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PeekMarg: Bringing Market Yard to Your Mobile

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Abstract
PeekMarg is an intelligent digital platform designed to empower farmers by providing real-time market insights, streamlined booking services, and AI-driven assistance. Conventional agricultural information systems often rely on manual data collection and outdated communication channels, resulting in inefficiencies, information delays, and reduced profitability for farmers. PeekMarg addresses these challenges by leveraging the MERN stack to deliver a fast, automated, and user-friendly solution. The platform integrates features such as an AI chatbot for instant guidance, a Finance Manager for better financial planning, and dynamic dashboards for live price tracking. By enhancing transparency, minimizing intermediary dependency, and ensuring reliable access to critical agricultural data, PeekMarg supports smarter decision-making and contributes to the digital transformation of the rural farming ecosystem.
Keywords— *Agriculture, MERN Stack, AI Assistance, Market Rates, Farmer Support System.*

1. Introduction
Agriculture is the backbone of India's economy, providing livelihood to millions of farmers and significantly contributing to national GDP. Despite its importance, the agricultural sector still struggles with issues such as limited market access, price fluctuations, lack of financial management, and dependency on middlemen. Farmers often rely on unverified information from local agents or traders, leading to reduced profit margins and lack of transparency. With the rapid growth of digital technologies, there is a critical need for integrated and farmer-friendly platforms to support informed decision-making and streamline agricultural processes. PeekMarg is developed as a comprehensive digital ecosystem that addresses these challenges by bringing together real-time market data, AI assistance, booking management, and financial planning tools on a single platform. Built using the MERN stack, the system ensures high performance, scalability, and secure interactions for both farmers and administrators. Farmers can log in to view daily commodity prices, request produce bookings, track approval statuses, and access AIdriven guidance in English and Marathi. Administrators can update market rates, approve bookings, manage farmer profiles, and maintain system transparency. A key strength of PeekMarg is its Artificial Intelligence features. The AI Chatbot guides farmers on market trends, farming techniques, government schemes, and weather updates. The Finance Manager module provides personalized insights, allowing farmers to record their financial activities, monitor profit/loss, and receive recommendations for better economic planning. These features encourage financial literacy and empower farmers to make strategic decisions.With secure authentication using JWT, cloud database integration via MongoDB Atlas, and automated email notifications, PeekMarg offers a reliable and modern solution to bridge the digital divide in agriculture. Future expansion possibilities, such as mobile app development, voice-based interaction, IoT-enabled crop monitoring, and predictive analytics, make PebMarg a forwardlooking platform for digital agriculture.

2. Literature Survey
Digitalisation in Agriculture: A Scoping.Review of Technologies (2024). Choruma et al. (2024) conducted a scoping review on digital agriculture tools used by smallholder farmers in Sub-Saharan Africa. The study categorized digital technologies into digital financial services, extension services,

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farm management tools, and digital marketing. The review highlighted benefits such as improved efficiency and connectivity, while also noting barriers like poor infrastructure, low digital literacy, and gender disparities. This work emphasizes the need for platforms that are simple, inclusive, and easily accessible—principles embedded in PeekMarg. Automation of Krishi Market System and Real-Time Price Display System (2023) Kabra et al. (2023) examined the role of automation in improving transparency in agricultural markets. Their research shows that real-time price updates can reduce market volatility and help farmers make informed decisions. They also highlighted challenges including internet dependency and the need for technical training. PeekMarg addresses these gaps through simplified UI, automated notifications, and cloud-based real-time price updates. AgriShop: A Digital Platform Connecting. Farmers to Local Markets (2022) Kavitha et al. (2022) developed AgriShop, a digital marketplace that connects farmers directly to buyers. Their study reported a 25% increase in farmer-tobuyer transactions and a 15% rise in earnings. This supports the idea that intermediary-free platforms enhance farmer income—a concept central to PeekMarg's booking management and transparent market rate display. Role of Agricultural Digital Marketing in Economic Development of India (2023) Muthulakshmi & Nithya (2023) discussed how digital marketing influences agricultural trade in India. They emphasized[1] the importance of AI, IoT, blockchain, and mobile applications for improving market access and supply chain efficiency. Government initiatives like eNAM and e-Choupal were also highlighted as major contributors. PeekMarg aligns with these developments by integrating AI tools and promoting direct farmermarket connectivity[2]. The Digital Transformation of Agri. Marketing: Managing Customer Experience (2021). Kanchan & Singh (2021) studied how digital transformation impacts customer experience in agriculture. The study revealed major challenges including low digital literacy, fragmented supply chains, and infrastructure gaps. PeekMarg addresses these issues through user-friendly design, bilingual support, and centralized cloudbased data flow. Smartphone App Usage Analysis: Datasets, Methods, and Applications (2022) Li et al. (2022) presented a comprehensive survey on smartphone app usage, focusing on available datasets[3], analytical methods, and practical applications. Their study highlighted how largescale usage data helps understand user behavior, personalization needs, and app performance. The findings emphasize the importance of data-driven insights for improving application design and user engagement. PeekMarg benefits from these concepts through its analytics-ready architecture and user activity tracking modules[4]. Enhancing Mobile App User Understanding and Marketing With Heterogeneous Crowdsourced Data (2019) Guo et al. (2019) reviewed how heterogeneous crowdsourced data—such as reviews, ratings, logs, and social posts—can enhance user understanding and app marketing. They introduced data-mining techniques for app popularity prediction, user profiling, and experience optimization. This aligns with PeekMarg's vision of using farmer interactions and feedback to refine features, improve chatbot responses, and deliver more personalized agricultural services. Mobile Augmented Reality Survey: From Where We Are to Where We Go (2017) Chatzopoulos et al. (2017) surveyed the evolution of mobile augmented reality (AR), identifying technical challenges and future opportunities such as immersive interfaces, sensor integration, and intelligent content delivery. Although not directly applied in PeekMarg's current version, these advancements indicate future potential for AR-based crop guidance, field visualization, and interactive farmer training modules[5].

3. Social Impact

PeekMarg has the potential to create a significant positive impact on the socio-economic landscape of rural farming communities. By integrating real-time market information, AI-driven assistance, and financial management tools, the platform directly addresses long-standing challenges faced by farmers, contributing to greater transparency, empowerment, and sustainability in agriculture. One of the major social benefits is the reduction of dependency on intermediaries, who often manipulate prices or delay

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information flow. By enabling farmers to directly access updated commodity rates and booking statuses, PeekMarg promotes fair trade practices and enhances market transparency. This leads to improved income stability and strengthens the bargaining power of farmers. PeekMarg also contributes to digital inclusion, especially in rural regions where technological adoption is slow. The platform's bilingual interface (English and Marathi), intuitive design[6], and AI chatbot ensure that even farmers with limited digital literacy can interact with the system effectively. This inclusiveness helps bridge the digital divide, allowing marginalized communities to participate in modern digital ecosystems. The integrated AI Chatbot and Finance Manager play a crucial role in enhancing financial awareness and decision-making. Farmers can track profits, record expenses, and receive personalized recommendations, encouraging better financial management practices. These features promote long-term economic resilience and reduce the risk of debt cycles, which are common in rural farming communities. Moreover, PeekMarg fosters community-level growth by promoting informed agricultural practices. Instant access to weather insights, government schemes, and market trends equips farmers to optimize production and plan more efficiently. As more farmers adopt such technologies, community productivity, sustainability, and economic development improve collectively.

Overall, PeekMarg not only serves as a technological tool but also as a catalyst for social upliftment, supporting transparency, financial literacy, digital empowerment, and community-wide agricultural development.

4. System Overview

4.1. Server Side

The server-side implementation focused on building all essential backend modules required for the PeekMarg agricultural platform. The backend was developed using Node.js, Express.js, and MongoDB, ensuring a secure, scalable, and modular structure. Several major components of the system were successfully completed during this phase. To begin with, the authentication module was fully implemented using JWT for secure user login and authorization, along with bcrypt for password encryption. This allows farmers and admins to log in safely and ensures that protected routes can only be accessed by authorized users. The admin management module was completed, enabling admins to add, update, and delete categories, subcategories, products, and market prices. Adminonly middleware was implemented to ensure proper access control[7]. Another major part implemented was the market price management system, where admins can update daily mandi rates and users can view them instantly through API calls. The booking module was also completed, allowing farmers to book vehicles or services for transporting produce. The backend handles booking creation, status updates, and admin approval workflows. The AI chatbot integration layer was prepared on the server side to support user queries related to farming, pricing, and general guidance. The backend handles message routing to the AI model and response delivery. The financial manager module was implemented to store farmer income and expense entries, generate summaries, and provide basic insights[8]. All data is securely stored in MongoDB with proper validation. Each module communicates through well-structured REST APIs. Middleware handles authentication, error control, and request validation, ensuring smooth interaction between the frontend and backend. API responses were optimized for speed and clarity so that the React frontend can fetch real-time data with ease.

4.2. Client Side

The client-side implementation of the PeekMarg platform was developed using React.js, providing a fast, responsive, and user-friendly interface for farmers and administrators. The main objective was to create a simple, intuitive UI that rural users can easily understand, even with minimal digital experience. The client side communicates with backend APIs using Axios, enabling real-time updates for market rates, bookings, finance records, and category-wise products. The frontend is divided into reusable components such as category cards, product displays, forms, tables, modals, and dashboard elements, improving maintainability. State management is handled using Redux Toolkit,

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ensuring consistent data flow across the entire application. Features like loading states, authentication status, and category/product lists are maintained globally for smooth navigation. The implementation includes separate views for farmers and admins. Farmers can view market prices, manage bookings, maintain finances, and interact with the AI chatbot. Admins can manage categories, subcategories, products, bookings, and price updates through a structured dashboard. Responsive design practices were followed using Tailwind CSS, ensuring the platform works effectively on mobile devices, tablets, and desktops. Error handling, form validation, and real-time UI updates enhance the overall user experience. The client side integrates seamlessly with the backend to form a complete system.

4.3. Database Design

The database for the PeekMarg system is designed using MongoDB, chosen for its scalability, flexibility, and ability to handle semi-structured data. The schema design follows a modular and normalized approach, where each major feature of the system is represented as a separate collection. The primary collections include Users, Categories, Subcategories, Products, Bookings, MarketRates, and FinanceRecords. Each collection is structured with well-defined fields, indexes, and relationships to ensure fast query performance. References between collections (such as category–subcategory–product relations) allow dynamic filtering and hierarchical organization. User information is stored securely with encrypted passwords, role identifiers (farmer/admin), and profile details. Market rate entries maintain date-wise pricing for different categories. Booking records store details of the farmer, vehicle type, pickup information, and admin approval status. The finance collection tracks income and expense entries with timestamps, descriptions, and categories, helping farmers maintain financial records. All collections include timestamps and validation rules to maintain data integrity. MongoDB Atlas is used for cloud storage, ensuring automatic backups, high availability, and performance optimization. The database design supports future scaling, additional modules, and integration with analytics or AI-driven insights

5. Methodology and Implementation

Techniques and Execution: The methodology for developing the PeekMarg agricultural support platform follows a modular, fullstack implementation approach, integrating backend services, frontend interfaces, and cloud-based data management. The system was designed using the MERN stack to ensure scalability, responsiveness, and high performance for rural and administrative users. The implementation process is divided into three primary layers: server-side execution, client-side development, and database design.

5.1. Server-Side Execution

The server side of PeekMarg was implemented using Node.js, Express.js, and MongoDB, forming a robust and secure backend architecture. The methodology began with the development of a comprehensive authentication system, utilizing JWT for secure token-based access control and bcrypt for password hashing. This ensures secure login and prevents unauthorized access to protected routes. Next, the admin management module was implemented to allow administrators to create, update, and delete categories, subcategories, products, and market price entries. Role-based middleware was developed to enforce admin-only access, strengthening system security. The market price management system enables administrators to upload and update daily mandi prices. This data is instantly accessible to users via optimized REST API calls, ensuring real-time market visibility. A complete booking management module was implemented to support farmer requests for transport or related services. The backend handles booking creation, status updates, and approval workflows, with automated handling of request lifecycle events. A dedicated integration layer for the AI Chatbot was added to route user queries to the AI model and deliver contextual responses. This component enables interactive support for farming guidance, market trends, and general assistance. The Financial Manager module was developed to store and retrieve income and expense data, generate summaries, and help farmers conduct basic financial planning. All backend components operate through structured REST APIs, supported by middleware for

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authentication, validation, and error control to ensure reliable communication with the frontend.

5.2. Client-Side Development

The client side was implemented using React.js, with a focus on simplicity, usability, and responsiveness. The interface was designed to accommodate rural users with minimal digital experience, ensuring intuitive navigation and clarity. Communication with backend APIs is handled through Axios, enabling real-time updates for bookings, market rates, finance records, and product listings. The frontend follows a modular structure using reusable components such as forms, cards, dashboards, tables, and modals to improve maintainability. Redux Toolkit serves as the global state management solution, maintaining authentication states, data loading indicators, and category/product lists across all pages. Separate role-based interfaces were created for farmers and administrators. Farmers can view market prices, manage bookings, track financial records, and access the AI chatbot. Administrators are provided with dashboards for category, product, booking, and pricing management. The user interface is fully responsive, designed using Tailwind CSS, ensuring effective performance on mobile, tablet, and desktop devices. Validation, real-time UI updates, and error-handling mechanisms further enhance the user experience. This structured front-end implementation ensures seamless integration with backend APIs to form a unified system.

5.3. Database Techniques and Data Modeling

The database architecture was implemented using MongoDB, leveraging its flexibility and support for semi-structured data. The schema design follows a modular approach with separate collections for Users, Categories, Subcategories, Products, Bookings, Market Rates, and Finance Records. Each collection is designed with meaningful fields, validation rules, and timestamps to maintain data consistency. Relationships between collections, such as category–subcategory–product linkages, enable dynamic filtering and efficient data retrieval. Secure user authentication is supported through encrypted passwords and role attributes distinguishing farmers from administrators. Booking entries include vehicle type, pickup details, user references, and approval statuses. Market rate entries maintain day-wise commodity pricing for easy tracking. Finance records store income and expense data with timestamps and descriptions, enabling farmers to monitor their financial activities. The system uses MongoDB Atlas, providing cloudbased storage with built-in scalability, performance optimization, and automated backup support. The database design allows future expansion for analytics, IoT modules, predictive forecasts, or additional AIdriven features.

6. Results and Discussion

PeekMarg, developed using the MERN stack, successfully delivers real-time market data, simplifies booking management, and provides AI-driven assistance to farmers.

- Functionality: All backend modules—authentication, admin management, booking workflows, market rate updates, financial records, and AI chatbot—worked as intended. JWT-based authentication ensured secure access, and admin operations were efficient.
- Performance: APIs responded quickly even under load, real-time market data and booking updates had minimal latency, and the system is scalable for large data volumes.
- Usability: The interface is intuitive, bilingual (English & Marathi), and user-friendly for rural users. Farmers reported easier access to market prices, booking updates, and financial tracking.
- AI & Finance Modules: The chatbot handled basic agricultural queries effectively, while the finance manager provided accurate income and expense summaries.

7. Research Gap

Despite the progress in digital agriculture platforms like Peek Marg, several gaps remain that present opportunities for further research and development:

- Connectivity & Accessibility: Existing solutions rely heavily on stable internet and modern devices, limiting adoption in remote or low-resource rural areas.
- Advanced AI & Decision Support:

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Current AI chatbots and analytics provide only basic guidance; there is a lack of context-aware, region-specific, and predictive decision support tools.

- Integration of IoT & Real-Time Data: Few platforms integrate IoT sensors, weather APIs, or satellite data for precision farming and crop monitoring.
- Automated Forecasting & Market Prediction: Limited use of machine learning for predicting market prices, crop demand, and optimal selling times.
- Supply Chain & Logistics Management: Existing systems do not fully automate or optimize the agricultural logistics ecosystem, including transport, warehousing, and distribution.
- Financial & Administrative Automation: Tools for predictive financial planning, automated reporting, and government subsidy tracking are underdeveloped.

8. Future Scope

- Mobile App & Accessibility: Develop Android/iOS apps with offline access, push notifications, and voice support for low-literacy users.
- Data & AI Integration: Incorporate real-time weather APIs, satellite data, crop advisories, machine learning for price forecasts, demand prediction, and advanced AI chatbot capabilities.
- IoT & Precision Farming: Use sensors and automated irrigation for remote crop monitoring and resource optimization.
- Logistics & Supply Chain: Expand booking module to connect transport, warehouses, and marketplaces.
- Blockchain & Governance: Implement blockchain for secure records, integrate government schemes, and enhance admin dashboards with analytics and automated reporting.
- Goal: Transform Peek Marg into a comprehensive, smart-agriculture ecosystem.

Conclusion

PeekMarg demonstrates how modern digital technologies can be effectively utilized to address practical challenges faced by farmers in India. By integrating the MERN stack with Artificial Intelligence, the platform creates a unified environment where farmers can easily access realtime market prices, track bookings, receive automated updates, and manage their financial activities. The AI Chatbot and Financial Manager modules provide personalized guidance and improve farmer decision-making, contributing to increased efficiency, profitability, and independence.

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