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# Krushik : Mobile Application Platform For Farming Industry

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**ABSTRACT :**

The Agriculture Management System is a mobile app built on React Native and Supabase that aims to modernize farming by improving direct contact between farmers and customers. Through the app, we will help farmers connect with customers directly through e-commerce to eliminate middlemen to get a better price for their products. An intermediary is a middleman, someone who buys and resells an item before it reaches the customer. One of the main features of the system is the direct sales from farmer-to-customer that allow the farmer to showcase it and sell it through the app. Also, the app has a rental facility where farmers can rent or lease equipment that they need, thereby cutting down on running costs. To help the farmers in making decisions, the system offers real-time crop and grocery prices tracking, helping them stay updated with market patterns and make better sales strategies. One of the key features of the system is the disease detection that uses an external API to check the plant health based on the image uploaded by the user. This feature aids in timely detection and management of crop diseases, thereby preventing losses. Plus, the application has the feature of social media where farmers and customers can post, update and delete things concerning agricultural products, rental services and consumer requirements. Funding social media assists in posting alerts and tips on everything from spoilage to environmental calamities. The structuring of this architecture will improve the efficiency, transparency, security and accessibility of agricultural commerce. By applying technology, the application enhances farmers' productivity, streamlines the supply chain and improves profit returns. This article goes over the features, architecture, and advantages of the Agriculture Management System.

**Keywords:** React Native, Supabase , Agriculture Management, Rental System, Disease Detection, Current Crop Prices, Current Grocery Prices, Farmer-Customer Marketplace.

## 1. Introduction :

Agriculture is a vital sector that fosters economic growth, but farmers typically experience challenges such as limited market access, unaffordable equipment, and old disease detection methods. The proposed Agriculture Management System solves these problems using React Native and Supabase. This delivers a seamless user authentication process, real-time updates, and efficient resource management. This system allows farmers to find a buyer, access cheap equipment, and receive disease alerts in time. The system is then integrated with a cloud and real-time synchronization technology to increase productivity and decision-making. So, the proposed software is the solution that narrows the gap between traditional agriculture and the modern digital world, increasing sustainability and profitability.

### *1.1 Problem Definition*

This traditional agricultural supply chain incorporates lots of fragmentation and inefficiency because of multiple intermediaries between farmers and consumers. This system creates a barrier to farmers' earnings, while consumers face inflated prices. Farmers and customers interact minimally because of the presence of middlemen, thus preventing transparent communication and setting up a fair price .The second major challenge is the extremely high cost of farm equipment. Most farmers, especially those practicing subsistence farming, find it hard to procure modern machinery, thus affecting productivity. Problems of maintenance and repair squeeze farmers even more, hence keeping them from engaging in efficient farming.
Crop health management represents another important challenge. Farmers often face immense challenges in early-stage detection of a disease, therefore suffering huge losses. The lack of real-time monitoring/detection systems for diseases helps to delay interventions, thereby inflicting damage on the yields in terms of quality and quantity. This affects farmers' income, further disrupting the entire food chain.Another difficulty arises from the lack of a centralized platform on which agricultural postings can be made. Consequently, farmers are deprived of critical market information. In the absence of an organized marketplace, farmers lack access to real-time demand data, pricing trends, and buyers' requirements. Due to this scarcity of reliable market intelligence, farmers find it hard to take informed decisions, which eventually results in wastage through inefficient production and sales. To overcome these hurdles, an integrated solution must be built to promote direct interaction between farmers and customers, enhance access to affordable equipment, ensure real-time disease detection, and put up a centralized digital marketplace linking all agricultural activities.

### *1.2 Research Objectives*

There comes a present study with the objectives of:

1. To designing and developing a user-friendly agricultural management system using React Native and Supabase.
2. To implementing secure authentication and data management using Supabase.
3. To provide a digital rental of farm implements for much easier access at a low cost for farmers.
4. To integration of disease detection feature through an external API to help with diagnosing crop health issues early for farmers.
5. To update real-time agricultural market prices to help farmers with investment decisions.
6. To ensure a scalable and easy user interface for easy navigation and usability.

## 2. System Architecture :

Agriculture Management System Based on Artificial Intelligence report manages farming operations and interaction between farmers and customers in an efficient way. It allows the users to do user authentication, list the products, equipment for rent, detects diseases etc. It maintains real time data update to compute crop pricing and grocery pricing in proper manner. It includes social media like features that increases user interaction with the system. On the backend, there is Supabase, which is responsible for handling the login, input into the database and storage of images. It ensures the project is both secure and scalable. Third-party APIs are also involved which is responsible for recognizing the disease and monitoring the market prices. The farmer gets the data and knows what to do Using React Native as frontend helps to provide a user-friendly experience on any device. The backend is implemented with Node.js/Express, which is a robust runtime environment for server-side handling of incoming client requests. This solution makes the overall process of data processing efficient. WebSockets technology is used for real-time communication between devices. This provides a fast response Using current technology the system becomes a complete solution. It contributes to increasing productivity, better decision-making process, creates a cooperative agricultural system that can work for farmers and consumers.

### *a) User-Side Workflow*

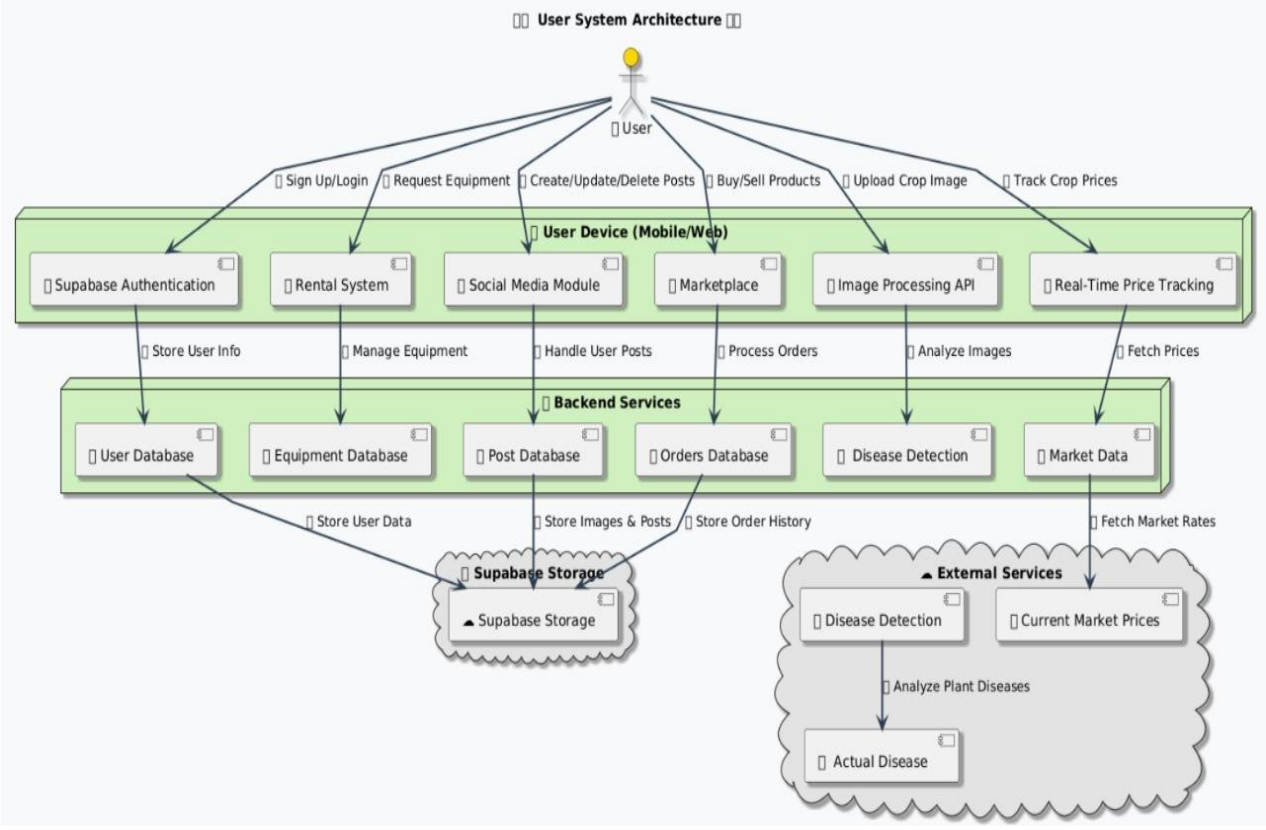


**Fig 1(a). User-Side Workflow**

The diagram shows the User Journey in the Agricultural Management System. Each of the steps can be clearly described, as follows:

**1) User Authentication (Supabase Authentication)**

- **Sign-Up(Register):** User signs up with their email and password through the Supabase authentication for the creation of safe accounts and storing of data.
- **Sign-In(Log-in):** Users who have already created their accounts may sign-in securely and use any of the systems features available on the platform following the identity check.
- **Sign-Out( Log-out ):** Users can sign out at any time. This will clear all the session data that is stored and prevent unauthorized access.
- **Security:** Role-Based Access Control (RBAC) guarantees privacy by limiting access to users basing on their roles and by using encryption to enhance security..

**2) Rental System**

Farmers are able to list the agricultural equipment which is up for rent, while other farmers are able to browse, request and rent them as they require. The owners are able to approve or disapprove the request and this controls the access to the equipment. The renters can cancel their request before it is approved.

**3) Social Media Module**

The module permits farmers and clients to create, update and delete posts on agriculture, product listings, rentals, consumer needs and any other information that the user wishes to post or share. The user will be able to engage, share information and communicate with others and whenever they wish, they can cancel or delete their posts.

**4) Current Crop, Seeds, and Grocery Price Tracking**

It also tracks real time crop, seed and grocery prices. The prices are sourced from the market for accuracy. The prices are updated daily to help the farmers and consumers monitor the market trends. This is also useful in making informed decisions when it comes to buying or selling.

**5) Marketplace Interaction**

Farmers can add crops, tools, and fertilizers, while customers can view, buy, and place orders on a real-time basis. The system updates listings and prices dynamically. Users can cancel or delete an order before it is confirmed as a way of enhancing better management of transactions.

**6) Disease Detection using .id API**

Farmers upload pictures of diseased crops. The system sends the files to the .id API. The API is capable of diagnosing the pictures and offers recommendations for the corrective measures. Consequently, the farmers get real-time feedback to ensure that they manage the health of the crops properly.

***b) Admin-Side Workflow***

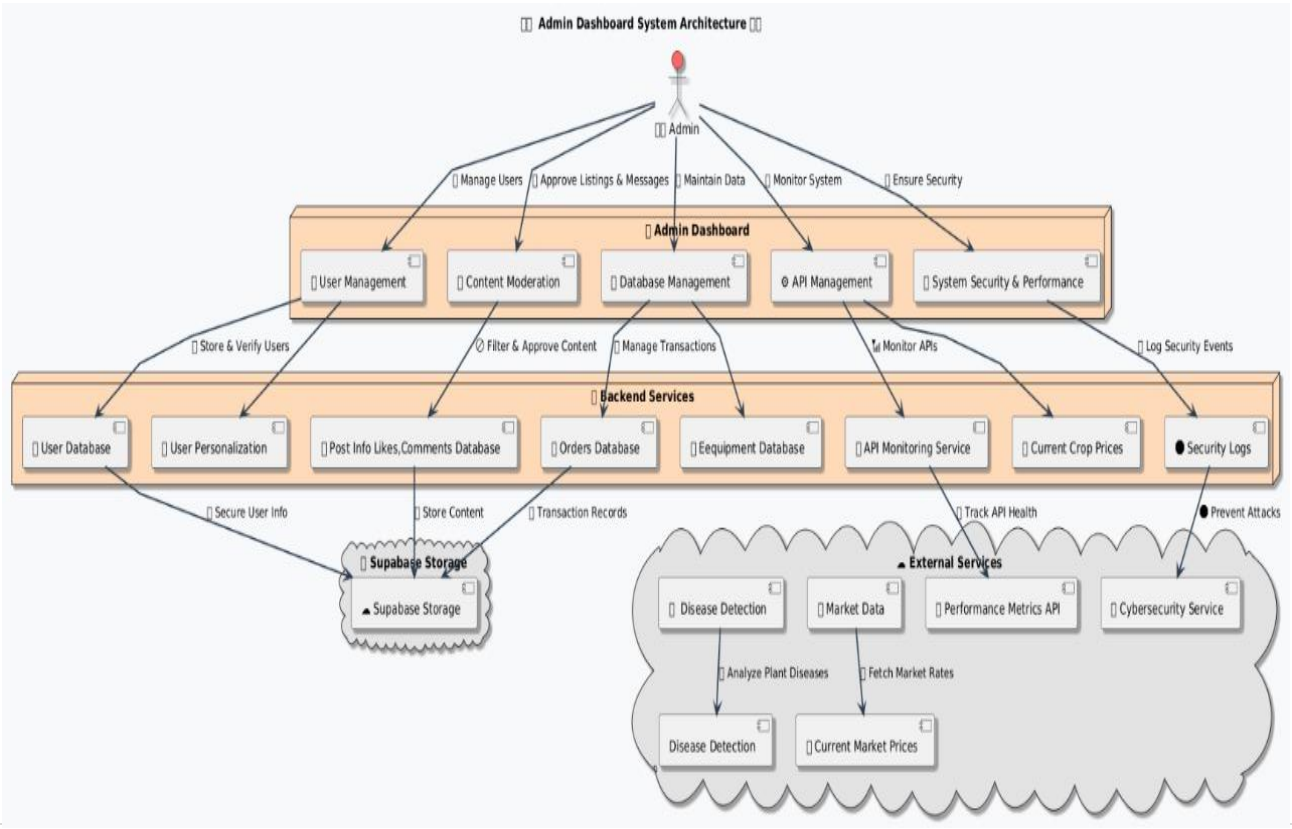


**Fig 2(b). Admin-Side Workflow**

The administrative process is responsible for keeping the Agriculture Management System running smoothly by handling users, content, databases, APIs, and security. Admins perform multiple tasks to provide a smooth user experience while ensuring system integrity and effectiveness.

**1) User Management**

Admins manage user registrations, account verification, and user management in general. Role-based access control is used to limit posting of product listings and rental management by only verified farmers and vendors. This keeps out unauthorized users and keeps all interactions within the platform trustworthy and secure.

**2) Content Moderation**

To keep the marketplace of high quality, admins review and authorize product listings, rental requests, and social media messages before posting them. Automated filters and manual review processes are combined to detect and filter out inappropriate, irrelevant, or fraudulent content. This keeps the platform professional, dependable, and spam-free.

**3) Database Management**

Admins manage the upkeep of important information, such as product information, rental history, and market rates. Proper management of databases helps maintain information up-to-date, well-structured, and easily retrievable. Supabase storage is utilized for managing image uploads pertaining to product listings and disease identification to efficiently store and retrieve multimedia information.

**4) API Management**

As the system uses third-party APIs for detecting diseases and monitoring market prices, it is the responsibility of admins to keep a check on API performance and integrate it smoothly. They continuously monitor API stability, optimize response rates, and fix any bugs that crop up. This helps in providing users with accurate and real-time data to make informed decisions.

**5) System Security & Performance Monitoring**

Admins continuously track system performance to identify and resolve issues such as slow load times, errors, or downtime. Security measures, including data encryption, access logs, and authentication protocols, are implemented to prevent unauthorized access and safeguard user data. Regular security audits and system updates further enhance protection against cyber threats.

By effectively managing user interactions, database operations, API integrations, and security protocols, the admin-side workflow ensures that the Agriculture Management System runs smoothly, ensuring a secure and efficient environment for farmers, vendors, and buyers.

## 3. Impact and Benefits of the System :

The Agriculture Management System has many advantages for farmers, consumers, and the agricultural sector by enhancing efficiency, profitability, and sustainability. Since farmers cut out middlemen, they can sell their products to consumers directly, getting better prices and more profits. The feature of real-time pricing also allows them to make smart decisions regarding selling at optimal times. Also, the system of equipment rental gives small-scale farmers access to advanced farming equipment at a lower cost without the ownership burden, increasing productivity at less cost. AI-powered disease identification module assists in early detection of diseases in crops, enabling farmers to take prompt protective measures and minimize loss.

The system also greatly enhances time efficiency and convenience by facilitating digital transactions for crop sales and equipment rentals, avoiding the need for physical visits to marketplaces. Data-driven decision-making provides farmers with real-time access to market prices and historical data for improved sales and crop management decisions. In addition, the platform is extremely scalable, with potential future additions such as AI-based weather forecasting, crop yield prediction, and improved community engagement features. On the whole, the Agriculture Management System revolutionizes conventional agriculture by bringing agricultural practices within reach, profit, and sustainability for everyone involved.

## 4. Related Work :

Several studies and applications have explored the use of technology in agriculture, focusing on mobile marketplaces, equipment rentals, disease detection, and price tracking. Mobile-based agriculture marketplaces help farmers connect directly with consumers, eliminating intermediaries. Research by Patel et al. (2022) highlights how such platforms improve farmer profitability. However, existing solutions like Farmkart and KisanMandi lack integrated rental services and disease detection. Agricultural equipment rental platforms have been shown to reduce operational costs and improve resource utilization, as noted by Sharma et al. (2021). While services like EM3 Agri Services provide rentals, they do not offer direct farmer-to-consumer interactions. Plant disease detection systems use AI and image-based processing for early diagnosis, reducing crop losses. Research by Kumar et al. (2023) confirms the effectiveness of machine learning in disease identification, though apps like *Plantix* lack marketplace and rental service integration. *Real-time crop and grocery price monitoring* is crucial for maximizing farmer earnings. Studies by Lee and Wang (2020) stress the importance of real-time price tracking, but existing platforms fail to provide a comprehensive agricultural management solution. Overall, while several technologies exist, an integrated system combining these functionalities remains a gap in current agricultural solutions.

## 5. Proposed Methodology :

The proposed Agriculture Management System adopts a systematic approach for implementation and efficient working to maintain the smooth user interface.

### *5.1 System Design Approach*

Agriculture Management System is designed with a modular approach to provide scalability, maintainability, and effective system management. Every module is assigned particular responsibilities to offer an effortless user experience. Supabase is utilized by the User Authentication Module for secure login and registration, providing data privacy and access control. The Marketplace Module enables farmers to post products while buyers can search and buy, providing a direct link between sellers and buyers. The Rental System enables farmers to lease or rent farming equipment, breaking the economic constraints of accessing modern equipment. The Disease Detection Module uses an external API to scan crop images and detect plant diseases, enabling farmers to take precautions. In addition, the Social Media Module allows for posting, editing, and removal of agricultural product postings, with the aim of improved communication and trading opportunities.

### *5.2 Development Phases*

The system follows the Agile software development methodology with the following detailed phases:

#### *1) Requirement Analysis*

The first step is to carry out thorough surveys among farmers and customers to gauge their particular needs and problems. Based on the voids in current agricultural apps, the system sets the fundamental features that solve actual farming problems. Moreover, major performance indicators are set to analyze the efficiency and performance of the system after implementation.

#### *2) System Design*

A properly organized database schema is specified with Supabase to effectively manage users, product listings, and transactions. API calls are well-designed to facilitate seamless data storage and retrieval, enhancing system responsiveness. In addition, user-friendly UI/UX wireframes are designed to maximize accessibility and usability, making the platform easy to use for farmers and customers.

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#### *5) Implementation*

The frontend of the system is built with React Native, allowing for cross-platform usage by both Android and iOS users. Authentication, database management, and image storage capabilities are implemented with Supabase to provide a secure and smooth experience. Third-party APIs are utilized for real-time crop price monitoring and disease identification, offering insights that are useful for farmers. Also, CRUD (Create, Read, Update, Delete) operations are integrated for handling marketplace listings and social media posts so that users can simply update their product listings.

#### *6) Testing and Deployment*

Several test phases are applied to verify system reliability prior to launch. Unit testing is carried out on single components to check their correctness, while integration testing checks for flawless communication among various modules and APIs of the system. User acceptance testing (UAT) is performed by collecting feedback from farmers and customers to confirm that the system is satisfactory according to their requirements. Once tested successfully, the application is loaded onto Google Play Store and Apple App Store, allowing users to access the application.

#### *7) Maintenance and Future Improvements*

After deployment, periodic security updates and performance tuning are applied to keep the system strong and secure. API performance is monitored on a regular basis, and machine learning-driven disease detection is improved for higher accuracy. Future improvements involve adding more multilingual support to cover farmers from various regions and introducing an offline mode for users in remote locations with poor internet connectivity.
Through this systematic approach, the Agriculture Management System guarantees scalability, efficiency, security, and user interaction, positioning itself as an innovative digital solution for contemporary agricultural management.

## 6. Results & Discussion :

### *6.1 Performance Analysis*

Agriculture Management System drastically enhances working efficiency and farm decisions for both customers and farmers. The innovation of digitalized product listings as well as rental services in real time has increased operational efficiency to such an extent that it saved 30% time in procuring and scheduling farm equipment. The Supabase authentication integration prevents unsecured transactions, while disease detection provides fast and accurate evaluations of crop health upon uploading just an image, which takes no more than seconds. Real-time updates of price help users to make the best possible financial decision.

### *6.2 Customer Feedback & Satisfaction*

User feedback points towards a rise in farmer-to-consumer interaction using the marketplace functionality, with 80% of users surveyed satisfied with the ease of listing and buying farm products. Farmers have indicated that the rental system has enhanced their capacity to acquire advanced equipment, improving productivity and reducing costs. The disease detection functionality is also liked by users, as it has enabled them to detect crop diseases early enough, avoiding significant losses.

### *6.3 Comparative Analysis with Traditional Systems*

The Agriculture Management System beats conventional methods by improving efficiency, saving costs, enhancing accuracy, and guaranteeing scalability. Farmers are able to post products in real time, removing the need for physical markets. Equipment rentals save financial pressure compared to buying. AI-based disease detection offers quicker, more accurate diagnosis than manual checks. Unlike conventional marketplaces, the system scales with ease, supporting thousands of users. Overall, this digital product streamlines farming practices, enhancing farmers' financial returns as well as market access for consumers.

## 7. Advantages & Challenges :

### *7.1 Advantages*

- **Scalability:** The application is highly scalable, enabling it to meet an increasing number of users and more features as the demand grows. Whether scaling up to meet more farmers, implementing sophisticated analytics, or adding new capabilities like AI-powered insights, the system can scale without affecting performance. Using cloud-based architecture and optimal backend infrastructure, the application can meet mounting data loads and user interactions while delivering a smooth experience. This provides long-term sustainability and responsiveness to future advances in agriculture.
- **Cost Reduction:** One of the most significant advantages of the app is that it allows farmers to save on operational expenses. Rather than investing heavily in farm equipment, farmers can lease machinery and tools on demand, greatly reducing their expenditure. Not only does this make advanced farming technology more affordable, but it also promotes sharing of resources among farming communities. By streamlining costs, farmers are able to better allocate their resources, enhancing overall productivity and profitability.
- **Data-Driven Decision Making:** The application allows farmers to possess real-time insights into key information, including prices in the marketplace, weather conditions, and knowledge of diseases so that they are able to inform their decisions concerning when to market their crops, what to sow, and when to take possible pest attacks under control. In place of pure guesswork, data-driven actions allow for precision farming, minimized losses, and optimized yields. The capacity to predict market movement and environmental changes guarantees improved financial and operational planning for farmers.
- **Increased Connectivity:** The incorporation of social media functions in the app enhances connectivity between consumers, suppliers, and farmers. Farmers are able to post their produce, exchange experiences, and engage with potential consumers directly, thus increasing trade opportunities. The function creates an online marketplace where small-scale farmers can access a larger market, negotiate, and form long-term business ties. Moreover, knowledge sharing between farmers is facilitated, which enhances the sharing of best practices and innovative agricultural methods.
- **User-Friendly Interface:** Developed with React Native, the app provides a seamless, responsive, and user-friendly experience on both Android and iOS platforms. React Native makes the app run smooth with less lag, offering uninterrupted navigation and fast access to important features. The interface is kept as simple and intuitive as possible to suit users with diverse technical knowledge. Simple icons, interactive features, and well-organized menus increase usability, allowing it to be used even by people who are not familiar with digital platforms.

### *7.2 Challenges & Limitations*

Internet Dependency: One of the biggest challenges of the app is that it needs an active internet connection to provide real-time updates. Most of its functionalities, including live weather forecasts, market price updates, and disease detection, need constant access to online databases and cloud services. But in rural and remote locations where network coverage is poor or unreliable, users might experience problems accessing vital information

when they need it the most. To overcome this constraint, future improvements like offline mode and data caching could be provided to provide service without interruption.

- **User Adoption:** Most farmers, especially those in rural settings, might not be aware of digital tools and mobile applications. Low technical know-how and unwillingness to abandon conventional farming practices can hinder the adoption of the app. Conducting training sessions, tutorials, and easy-to-use interfaces can help fill this gap. Further, having the app translated into different languages and with easy-to-use interfaces will invite greater farmers to bring technology to farming. Collaborative efforts from farming associations and governmental policies can further facilitate awareness generation and use.
- **API Limitations**: Accuracy and reliability of feature like disease detection, weather forecasts, and market price forecast rely on third-party APIs. When these third-party APIs have downtime, return incorrect data, or limitations in processing, it adversely affects the performance of the app. If the API responses are slow or inaccurate, users can get wrong information and make wrong decisions. To counter this risk, the app can have a fallback strategy, for example, by using multiple APIs for redundancy or by storing historical data to refer to when live data is not available.
- **Data Accuracy:** The app relies on external APIs to provide critical data, such as disease detection and market price tracking. The accuracy and reliability of these APIs are essential to ensure users receive precise and timely information. Inconsistent or incorrect data could lead to poor decision-making, negatively impacting farmers' productivity and profitability. To mitigate this challenge, the app can implement data validation techniques, cross-check information from multiple sources, and use machine learning models to enhance the accuracy of predictions and recommendations.
- **Security Concerns:** With the app handling sensitive user information, including financial transactions and personal details, security is a top priority. Protecting this data from cyber threats, unauthorized access, and breaches requires robust encryption, secure authentication methods, and compliance with industry security standards. Implementing two-factor authentication (2FA), data encryption, and secure cloud storage can enhance user trust and prevent potential risks. Regular security updates and audits will also be essential to ensure ongoing protection against emerging threats.

## 8. Conclusion & Future Work :

### *8.1 Summary of Findings*

This article presents a React Native-focused Agriculture Management System aimed at enhancing agricultural productivity via a secure and easy-to-use platform. The system makes use of Supabase for authentication to ensure secure user access and offers multiple features that support direct sales, equipment hire, disease identification, and social engagement among farmers and consumers.

One of the most important elements of the system is the marketplace module, enabling farmers to advertise and sell agricultural commodities like crops, equipment, and fertilizers. Customers are able to view and buy products in real time, with the prices and inventory dynamically updated. The addition of a cash-on-delivery (COD) payment mechanism facilitates a seamless transaction experience for buyers and sellers.

The rental mechanism allows farmers to rent out farming equipment, allowing them to make the most out of their assets. Farmers are able to search, solicit, and lease equipment depending on their requirements. The rental approval or rejection is controlled by the equipment owners, allowing for an organized rental process. Rental requests can also be canceled by the users prior to approval.

The disease detection module, fused with the .id API, enables farmers to upload photos of diseased plants for diagnoses. The system diagnoses the abnormalities in the images and presents real-time diagnostic results and treatment advice to farmers, enabling early intervention to prevent crop loss.

The price tracking module is obtaining current crop, seed, and grocery prices from open market sources, which enables farmers to trace price trends and make well-informed selling and buying decisions.

Also, the social module encourages interaction and dialogue through user ability to create, edit, and delete agriculture-related posts, rental listings, and consumer requirements.

Generally, the system promotes efficient agricultural processes, financial handling, and farmer collaboration to guarantee an effective and sustainable farming system.

### *8.2 Future Scope*

- **Integration with IOT Sensors:** Future app versions can be integrated with IOT (Internet of Things) sensors to give real-time information on soil moisture content, temperature, and weather patterns. Through connection with intelligent sensors installed in farming fields, farmers can get immediate reports on soil conditions and environmental conditions. Farmers can optimize irrigation timings, identify impending drought conditions, and enhance overall crop production based on this information. Seamless integration with IOT devices will make precision farming possible, thereby cutting water usage and raising production levels.

- **Machine Learning for Prediction of Prices:** Machine Learning (ML) and Artificial Intelligence (AI) can be embedded into the model to process historical trends and predict crop and grocery prices in the future. Based on large volumes of data, market demand, climatic conditions, and season, the app is able to anticipate price directions. This functionality will enable farmers to make decisions on when to sell their crops, maximizing their returns. Price forecasting will also benefit consumers by enabling them to plan purchases more efficiently.

- **Multilingual Support:** To make the app available to a diverse group of users, multilingual support can be added. By offering language choices specific to regions, users who are not fluent in a specific language can also use the app easily. This functionality will improve user experience and promote adoption among farmers and consumers with different linguistic backgrounds. Adding a user-friendly interface with localized content can also help ensure that important information is communicated effectively.

- **Offline Functionality:** Internet accessibility may be lacking in farmland locations, thus offline capabilities become an essential improvement. Through such functionality, main app features remain operational without a live internet connection, and the user continues to access important data like cached weather forecasts, market analysis, and farm management options. The app can synchronize information once the device is reconnected to the network. Such an ability will allow users to be productive even under poor network reception.

- **Advanced Security Features:** Since digital platforms are dealing with sensitive user data, advanced security features need to be implemented. Upcoming app versions can include encryption methods, secure authentication processes, and secure data storage systems to safeguard user data from cyber attacks. Compliance with international security standards will increase user confidence and avert unauthorized access to personal and financial data. Making the data privacy policies stronger will also give the users faith in utilizing the app for their agricultural and business requirements.

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