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AgroEcom: An Agricultural Equipment Rental Services for Smart Farming

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ABSTRACT

Agriculture is a labor-intensive sector, requiring a lot of machinery for agriculture. In comparison to workers, these machines are able to finish tasks in agriculture considerably sooner. The machinery used for farming or other agricultural purposes are referred to as "farm equipments." The various types of machinery used in agriculture include tractors, harvesting tools, mower conditioners, tillage tools, and other farming equipment. However, these machinery and gear are frequently very pricey, and every farmer cannot afford to buy them. The high price of purchasing new farm equipment and its corresponding high costs of upkeep increase the demand for farm rental services. This website provides a system for renting agricultural machines and vehicles called AgroEcom that allows farmers to get the latest data for farming and farm machinery such as tractors, tillers, rotavators, etc. Farmers can rent farming equipment and machinery through this website and perform all tasks related to farming while sitting at home. Farmers use rental services to earn some profit by balancing the costs of keeping their farm equipments. In order to avoid paying an immense amount of capital as a down payment on essential farm equipment, leasing out machinery for agriculture helps farmers to harvest their crop on time. Also, the agricultural operation is not profitable, farmers might find it hard to afford getting heaviest farm equipment. In spite of improving the efficiency of the agricultural machinery that is already accessible, this approach will help individual farmers who are willing to rent out their equipment and machinery for farming to improve their agricultural income. This system will offer farmers an area to buy and rent used agricultural machinery.

I. INTRODUCTION

Agriculture machinery includes a number of machines and tools that are used in farming and agricultural activities to help in crop planting, cultivating crops, crop harvesting, and crop processing. These equipments are designed to increase productivity and efficiency, reduce worker expenditures, and improve the general quality of agricultural operations . Tractors, ploughs, cultivators, harvesters, irrigation systems, seed drills, and sprayers are different kinds of agricultural machinery [1].

Various sources of energy, like humans, animals, diesel, and electricity can power these machines. Agriculture has become significantly updated and industrialised, improving its efficiency and affordability, thanks in part to the use of farming equipment.

Types of Machinery

The following are some of the most typical agricultural machinery types used in modern farming:

- Tractors are adjustable machinery that can be used for a wide range of occupations, like planting, harvesting, tilling, and mowing.

- Harvesters are machinery for collecting grains, such as maize, wheat, and soybeans. There are different kinds of harvesters, including cotton, sugar cane, and combine harvesters [2].

- The ploughs - used to break up and turn the land in order to make it ready to be planting.

- Planters – equipment for sowing seeds in the ground.

- Cultivators, which are used to till the ground and eradicate weeds.

- Irrigation systems - used to supply water to crops when there is a lack of rain or a drought [2].

- Sprayers are tools used to spray crops using pesticides, herbicides, and fertilisers.

- Balers that can be utilised for gathering and bale hay and other kinds of products for either transportation or storage.

- Seed drills, which are used for accurate and precise seeding.

- Spreaders - used to distribute commodities such as fertiliser across huge regions uniformly.

- Mowers: used to gather and cut forage crops like grass, lucerne and others.

- Tillers - used to aerate soil, prepare it for planting, and manage weeds [3].

There are many different types of agricultural machinery used in modern farming; these are just a few examples. There are also many more specialised machines used for particular jobs or crops.

II. PROBLEM STATEMENT

The agriculture industry is heavily reliant on machinery for efficient and effective production .Farmers often require specialized agricultural machinery for specific tasks such as planting, tilling, harvesting, and spraying. However, the cost of purchasing and maintaining these machines can be prohibitive for many farmers, particularly those with small to medium-sized farms. Additionally, the high capital investment required for purchasing these machines may not be justified for farmers who need them only occasionally. As a result, farmers may resort to manual labour or outdated machinery, which can negatively impact their productivity and profitability [4]. Moreover, farmers who own agricultural machinery often face underutilization of the equipment and may struggle to generate enough revenue to cover their investment. Additionally, maintaining and repairing the machinery can be costly, especially for farmers who do not have the technical knowledge or expertise to do it themselves. Another problem is the lack of access to modern and specialized machinery in some regions. In many developing countries, farmers may not have access to the latest agricultural machinery and may have to rely on outdated equipment, which can negatively impact their productivity and yield. Additionally, some farmers may not be able to afford to purchase specialized machinery that is designed for specific crops or tasks, limiting their ability to improve their productivity. A third problem is the limited availability of spare parts and technical support. In some regions, it can be challenging to find spare parts for agricultural machinery, which can lead to extended downtime and reduced productivity [5]. Lastly, there is a problem of underutilization of agricultural machinery. Some farmers may not use their machinery to its full potential, leading to inefficient use of resources and reduced profitability. To address this problem, AgroEcom an web-based agriculture machinery rental system can be developed to connect farmers with individuals who own agricultural machinery.

III. PROPOSED SYSTEM

Proposed AgroEcom a Web based Agricultural Machinery Rental System would be an online platform that connects farmers with rental companies or individual owners offering agricultural machinery for rent. The system would offer a range of equipment, including tractors, tillage equipment, harvesting equipment, and other specialized machinery.

The proposed system would have the following features:

- **Equipment Listings**: Rental companies or individual owners would be able to list their equipment available for rent on the platform, including information about the equipment, such as model, make, availability, rental rate, and location.

- **Equipment Search:** Farmers would be able to search for equipment based on location, type of equipment, rental rate, and availability.

- **Online Booking**: Farmers would be able to book equipment online and make payment through the platform.

- **Ratings and Reviews**: Farmers would be able to rate and review the equipment and the rental companies, providing feedback that can be used to improve the quality of service provided.

The proposed Web based Agricultural Machinery Rental System would provide farmers with access to a wide range of equipment at competitive prices, increasing their efficiency and productivity while reducing their costs. Rental companies or individual owners would benefit from increased exposure and a wider customer base, helping to expand their businesses. Overall, this proposed system would offer a convenient and efficient solution for farmers to rent agricultural machinery.

IV. MODULE DESCRIPTION

1. AgroEcom Rental Web UI

Web based system to maintain the efficient operation and management of agriculture equipment's transparently. Users (farmers) may search the database of rental machinery and reserve them. A data base management system was made used for higher system compatibility and integrated work. The entire development process has been subdivided into two: the front-end development and the backend development. The front end comprises of the visually visible parts such as the home page, admin panel, contact page, about us page, vender and renter panel [6]. The back end contains the database and its interaction with the front-end.

2. AgroEcom End User Module

2.1 AgroEcom Admin

User management: Allows the admin to manage user accounts, including creating, editing, and deleting accounts.

Equipment management: Enables the admin to add, update, and remove equipment listings in the system.

Rental management: Provides tools to handle rental requests, approve or decline rentals, and track rental activities.

Maintenance management: Allows the admin to manage equipment maintenance requests and track maintenance activities.

Financial management: Provides features to track rental payments, generate financial reports, and manage transactions.

Analytics and reporting: Generates reports and provides insights on rental activities, revenue, equipment utilization, and user feedback.

User support: Handles user inquiries, troubleshoots issues, and provides customer support.

2.2 Agri Machinery Vendor

In this sub-module the vender information is processed. This information includes giving username and password to login to this site. This is required to verify the user. The contact number of the vendor is used to confirm the vender's registered equipment and also to send promotional number [7]. Vendor can also see their registered equipment when they login on their account using their user id and password.

Equipment listing: Allows vendors to add and manage their equipment listings, including details such as type, make, model, rental cost, and availability dates.

Availability management: Enables vendors to update the availability status of their equipment based on rental bookings and maintenance schedules.

Rental request handling: Provides tools for vendors to review and approve rental requests received from renters.

Maintenance request handling: Allows vendors to respond to equipment maintenance requests and coordinate maintenance activities.

Payment tracking: Enables vendors to track rental payments received for their equipment.

2.3 Agri Machinery Renter

In this sub-module the farmer information is processed. This information includes giving username and password to login to this site [8]. This is required to verify the user. The registered number of the customer is used to confirm the farmer's orders and also to send promotional number.

User registration and authentication: Enables renters to create an account and log in securely.

Equipment search and filtering: Allows renters to search for equipment based on their requirements, including type, location, and availability dates.

Rental request submission: Enables renters to submit rental requests for specific equipment and specify the rental duration.

Rental status tracking: Allows renters to track the status of their rental requests, including approvals, delivery/pickup details, and return instructions.

Payment processing: Provides a secure and convenient payment system for renters to make rental payments online.

Equipment feedback and rating: Enables renters to provide feedback and ratings on the rented equipment and their rental experience.

3. Machinery Module

In this module Equipment details can be added to the database. The late charges and actual price of the equipment can be added. The equipment details can be edited. The equipment is stored as per category. Arrangement of equipment into categories enables the user to search the Equipment based on its category [8]. The database is normalized so that the redundancy is minimized.

3.1 Machinery Booking

This sub-module lets the farmer to select the items that they intend to take on rent to store in cart before placing the order. The items can be stored into the cart and it can be deleted from the cart. The booking module is responsible for things such as the renting of agricultural machinery for sale. The user would have to enter the number of hours, pick the date and time, to hire a tractor or equipment. Upon entering these information, users will have to confirm their reservation. Then the customer will get the total price of the equipment for agriculture. If the owner can authorize the request, the user can send text MSG to the owner, then he can send text MSG with notification. The booking will then be successfully confirmed. After active booking, both users view the history and contact information of each other.

3.2 Order

In this sub-module farmer order is processed. The user can place the order for the equipment they want to take on rent. It verifies the pin code and it confirms the order to delivered place. At the given address the equipment should be delivered.

4. Payment

In this module payment options for the order is given and processed. Payment would be through credit card, debit card or cash on delivery. The total charges of the equipment are the sum of cost of the product and delivery charges will be deducted from the user's account in case of payment options other than cash on delivery [9].

5. Notification

The Notification Module for a Web based Agricultural Machinery Rental System is an important feature that keeps users informed about their rental orders and updates related to the rental process [10]. The Notification Module includes several features that help users stay updated on their rental orders, including:

5.1 Order Confirmation

After a farmer has placed an order for equipment rental, the Notification Module sends an order confirmation notification to the farmer. This notification includes details about the rental order, such as equipment type, rental period, and rental rate.

**5.2 Equipment Pickup/Delivery**

When the equipment is ready for pickup or delivery, the Notification Module sends a notification to the farmer to inform them of the pickup/delivery date and time. This allows the farmer to plan their schedule accordingly.

Thus, the Notification Module is an essential feature of a Web based Agricultural Machinery Rental System as it keeps users informed about their rental orders and updates related to the rental process, which improves the user experience and helps ensure successful rental transactions.

V. DATA FLOW DIAGRAM
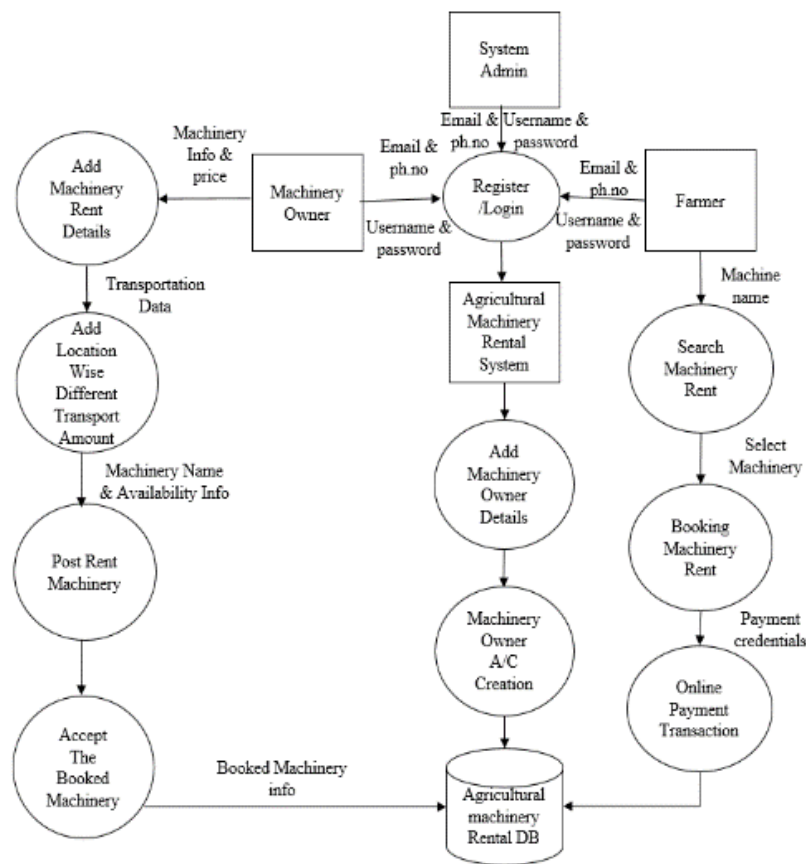
VI. USE CASE DIAGRAM
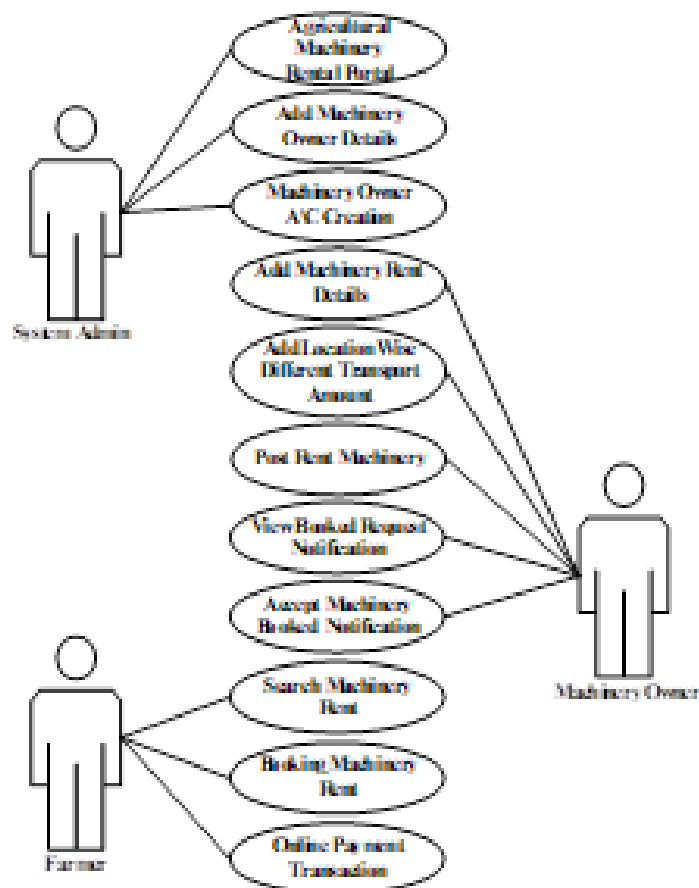
VII. CONCLUSION

AgroEcom is a web-based Agricultural Machinery Rental System that provides an online platform for farmers to rent agricultural machinery from service providers. The system is designed to be user-friendly, efficient, and secure. This Agricultural Machinery Rental System offers a various features such as equipment listing, equipment booking, payment processing, and order management. The system has several advantages over traditional offline rental systems. This system offers a more convenient and efficient way for farmers to rent agricultural machinery, eliminates the need for physical visits to rental shops, and provides a wider range of equipment options. The implementation of AgroEcom involves several stages, including system design, development, testing, and deployment. The testing phase ensures that the system is reliable, efficient, and user-friendly. Various types of testing, such as functionality testing, usability testing, compatibility testing, performance testing, security testing, user acceptance testing, and regression testing, should be conducted to ensure the system meets the required standards. Thus AgroEcom is a useful and innovative solution that can help farmers and service providers in the agricultural sector. This web-based Agricultural Rental System has the potential to improve the efficiency of agricultural machinery rental and contribute to the growth of the industry.

VIII. FUTURE ENHANCEMENT

Agricultural Machinery Rental System, has the potential for further enhancement to improve its functionality and provide a better user experience. Here are some future enhancements that could be considered:

- **Mobile App**: Developing a mobile app for AgroEcom can make it more convenient for farmers and service providers to access the system from their mobile devices.

- **Integration with Smart Farming Technologies**: AgroEcom can be integrated with smart farming technologies such as IOT sensors, drones, and AI-based systems to provide better decision-making capabilities for farmers and optimize the use of rented equipment.

- **Geographical Expansion:** AgroEcom can be expanded to cover a wider geographical area, thus reaching a broader audience and increasing the number of service providers and equipment available on the platform.

- **Multiple Languages:** Introducing support for multiple languages can enable AgroEcom to cater to farmers and service providers from different regions and countries, thus making the platform more accessible.

- **Integration with Precision Farming Technologies:** AgroEcom can be integrated with precision farming technologies, such as GPS and remote sensing, to enable farmers to optimize their farming practices and reduce their environmental impact.

- **Equipment Leasing:** Introducing equipment leasing options can provide farmers with a more cost-effective way of renting equipment, thus making the platform more attractive to users.

- **Partnering with Agricultural Service Providers:** Partnering with agricultural service providers, such as seed and fertilizer suppliers, can enable AgroEcom to offer a complete agricultural solution to farmers and service providers.

- **AI-Based Equipment Recommendation:** Implementing AI-based equipment recommendation systems can enable AgroEcom to provide personalized equipment recommendations to farmers based on their specific needs and requirements.

IX. REFERENCE

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