefits.

2. MATERIALS AND EQUIPMENTS

The Agrivision system was developed using a combination of software tools and digital resources designed to support scalable and real-time agricultural data processing. A web-based application framework was used to design the user interface, ensuring accessibility across multiple devices. The backend infrastructure was implemented to manage data ingestion, storage, and service integration efficiently. Cloud computing resources were utilized to enable reliable data availability and system scalability.

External data services were integrated through application programming interfaces (APIs) to obtain real-time mandi price information and localized weather data. Machine learning libraries were employed to develop crop advisory models that analyze soil characteristics, crop types, and environmental conditions. Database management systems were used to store user profiles, transaction records, and historical agricultural data securely. All tools and platforms were selected based on their stability, performance, and suitability for large-scale agricultural applications.

3. EXPERIMENTAL DATA

The experimental data used in this study were collected from authenticated secondary sources, including government agricultural portals, digital market platforms, meteorological services, and publicly available agricultural datasets. Mandi price data from multiple agricultural markets across different regions were used to evaluate the effectiveness of real-time price monitoring and market transparency.

Weather datasets consisting of temperature, rainfall, and humidity parameters were analyzed to assess the performance of location-specific weather forecasting and alert mechanisms. Sample soil and crop datasets were utilized to validate the AI-based crop advisory module. The collected data were preprocessed to remove inconsistencies and ensure accuracy. Experimental evaluation focused on data reliability, system responsiveness, and the relevance of outputs generated by the Agrivision platform

4. LITERATURE REVIEW

[1] Shastri, S., et al. (2025) explored the use of gradient boosting models and deep learning techniques in crop recommendation systems. Their work demonstrated that advanced machine learning algorithms can analyze soil data, weather patterns, and past yield information to produce more accurate crop suggestions. The study showed clear improvements over traditional rule-based methods, illustrating how AI-driven tools can support farmers in making better planning and cultivation decisions.

[2] Miller, T. (2025) offered a broad review on the convergence of IoT, artificial intelligence, and cloud technologies in modern farming practices. The study discusses how sensor networks, remote monitoring systems, and data analytics can significantly enhance precision agriculture by enabling real time insights and automated decision-making. It also draws attention to issues related to data governance and implementation challenges, suggesting that policy development and infrastructure improvements are essential for large-scale adoption of smart agriculture technologies.

[3] Gumbi et al. (2023) review the role of digital technologies in sustainable agriculture for smallholder farmers. They show that mobile apps, precision tools, and advisory systems enhance decision-making and crop management. However, limited digital literacy and uneven technology access remain key adoption challenges. The study emphasizes designing context-specific solutions to make digital agriculture effective.

[4] S. Raut et al. (2023) This study reviews recent digital innovations enabling sustainable agriculture through data-driven technologies. It highlights the role of AI, cloud platforms, and decision-support systems in improving farm productivity. The authors emphasize technology integration for resource optimization and environmental sustainability. The review provides insights into challenges and future directions of digital agricultural systems.

[5] R. K. Sharma, et al. (2023) This systematic review analyzes digital agriculture platforms designed for market transparency and farmer decision support. It discusses how real-time pricing, digital marketplaces, and analytics tools reduce information asymmetry. The study highlights improved farmer participation and income generation through platform-based ecosystems. It also identifies scalability and adoption challenges in developing regions.

[6] R. Tiwari and A. Kumar (2023) This work explores AI-driven decision support systems applied to precision agriculture. Machine learning models are used to analyze crop, soil, and environmental data for informed decision-making. The study demonstrates improved accuracy in recommendations and efficient resource utilization. It underscores AI's potential in enhancing productivity and sustainability in modern farming.

5. RESEARCH GAPS

Although various studies have examined digital agriculture from market information systems to crop advisory models and weather-based prediction tools—there are still notable gaps in existing research. Most available platforms provide only standalone services such as price forecasting, soil-based crop suggestions, or general weather updates. However, farmers increasingly require an integrated system that brings all essential agricultural services together in one accessible platform. A key limitation is the inconsistency and restricted coverage of real-time mandi prices. Many systems update prices for only a limited number of markets, leaving smaller or remote mandis without representation. As a result, farmers often lack comprehensive price comparisons and may miss opportunities to sell at better rates. AI-based crop advisory solutions also face challenges due to incomplete or fragmented datasets. Many models do not combine soil health information, pest trends, seasonal variability, and local farming practices into a unified framework. This leads to broad or generic recommendations that do not fully address region-specific needs. Additionally, very few studies explore the integration of diverse data sources—such as satellite imagery, IoT sensors, and historical patterns—into a single, fully optimized advisory model. Weather prediction systems reveal similar gaps. Most tools provide district-level or regional forecasts, which are not sufficient for farmers who experience micro-climatic changes at the village or farm level. Without hyper-local prediction capabilities, farmers remain vulnerable to sudden weather fluctuations. There are also significant gaps in the dissemination of information about government schemes, subsidies, and insurance programs. Even though multiple portals exist, they are often complex, scattered across different platforms, and not regularly updated. This makes it difficult for farmers to access accurate, relevant, and easy-to-understand information in one place. Finally, digital inclusivity remains a major concern. Many existing agricultural platforms do not support multiple local languages, voice commands, or simplified interfaces suitable for users with varying literacy levels. This limits accessibility and adoption among rural communities. Bridging these gaps requires developing an integrated, AI driven agricultural ecosystem that provides real-time updates, personalized recommendations, hyper-local insights, and inclusive access to financial and support services—all within a user-friendly, multilingual interface.

6. PROBLEM DEFINITION

Farmers today face several interconnected challenges that limit their income, reduce productivity, and weaken their ability to make informed decisions. The first and most common issue is the lack of real-time and trustworthy market information. Because farmers do not have quick access to updated mandi prices, they often rely on middlemen, which leads to unfair pricing and lower profits.

Another major gap is that farmers must use multiple, unconnected platforms to get essential services like crop advisory, weather forecasts, market updates, and government scheme details. Since these services are scattered and complicated to access, farmers struggle to get the right information at the right time.

Unpredictable weather adds another layer of difficulty. Farmers rarely receive hyper-local, timely alerts, causing poor planning of sowing, irrigation, fertilizer application, and harvesting, which increases crop loss and reduces yield. Most farmers also do not get personalized crop guidance based on their soil health, crop type, disease risk, or local environmental factors. Generic recommendations are not enough to improve productivity or help farmers manage risks effectively. On top of this, awareness about government schemes, subsidies, insurance programs, and loans is still low because information is scattered, difficult to understand, or not available in a farmer's local language.

All these challenges show the need for a single, easy-to-use, multilingual digital platform that brings all critical services under one roof—real-time market prices, a farmer-to-buyer marketplace, AI-driven crop advisory, weather alerts, and a centralized portal for government schemes. The proposed solution aims to address these problems by improving transparency, reducing dependency on intermediaries, delivering personalized insights, and supporting the shift toward modern, data-driven digital agriculture.

7. METHODOLOGY

A. Requirement Analysis

The methodology began with a detailed examination of the major challenges faced by farmers in accessing timely and reliable agricultural information. Existing digital platforms, government portals, and field-level interviews were studied to understand the gaps. Based on this analysis, the following key requirements were identified:

- Access to real-time and accurate mandi prices
- Weather information and early alerts for extreme conditions
- AI-based crop advisory support for informed decision-making
- Easy access to government schemes and subsidy information
- A simple, intuitive interface suitable for users with minimal digital literacy

These requirements guided the functional and technical planning of the Agrivision platform.

B. System Design

Using the identified requirements, a modular system architecture was designed to ensure clarity, scalability, and ease of maintenance. The platform was organized into the following core components:

- Real-time mandi price monitoring module
- AI-driven crop advisory engine
- Weather forecasting and alert module
- Government scheme and subsidy information portal
- Farmer–buyer communication and marketplace module

To support development, flow diagrams, use-case models, and database structures were prepared, capturing how different modules interact within the system.

C. Data Collection and Integration

To support the platform's functionality, multiple authenticated and government-approved data sources were used:

- Mandi Prices: eNAM and Agmarknet APIs
- Weather Data: Meteorological APIs providing real-time climate information
- Crop Advisory Data: Soil characteristics, disease patterns, and crop-cycle datasets
- Government Schemes: Data from official agricultural welfare portals

The collected data was cleaned, validated, and stored in structured formats to ensure reliability and accuracy across the application modules.

D. Development of Core Modules

Each major feature of the Agrivision platform was implemented as an independent but interconnected module:

- Price Monitoring Module: Periodically retrieves mandi prices and updates the user interface.
- Digital Marketplace: Enables secure and direct communication between farmers and buyers.
- AI Crop Advisory: Uses machine learning to generate personalized crop recommendations.
- Weather Module: Provides location-based forecasts and extreme-weather alerts.
- Scheme Information Portal: Offers categorized and simplified access to government schemes and benefits.

This modular approach ensured smooth integration, flexibility for future expansion, and efficient system performance.

8. RESULTS AND DISCUSSIONS

The experimental evaluation demonstrates that the Agrivision system effectively integrates diverse agricultural services into a unified digital platform. The centralized user dashboard enables efficient access to live mandi prices, weather forecasts, crop advisory services, digital marketplaces, and government scheme information. Real-time price updates enhance market transparency and support informed decision-making by farmers. The digital marketplace module facilitates direct farmer-to-buyer interactions, reducing intermediary dependence. The AI-driven crop advisory system provides context-aware recommendations that improve planning and resource utilization. Furthermore, the integration of government scheme information enhances awareness of subsidies and welfare programs. The results indicate that Agrivision contributes to improved efficiency, transparency, and sustainability in digital agriculture ecosystems.

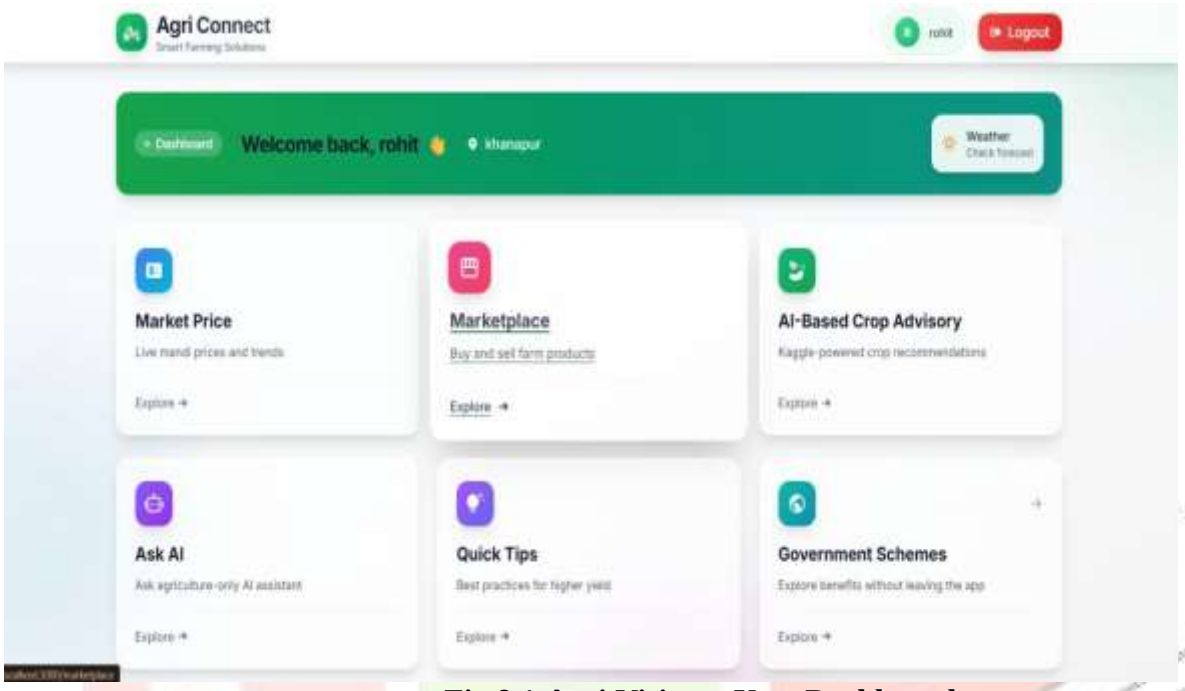

Fig 8.1 Agri Vision – User Dashboard

9. FUTURE PERSPECTIVE

The Agrivision platform represents a significant step toward the digital transformation of agriculture by demonstrating how integrated information systems can effectively support farmers' decision-making processes. As agriculture continues to evolve in response to changing climatic conditions, market dynamics, and resource constraints, platforms like Agrivision highlight the growing importance of data-driven and technology-enabled solutions in the farming sector.

By combining market intelligence, advisory services, weather information, and institutional support within a single digital ecosystem, Agrivision aligns with national and global initiatives aimed at promoting sustainable and inclusive agricultural development. The system underscores the role of digital platforms in enhancing transparency, reducing information asymmetry, and empowering farmers to participate more actively in modern agricultural value chains.

From a broader perspective, Agrivision reflects the potential of technology to bridge the gap between traditional farming practices and modern agricultural management. Its structured approach to information delivery and decision support can serve as a reference model for similar digital agriculture initiatives. As awareness and adoption of digital tools increase among farming communities, such platforms are expected to play a crucial role in improving productivity, resilience, and economic stability in the agricultural sector, contributing to long-term rural development and food security

10. CONCLUSION

This research successfully presents the design and development of a unified agricultural information and decision-support system aimed at addressing key challenges faced by Indian farmers. By integrating real-time mandi price updates, a transparent digital marketplace, AI-driven crop advisory services, hyper-local weather forecasting, and a centralized portal for government schemes, the system delivers a comprehensive and farmer-centric solution to existing information gaps in the agricultural ecosystem.

The platform enables farmers to make informed and timely decisions related to crop planning, market participation, resource utilization, and risk management. The inclusion of AI-powered analytics supports personalized advisory based on soil conditions, crop type, and environmental factors, while accurate weather alerts enhance operational efficiency. Additionally, direct digital connectivity between farmers and buyers reduces reliance on intermediaries, improving price transparency and income opportunities. Centralized access to government schemes further strengthens financial awareness and institutional support.

By leveraging modern technologies such as artificial intelligence, cloud computing, predictive analytics, and a multilingual mobile interface, the system ensures accessibility, usability, and scalability across diverse farming communities. Overall, the research demonstrates that integrating multiple agricultural services into a single, intuitive platform significantly enhances decision-making capabilities, promotes sustainable farming practices, and contributes to the digital transformation and empowerment of the agricultural sector.

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