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FARM LAND AND FARM EQUIPMENT LEASING PORTAL

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Abstract: This paper presents a complete implementation of farm land and farm equipment leasing portal, a web-based approach to facilitate the physical leasing of agricultural land and equipment. The portal was implemented with Spring Boot, MySQL, Spring Data JPA, HTML, CSS, JavaScript, and Google OAuth2 authentication. The portal allows customers to upload a list of booths and systems, add images and files, talk to owners via an internal chat tool, and get support for production-level AI chatbot use introduced via the Groq API. The implementation shows that the proposed system can be successfully applied to provide effective resource allocation, structured communication, and intelligent agricultural assistance within the farming sector.

Index Terms - Agricultural Portal, Land Listing, Equipment Rental, Spring Boot, MySQL, Google OAuth2, AI Assistant, Web Marketplace.

I. INTRODUCTION

Agricultural workers often need timely access rights to the booth, machinery, and disruptive communication channels, but in many places these interactions are nonetheless made through unstructured and generally offline means. This kind of expectation of close people, intermediaries, and guides in scrutiny makes the whole process slow and uncertain for the individual owner and future tenants. The farm land and farm equipment retail section has evolved as a concept to narrow this gap by bringing access to agricultural support and owner-to-person interaction into one authentic environment. The service is now finished as an active web application. The active portal allows users to safely log in, explore soil and equipment data, print their own listings, open chats with owners, and consult an AI assistant for cultivation guidance. One of the key strengths of the proposed system is that it does not treat these capabilities as isolated utilities. Listing advent, user identification, report add, messaging, and AI interaction are all connected through a single software backbone and database. This provides a more traceable and organized workflow than an informal business discussion. This paper follows the broad structure of the immediate learning paper, however the focus is now on the finishing touches, implementation, and output. As a consequence, the discussion shows the actual implementation, the modules in use, and the behaviors seen within the final section itself.

II. RESEARCH METHODOLOGY

The methodology section describes the implementation and execution of the flow used to complete the study. This includes device architecture, frontend implementation, backend processing, database handling, authentication, AI integration, and testing of the developed modules. The info is as follows;

2.1 System Architecture

The completed portal follows a modular three-layer architecture consisting of presentation layer, business logic layer, and persistence layer. The presentation layer is developed using HTML, CSS, and JavaScript. Backend business logic is executed using the Spring Boot framework while MySQL is used for data storage. The system architecture enables user interaction, listing management, authentication, messaging, and AI assistance to operate within a unified environment. Uploaded images and documents are stored through local resource mapping configuration and linked to entities stored within the database.

2.2 Data and Sources of Data

The tool makes use of dynamic utility facts generated through person interaction with the portal. Data consists of country list information, system facts, images uploaded, user profile statistics, and chat messages exchanged between clients. Country-related directories carry village name, location, payment, water supply, soil type and description. Equipment-related statistics include system calls, condo fees, and photos. User profile records are collected throughout Google OAuth2 authentication and related to portal sports. The AI chatbot module receives user requests through the frontend and techniques them the use of the Groq API. Responses generated with the help of the AI carrier are downgraded back to the utility interface in conversational format.

2.3 Theoretical Framework

The theoretical framework of the portal is based on the integration of agricultural resource sharing, communication management, and intelligent agricultural assistance within a unified web platform. The system coordinates listing publication, user interaction, messaging, and AI-assisted guidance through interconnected backend modules. Spring Boot controllers and service classes manage request processing and module communication, while repository layers coordinate data access operations. The framework establishes interaction between the frontend interface, backend services, database entities, and external AI services to support organized agricultural resource management and user collaboration.

2.4 Authentication and Security Model

The authentication and security model of the portal is implemented using Google OAuth2 authentication integrated with Spring Security. The system verifies user identity during login and associates authenticated accounts with portal activities and uploaded records. Ownership validation mechanisms are applied before sensitive operations such as listing deletion or profile-specific modifications are permitted. Secure session handling and authenticated request validation help maintain controlled access to protected resources and communication features within the platform.

2.5 Module Interaction Workflow

The module interaction workflow describes the movement of data between the frontend interface, backend services, database layer, and AI integration modules. User requests submitted through the frontend are processed by Spring Boot controllers and routed to appropriate service components. Listing information, uploaded documents, chat records, and profile data are transferred through repository layers and stored using Spring Data JPA and Hibernate for persistent storage operations. AI chatbot queries are forwarded to the Groq API, and generated agricultural guidance responses are returned to the frontend in conversational format. This workflow enables coordinated interaction between all functional modules within the portal.

III. MODULE DESCRIPTION

The completed portal is organized into functional modules that collectively support listing management, communication, authentication, and intelligent assistance.

3.1 ADMIN MODULE

This unique concept covered a dedicated regional dashboard for monitoring and privacy. In full implementation, the admin dashboard didn't look different but it came up. However, background controls are well implemented. The system validates possession before touchy operations. When a list is created, the owner's records are attached to the record in a process that uses verified account information. During deletion requests, the application verifies whether the requesting user owns the listing before allowing its deletion. While the entire stakeholder group remains in future work, the current implementation already provides basic security and hands-on solutions.

3.2 FARMER (OWNER) MODULE

The Farmer or Owner module allows certified users to export farmland and farm equipment records directly to portals. Land placement supports town name, lot area, price, description, water source, land type, drawings, and applicable documentation. Device placement supports device name, rental cost per day, and device image. The submitted records are stored in the MySQL database and displayed in the market place. Owners can review their abandoned listings and delete their own posts if required. The output of this module includes list maps, detailed list views, posted image galleries, and links to downloadable documents linked to owner accounts.

3.3 USER (LESSEE) MODULE

Professional or Business module specializing in surfing and conversation. Users can explore available soil and system listings from the homepage and view details including descriptions, dimensions and photos. Verified customers can open listing information and immediately engage with owners about using the internal messaging system. The Inbox section stores message records and counts unread display messages. Full implementation emphasizes conversational interaction, instead of the formal business acceptance process. Even so, the module supports the most important aspect of business transactions: systematic owner-operator communication.

3.4 AI CHATBOT MODULE

The AI chatbot module provides intelligent agricultural assistance to users. It is integrated using the Groq API and configured to answer agriculture-related questions. The chatbot appears as a floating conversational interface within the portal. User questions are sent to backend chatbot services and processed through the AI API before responses are returned to the frontend interface. This module extends the portal beyond standard marketplace functionality and improves usability for users seeking agricultural guidance.

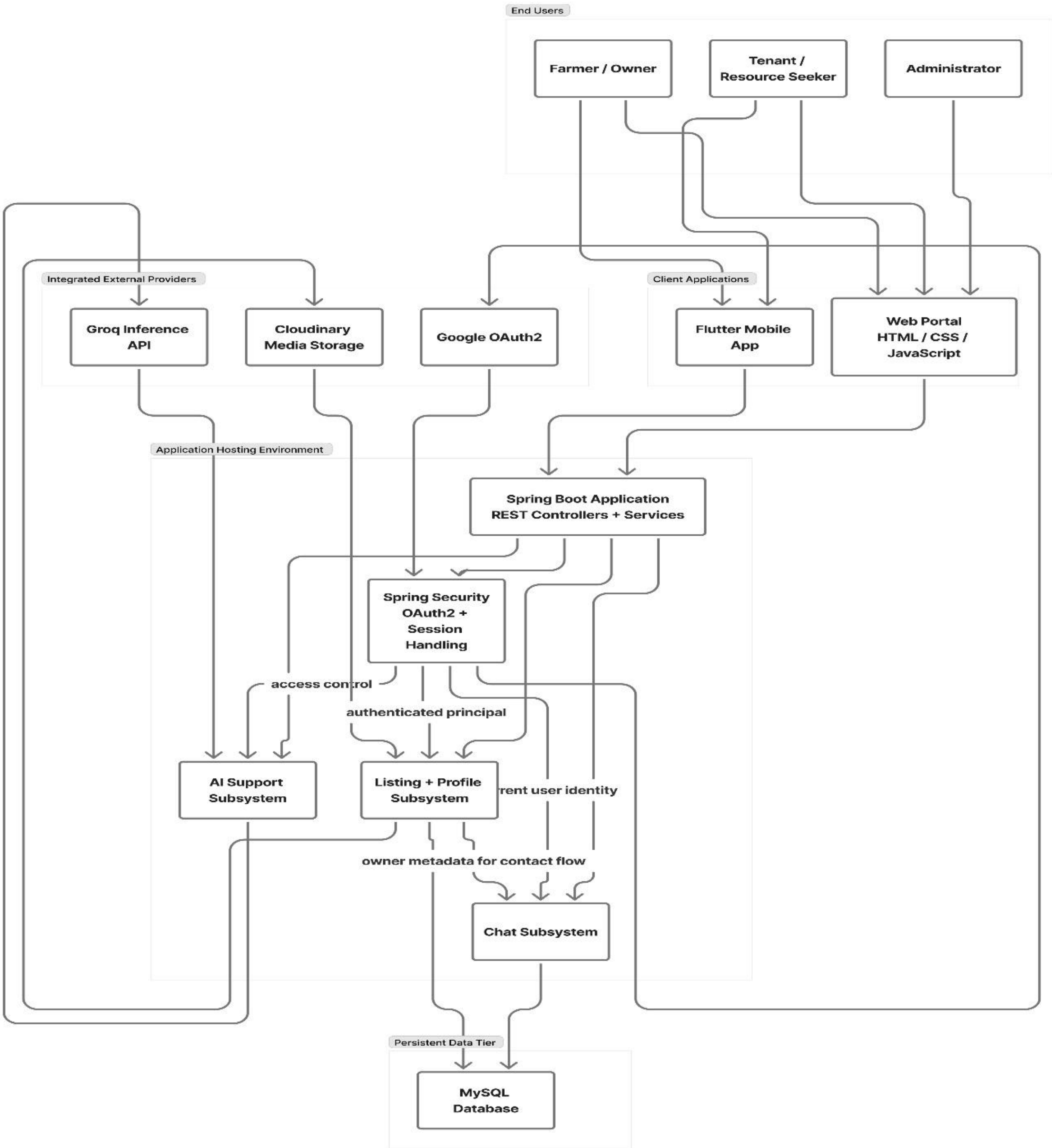

Figure 2.1: System Architecture of the Farm Land and Farm Equipment Leasing Portal

IV. RESULTS AND DISCUSSION

4.1 Results of Implemented System Modules

Module	Implemented Features	Output Generated
Authentication Module	Google OAuth2 Login	Secure user access and identity management
Land Listing Module	Land posting with images and documents	Visible land marketplace records
Equipment Module	Equipment posting and browsing	Equipment rental listings
Messaging Module	Owner-user chat system	Stored conversations and inbox
Profile Module	User profile and uploaded listings	Owner-linked records
AI Chatbot Module	Groq API integration	Agriculture-related responses

Table 4.1: Results of Implemented Portal Modules

The completed implementation successfully delivered the major functionalities proposed during the initial project phase. The authentication module provided secure access using Google OAuth2 while maintaining ownership-based restrictions for sensitive operations. The listing modules generated visible marketplace records for farmland and farm equipment. Uploaded images and documents were correctly linked with listings and served through resource mapping configuration. The messaging system enabled direct owner-user interaction and stored conversation history within the database. The AI chatbot successfully processed agriculture-related queries and generated contextual responses using the Groq API. The integrated behavior of these modules demonstrated that a lightweight full-stack architecture based on Spring Boot and MySQL can support agricultural resource sharing, communication, and guidance within a single web application.

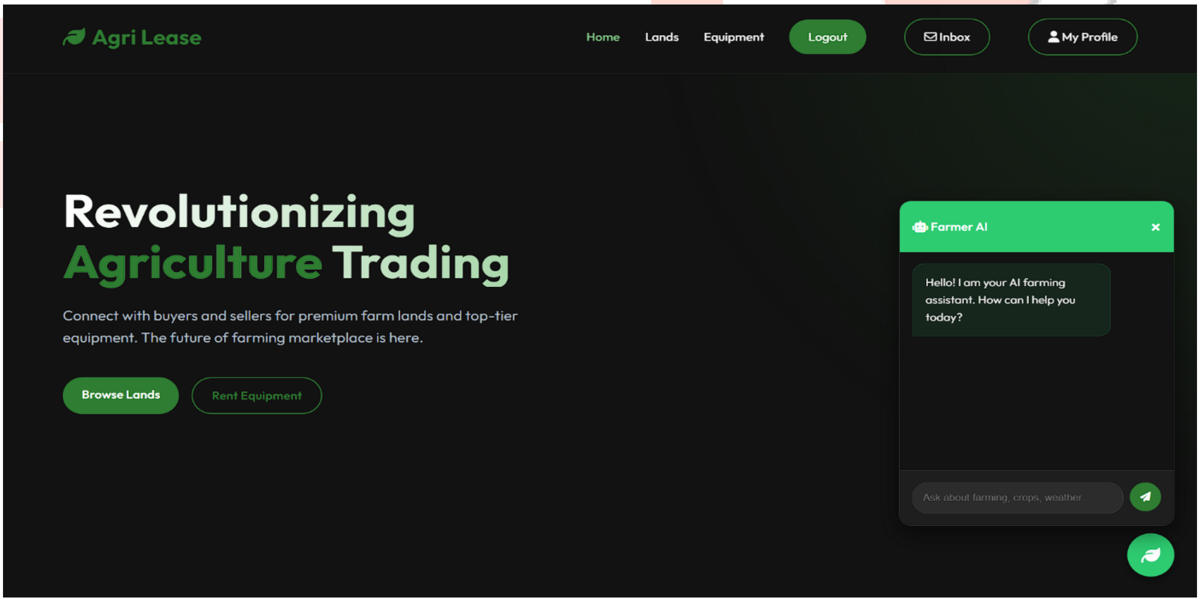

Figure 4.1: Portal Homepage Interface

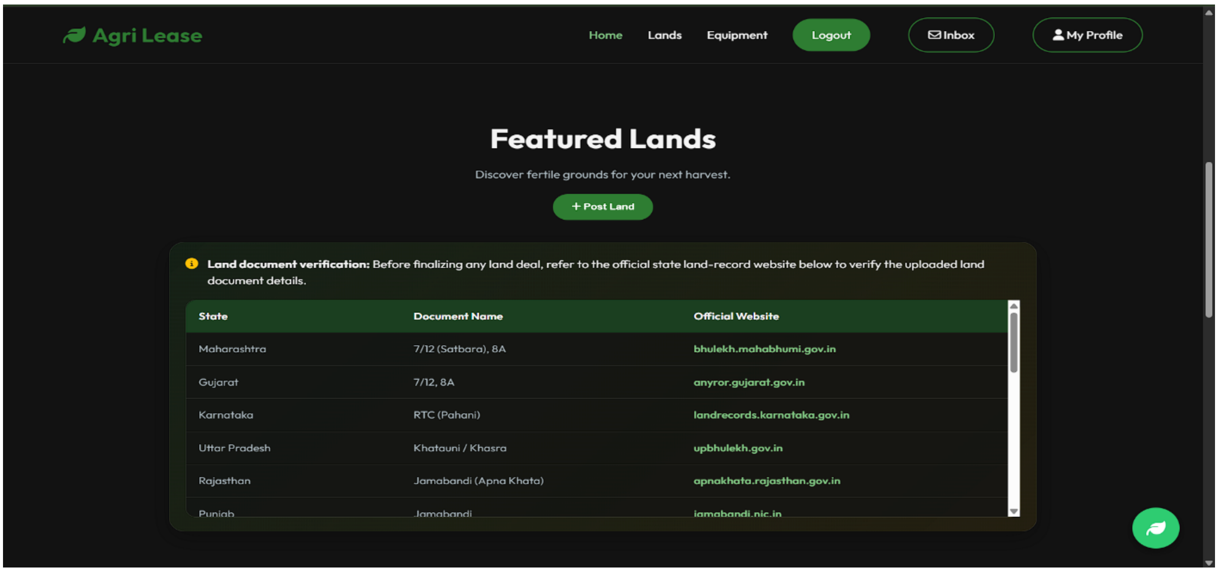

Figure 4.2: Land Listing Interface

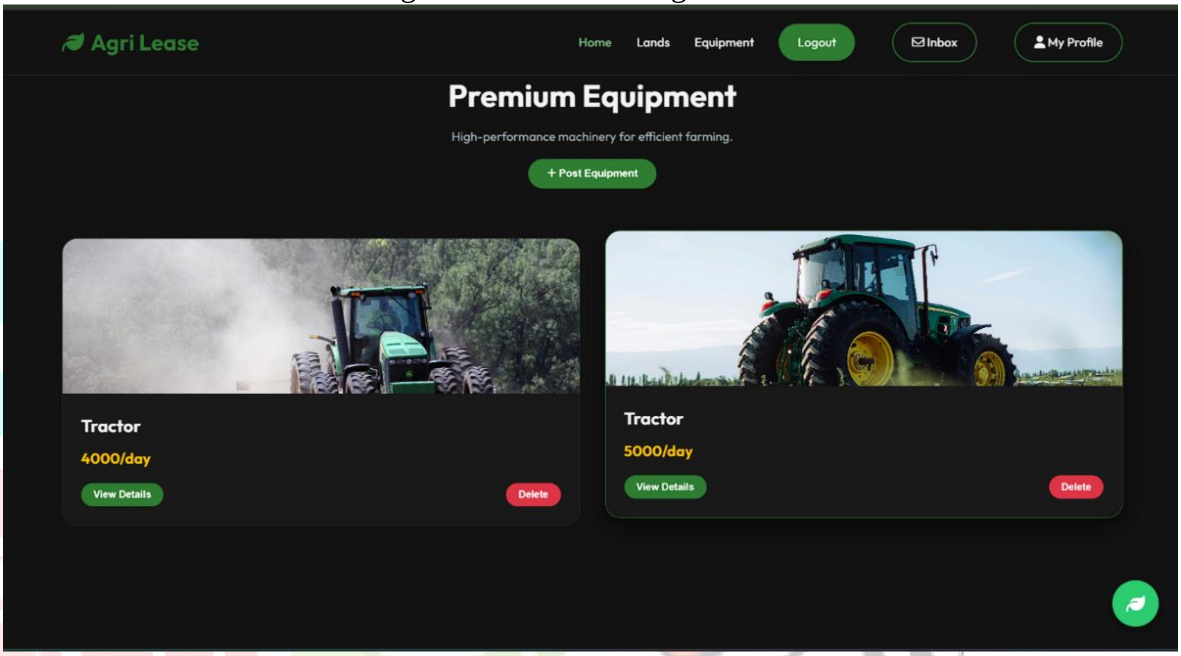

Figure 4.3: Equipment Listing Interface

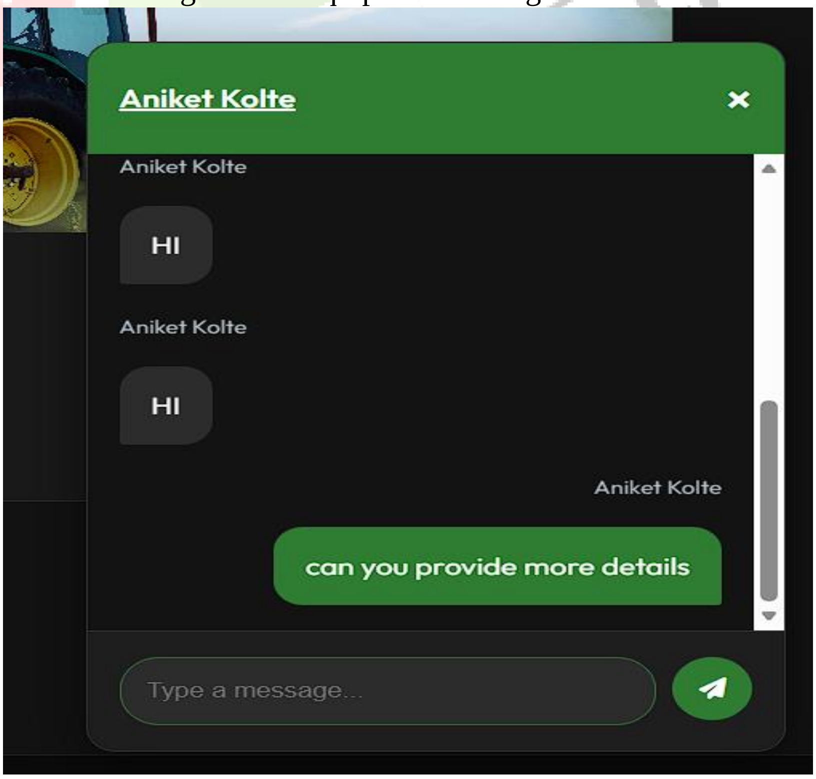

Figure 4.4: User Messaging Interface

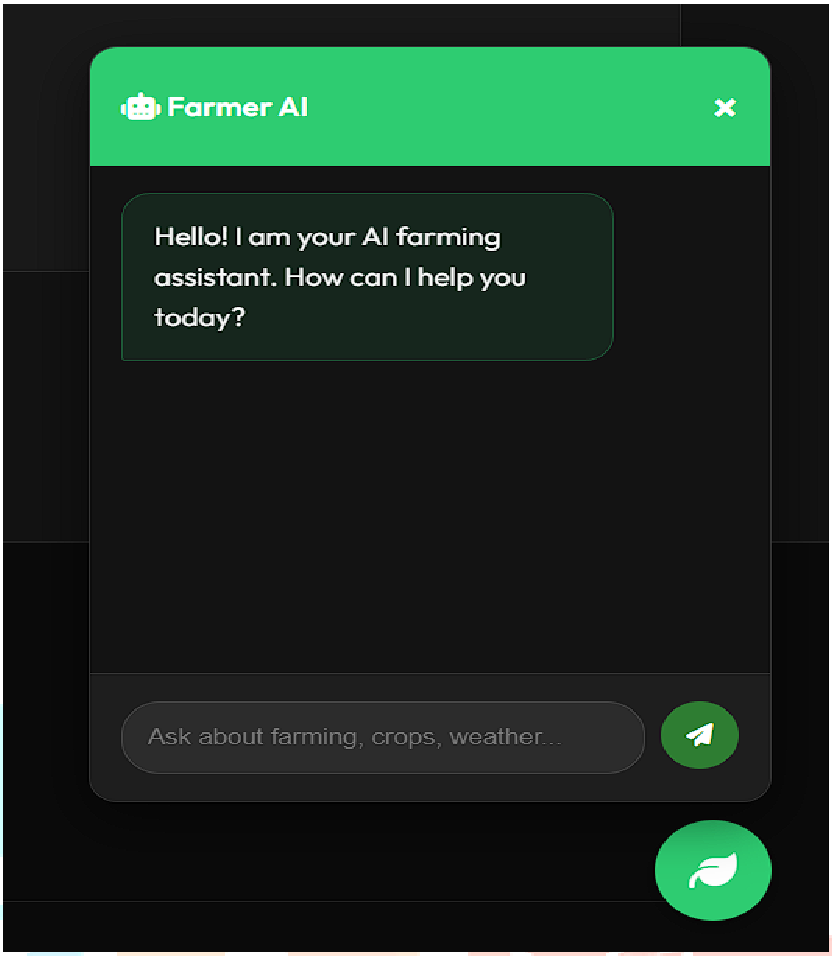

Figure 4.5: AI Chatbot Assistance Interface

V. FUTURE SCOPE

Future development can strengthen the project in both technical and deployment aspects. A dedicated administrative dashboard would allow moderators to verify listings, inspect misuse, and generate platform analytics. Another major extension is full lease transaction management including booking requests, approval workflows, leasing duration management, digital agreements, and payment integration. The portal can also be improved through multilingual support, recommendation systems, location-based filtering, and personalized listing suggestions. The AI chatbot can be extended further using localized agricultural datasets and seasonal crop advisory systems. Cloud deployment, automated testing pipelines, scalability improvements, and production-grade monitoring are also important areas for future enhancement.

VI. CONCLUSION

The Farm Land and Farm Equipment Leasing Portal has successfully progressed from conceptual proposal to completed implementation. The final application now supports secure sign-in, listing management, image and document upload, messaging, profile handling, and AI-assisted agricultural support within one integrated system. The project reduces dependence on fragmented manual communication methods and provides a more structured approach for agricultural users to discover and discuss resources. The completed implementation therefore improves accessibility, transparency, and continuity of interaction among users. Although additional features remain possible, the current implementation already validates the primary objective behind the system and provides a strong foundation for future agri-technology development.

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