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Aruvadai Bhoomi: A Smart Agricultural and Cultural Exploration Platform

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Abstract:

Since the beginning of time, agriculture has played a crucial role in India's economy and numerous people are involved in it as their profession. Though there exist many digital websites currently, farmers have faced certain problems in marketing their products. Moreover, a considerable amount of cultural and tourism sites in the rural areas have received less recognition due to the spread of information. For overcoming these challenges, the platform "Aruvadai Bhoomi" was designed as a combination of agriculture and culture into one web application. The farmers will be able to enroll into the portal, upload their products, check for updates, and track orders. Customers can see available products, look up for desired items, and buy them without any problems. Besides, information about temples, history sites, arts and cultures, mountains, wildlife, and tourists spots in Tamil Nadu will be available for the users. The food donation facility is also integrated with this website along with a very simple chatbot. This platform will benefit the farmers by providing an opportunity to sell their produce, make people culturally aware, and facilitate rural development.

Keywords — Agriculture, Farmers, Cultural Exploration, Food Waste Management, Digital Platform.

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1. INTRODUCTION

1.1 Background of Agricultural and Cultural Platforms

For many years now, agriculture has been at the core of India's economy and provides livelihood for a huge proportion of the country's populace. Agricultural farmers help to supply food and agricultural goods which are essential for people's lives. Despite advancements in technology over recent years, there are still challenges associated with advertising and selling their goods directly to consumers. Most farmers find themselves relying on intermediaries for their services which reduce their incomes and limit their markets. India boasts of an incredible history characterized by temples, ancient monuments, cultural arts, festivals, wildlife parks, among other features. One of such states in India is Tamil Nadu state which has a wealth of historical sites. There is however no centralized website from where information about all the sites in India can be accessed. Emergence of digital technologies has created a good opportunity for combining the three activities. It would be helpful if all the services were provided within one platform.

1.2 Limitations of Existing Systems

• Agricultural information systems used at present focus only on the purchase and sale of goods. These systems help the farmer to identify a customer but are devoid of any information that is related to cultural heritage, tourism, or sustainability concerns.

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Tourist information websites lack the necessary function that would allow farmers to market their produce. The following are some limitations associated with present information systems:

• Inadequate interconnection between agricultural and cultural information.

• Few options available for promotion by the farmers. • No provision for donating food waste and making compost.

• The information is spread across various channels.

• Limited awareness about the tourist spots located in rural areas.

• Lack of support and assistance from the user end. Due to such constraints, users often have to rely on other applications and sites for receiving the relevant services.

1.3 Limitations of Existing Systems

There have been various problems in terms of promoting farmers' products and increasing their reach through online platforms. On the other hand, there is lack of recognition of several cultural places, tourist spots, and practices. There is also environmental pollution due to improper disposal of food waste by individuals, restaurants, and at events. There is lack of an online platform integrating all these four processes, which leads to problems for users. As a result, there is requirement of an online platform catering to all these needs.

1.4 Goals of the Proposed Platform

The primary aim of Aruvadai Bhoomi is to create an integrated web application which helps in the trade and exploration of agricultural business and culture. The aims of the platform are given below:

• A web-based marketplace for farmers to upload and sell agricultural produce. To enable customers to search, browse, and purchase products conveniently.

• The customers should be able to search, browse, and purchase these products.

• Supporting the promotion of temples, historical sites, arts and culture, wildlife, and tourism places of Tamil Nadu.

• Helping in the process of donating leftover food and compost management.

• Location and contact details provided to users.

• The process of administration and monitoring by the platform.

Contribute towards sustainable development of rural areas using digitization.

2. LITERATURE REVIEW

The employment of online systems in the agricultural sector has witnessed substantial growth over recent years. Many academics and developers have paid attention to designing platforms for marketing purposes in order to inform customers about agricultural produce. A variety of online agricultural markets have been launched for minimizing the reliance on brokers as well as increasing the possibilities for farmers. The introduction of those systems facilitates the process of displaying products, monitoring the stock, and communicating with potential buyers. Though the use of such platforms contributes to the improvement of agricultural markets, they do not offer other types of services except agricultural trade.

On the one hand, there have been numerous tourism and cultural information systems designed for popularizing historical landmarks, temples, traditional culture, and travel destinations. The introduction of those websites allows users to gain more information about places using Internet services. Besides, these platforms ensure the preservation of the cultural heritage and its availability to all users of Internet resources. Despite the significance of tourism and cultural websites, they have no connections with local farming communities and cannot contribute to their prosperity.

Sustainable practices in waste management have also gained attention among researchers. Several waste management approaches concerning food have been suggested to reduce the amount of waste, carry out donations, recycle, and compost waste. Such applications allow minimizing negative impacts on the environment and proper management of waste. Nevertheless, food waste management applications tend to function independently without any connections to agricultural or tourist platforms.

With the rise of Internet-based service platforms, it has become increasingly popular to use chatbots to enhance communication between an application and

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its users. Simple chatbots allow responding to various user questions, guiding users through the functionality of the platform, and responding to user requests in real-time. Chatbots are an efficient means to provide customers with assistance and simplify the work of administrators. Many systems, however, do not use chatbots for rural development purposes.

According to a literature review of some of the platforms developed till now, it can be seen that they deal with only one particular aspect. There is not much research or development work that involves combining all these aspects under one umbrella. It leaves a void in terms of providing users with access to multiple services through one platform.

The proposed Aruvadai Bhoomi platform combines various aspects including agricultural trading, cultural exploration, tourism information, food waste donation, and help services for the users. Thus, through a web-based approach, the Aruvadai Bhoomi platform aims at fulfilling multiple purposes related to farmers, cultural exploration, sustainability, and rural development.

3. PROPOSED SYSTEM ARCHITECTURE

The suggested system will be designed as a web-based system that integrates agricultural trading, culture, tourism information, and food waste management into one system. This system is structured using multiple layers that make it easy for the users, application modules, and the database to interact effectively. This web-based application is created using HTML, CSS, JavaScript, PHP, and MySQL languages to create an easy-to-use system. It will be easy for farmers, customers, tourists, and administrators to use various features from one platform.

3.1 System Architecture Framework

The architecture design of the Aruvadai Bhoomi system consists of four layers that are structured in a logical way, namely the User Access layer, the Application layer, the Service Processing layer, and the Data Management layer.

User Access Layer:
This layer serves as the entry point to the system. Users come in different types such as farmers, customers, tourists, and administrators. The farmers have the capability of registering, uploading their products, checking the availability, and tracking orders. The customer can search for the available products, look for agricultural products and make orders. The tourists can get information regarding temples, historic sites, wild life, mountainous regions, art, and culture.

Application Layer: This layer holds the functional modules for the system. They include Farmer Registration, Customer Registration, Product Management, Product Search & Browsing, Order Management, Cultural Information Management, Food Waste Donation Management, and Chatbot Assistance. They perform basic services that are essential to the users of the platform and help the user interact with the platform smoothly.

Service Processing Layer:
This layer deals with the processing of the users' requests and business activities. It takes care of user authentication, validation, product transactions, order tracking, location-based services, notifications, and chatbots. This service layer functions as a mediator between the modules of the application and the database to make sure that the data is safely processed.

Data Management Layer:
This is the layer where all data concerning the platform will be stored. For our platform, we use MongoDB, which is the main database for storing all user accounts, products, orders, cultural information, waste donations, bot data, and administrative data. This gives us efficient storage and retrieval of data.

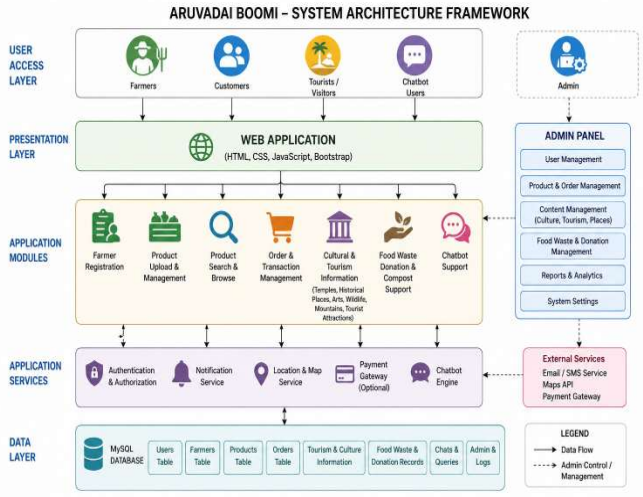

Fig 3.1 Proposed Architecture Diagram of the application

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3.2 System Architecture Framework

User Access Layer:

The User Access Layer offers various interfaces for farmers, consumers, tourists, and managers. Users will be able to use platform services based on the level of permission assigned to them. The layer guarantees an easy interaction with the system using a web interface.

Application Layer:

This layer is where the key modules for supporting agriculture trading and culture discovery reside. This includes the modules for uploading and managing the farmers' products, searching and purchasing of products by customers, discovering information relating to culture and tourism by visitors, as well as the food waste donations and chatbot module.

Service Processing Layer:

This layer is responsible for executing business logic and service management operations. This layer will manage user authentication, order processing, inventory updating, searching services, notification services, and chatbot services. This layer will ensure proper interaction between users and the database.

Data Management Layer:

Data Management Layer holds all data produced by the platform. It deals with customer data, farmer information, products, orders placed by customers, donations made by people, tourists, and administrative data. Centralized data management allows for effective management of all data used by the system.

4. ADVANTAGES OF THE PROPOSED SYSTEM

4.1 Direct Farmer-to-Customer Connectivity

The recommended system offers an opportunity for the farmers to exhibit and sell their products directly to the consumers. It eliminates the middlemen and enables farmers to market their produce to more people. The consumer is able to access and choose products from a single platform.

4.2 Integrated Agricultural and Cultural Information

As opposed to other existing applications that emphasize one particular service only, Aruvadai Bhoomi integrates agriculture-based services and provides users with cultural and tourism information as well. The details of temples, history spots, wildlife destinations, mountains, arts, cultures, and tourism destinations have been included along with the agriculture-based services.

4.3 Easy Access and User-Friendly Interface

A very user-friendly interface has been used in the development of this software in order to facilitate ease of use by the farmers and customers who wish to utilize various services offered on the site. It will be easy for the farmers to upload and manage their products as well as for customers to search for any details.

4.4 Support for Sustainable Practices

By introducing a module for donation of food waste and assistance in composting, responsibility in waste management is achieved. By providing details about surplus food, users can also help reduce food wastage. This ensures that sustainable practices are emphasized and resources are utilized effectively.

5. METHODOLOGY

5.1 Data Collection and Storage

The above system will collect data from diverse groups of users, namely farmers, customers, and administrators. Farmers will be allowed to register themselves along with uploading details of their products including name of the product, its category, quantity, price, and availability. Users will have the option of registering, browsing the list of available items, and making purchase orders. Data pertaining to temples, historical sites, locations of wildlife, mountains, arts, culture, and tourists' spots will be kept in the system.

5.2 Training of the AI model

The application offers distinct ways for registration and login services to both the farmers and the buyers. The registration process involves collecting data about the user and saving the data in the database. Authorization takes place through login details which make sure only authorized users gain entry to their particular module.

5.3 Product Management Process

With the completion of the login process, farmers gain access to their dashboard to upload agricultural goods. Farmers are able to add new details regarding the products, manage availability of products, as well

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as monitor any orders made by the customers. The uploaded products become available for the customer to view and buy.

5.4 Cultural and Tourism Information Management

Details about the places in Tamil Nadu pertaining to temples, history, art and culture, animal life, mountain ranges, and tourist spots are made available by the system. The details of these places are maintained through the administrative module. Through the system, users are provided access to these places.

5.5 Food Waste Management and User Assistance

There is also a food waste donation module which provides users with the ability to add their details regarding their food surplus. These details can then be viewed and managed from the admin dashboard. Moreover, there is a simple chatbot functionality included in the software that will help users get quick answers to any of their common questions.

6. WORKING PRINCIPLE

6.1 User Registration and Login

Aruvadai Bhoomi system functions through registering the user. The system offers facilities to register and log into the system for both farmers and customers separately. For new users who wish to create an account, all that is required is to provide the information needed. Once registered, the user can then log in to the system.

6.2 Agricultural Product Management

Once registered, users gain access to the dashboard, where they can add their agricultural products. Information regarding the agricultural products, including product name, product category, quantity, price, and status, can be entered anytime and amended according to need. After being added to the database, the products become visible on the website for clients to see and make purchases.

6.3 Product Search and Customer Interaction

They can look at what the store offers and utilize the searching capability in order to find certain agricultural products. Information relating to these products is then displayed to them by using the information stored in the database. The customers will be able to place orders directly to the farmers using the system.

6.4 Cultural and Tourism Information Access

Besides farming services, other options include the availability of information on temples, historical sites, arts and culture, wildlife spots, mountains, and tourist destinations within the state of Tamil Nadu. Information in regard to these aspects is updated by the administrator and made available through specialized areas within the platform.

7. CONSTRAINTS AND PROBLEMS

7.1 Dependency on Internet Connection

This system is totally online and hence depends on availability of internet connection in order to access its services. Both farmers and customers as well as other users need to have an internet connection in order to register themselves and do any other activity like browsing through products and uploading information.

7.2 Accuracy and Maintenance of Information

How effectively this platform works depends on how accurate the information is on it, input by both users and administrators. Misleading information about the products available, tourist locations, or out-of-date tourist information can negatively impact the user's experience using this system. Therefore, constant updates are needed for the platform to continue being efficient.

7.3 User Adoption and Digital Awareness

For some farmers and rural users, they may have little knowledge about using these digital platforms. It might pose challenges during their registration, product management, and use of the platform. It is therefore important that the users get trained on how to make use of the platform.

8. EXPERIMENTAL RESULTS AND DISCUSSION

8.1 Experimental setup and dataset description

The Aruvadai Bhoomi portal has been developed using the technologies React.js on the frontend part, Node.js and Express.js on the backend side along with MongoDB for the database operations. The testing process included evaluating the functionality of all the modules including the farmer registration module, customer registration module, product

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management module, cultural information retrieval module, food waste management module, and finally the chatbot and admin module.

For testing purposes, different users were assigned for different modules to test their functionalities. It was observed that farmers were able to register themselves, upload their products, change the status of their products as available or unavailable, and manage their orders.

8.2 Results and Discussion

However, according to the results of the test conducted, it can be concluded that the services have been integrated perfectly into one software system. The product information uploaded by the farmers was stored appropriately and made accessible to the consumers. Using search services, users could easily search for specific products using keywords and categories.

With the cultural exploration service, information regarding temples, historic places, arts and culture, wildlife areas, mountains, and tourism areas was accessible. Donation services ensured that users easily uploaded their donations while chatbots helped in solving issues arising out of consumers' inquiries.

The admin dashboard proved to be an effective tool in monitoring users and donations.

Table 1: Functional Testing Results

Module	Function Tested	Result
Farmer registration	Account Creation	Successful
Customer registration	Account Creation	Successful
Farmer login	Authentication	Successful
Customer login	Authentication	Successful
Product upload	Product Addition	Successful
Cultural exploration Module	Information Access	Successful
Food waste Donation Module	Data submission	Successful
Basic Chatbot	User Interaction	Successful
Admin dashboard	Data Monitoring	Successful

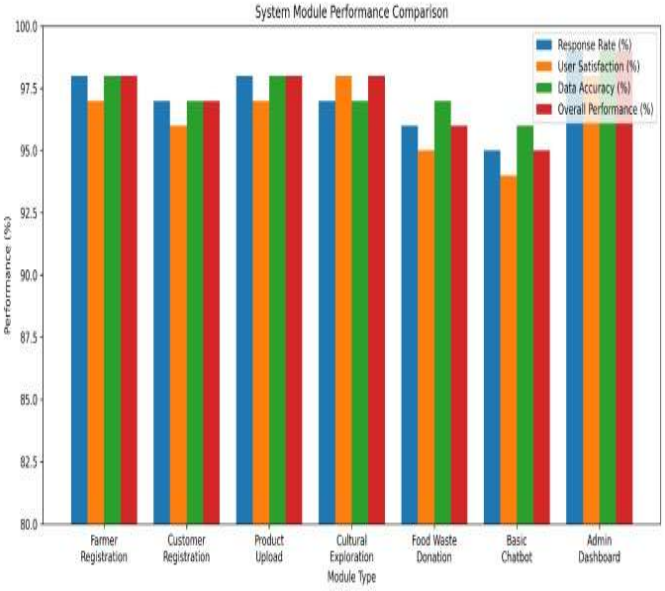

Fig 8.2 Classification Performance Metrics Comparison chart

8.3 Discussion

Indeed, from the experiment, it is clear that the Aruvadai Bhoomi system is able to combine agriculture trading, cultural exploration, and food waste into one virtual platform. From the experiment, it was established that all the main functions of the platform worked as they should and delivered the services to the users without any problem. Farmers were able to control their products and customers could access the information required. The two other modules also operated effectively. Overall, it is evident that the platform makes everything easy and convenient for the users.

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9. CONCLUSION AND FUTURE SCOPE

9.1 Conclusion

Aruvadai Bhoomi, which is suggested in this paper, is a comprehensive solution for agricultural trade, cultural exploration, and sustainable development of communities. It helps farmers to advertise and maintain their products, providing users with an ability to search for various agricultural products through the convenient interface. Also, information on temples, historically valuable locations, art, wildlife, cultural and tourism sites can be found by means of this platform for all of Tamil Nadu. The food waste donation module helps to utilize natural resources in an optimal way and thus preserve the environment. The experiment shows that all modules work well and can be used efficiently. Due to the combination of multiple services within one application, Aruvadai Bhoomi makes a positive contribution to different spheres.

9.2 Future Scope

Some additional features can be added to the Aruvadai Bhoomi platform to improve the user experience and make the platform more efficient. Some of these improvements might include adding online payment options, order tracking system, support in various languages, and mobile app version. Recommendation systems powered by AI can also be introduced to recommend users with suitable products and tourist spots according to their preferences. The chatbot can be updated to offer smarter and more responsive feedback. Other additional features could be the introduction of weather information, crop advisory service, and market price analysis services for farmers.

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