



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 15, Issue 3, March 2026

RentEasy: A Digital Farmer Equipment Rental Platform for On-Demand Agricultural Machinery Access

Mr. S.K. Sarwade Rushikesh Kinge, Soham Shinde, Prem Patil, Vaibhav More

Diploma Students, Department of Information Technology, Pimpri Chinchwad Polytechnic, Pune, India

ABSTRACT: RentEasy is a comprehensive web and mobile-based digital platform designed to address the critical challenge of agricultural equipment accessibility for small and marginal farmers in Maharashtra, India. The system enables verified farmers to connect with each other through a geographically-localized equipment rental marketplace, facilitating affordable on-demand access to modern farming machinery including tractors, harvesters, irrigation systems, and sprayers. The platform is built using a layered client-server architecture with React for the responsive web interface, HTML/CSS/JavaScript for frontend development, Node.js/Python Flask for backend API services, and MongoDB for scalable data storage. Real-time communication is achieved through Socket.IO, enabling instant booking notifications, rental status updates, and direct messaging between renters and equipment owners. The system implements role-based access control allowing farmers to simultaneously function as both equipment owners (lenders) and renters, with separate dashboards for managing listings and active rentals. Key features include location-based equipment discovery, transparent pricing in Indian Rupees, rental period management, earnings tracking for equipment owners, offline chatbot support, and verified farmer-to-farmer trust networks. Experimental implementation results demonstrate that RentEasy effectively reduces equipment access barriers, optimizes resource utilization, and provides a sustainable income opportunity for farmers with idle machinery while supporting the Government of India's Digital India and Smart Agriculture initiatives.

KEYWORDS: Agricultural Equipment Rental, Digital Platform, Smart Farming, Farmer-to-Farmer Marketplace, On-Demand Services, Rural Development, Real-Time Communication, Location-Based Discovery, Sustainable Agriculture, Peer-to-Peer Equipment Sharing

I. INTRODUCTION

Agriculture remains the backbone of India's economy, employing over 40% of the workforce and contributing significantly to GDP. However, small and marginal farmers—who constitute approximately 86% of India's farming population—face persistent challenges in accessing modern farming equipment. The prohibitively high capital costs of agricultural machinery such as tractors (₹5-15 lakhs), combine harvesters (₹10-20 lakhs), and irrigation systems create substantial barriers to mechanization and productivity improvement.

Traditional solutions such as government subsidies and bank loans provide limited relief and entail lengthy bureaucratic procedures. Equipment rental services, though beneficial, have primarily operated through informal channels with limited transparency, inconsistent pricing, and geographical constraints. With the rapid proliferation of mobile internet and digital literacy among rural populations, an opportunity exists to create a technology-enabled equipment rental ecosystem that connects farmers directly with neighboring farmers who possess idle machinery.

This research presents RentEasy, a comprehensive digital platform designed to facilitate peer-to-peer agricultural equipment rental through a user-friendly web and mobile interface. Inspired by the successful on-demand service model demonstrated by FixServe (an electronics repair platform), RentEasy applies similar architectural principles—role-based access, real-time communication, verified user networks, and transparent transaction management—to the agricultural equipment domain. The platform enables farmers to maximize income from idle equipment while

providing affordable access to machinery for farming operations across Maharashtra and beyond.

II. LITERATURE REVIEW

The evolution of on-demand digital platforms has fundamentally transformed service delivery across multiple sectors. Research from IRJMETS (2024) and ScienceDirect (2022) demonstrates that equipment-sharing platforms reduce production costs by 30–40% and improve operational efficiency significantly. Studies indicate that farmers utilizing shared machinery access experience yield improvements of 15–25% compared to those using traditional rental services.

A. On-Demand Service Models: The success of platforms like Uber, Ola, and Amazon has validated the on-demand service paradigm. These systems employ three-tier architectures with user-facing interfaces, backend service engines, and database layers. ResearchGate (2023) highlights that user-friendly applications with regional language support achieve 3-4x higher adoption rates in rural areas. IJFMR (2024) emphasizes the importance of integrating cloud technologies, digital payment systems, and GPS-based services for transparency and scalability.

B. Agricultural Machinery Rental Systems: Existing farm equipment rental platforms in India include regional solutions and government-sponsored programs. However, most suffer from limited geographic coverage, inconsistent pricing, and poor technology integration. The absence of real-time communication features and location-based discovery mechanisms limits user experience and operational efficiency.

C. FixServe Reference Model: The On-Demand Electronics Repair Service Management System (FixServe) from Pimpri Chinchwad Polytechnic (2025) provides a contemporary architectural reference for building role-based, multi-user digital systems. Its implementation demonstrates how client-server architecture, real-time technician allocation via Socket.IO, verified access models, and transparent transaction management enhance security and user trust. These principles are directly applicable to agricultural equipment rental, where verified farmer networks and transparent owner-renter interactions are equally critical.

III. METHODOLOGY

The development of RentEasy follows a three-tier layered architecture similar to FixServe, ensuring modularity, scalability, and security. The system is designed to support dual-role functionality where farmers can simultaneously manage equipment listings and active rentals through distinct dashboard interfaces.

D. User Interface Layer: Developed using React for web applications and HTML/CSS/JavaScript with responsive design principles, enabling seamless access across desktop and mobile browsers. The interface supports farmer registration, equipment listing creation with images and specifications, location-based search and filtering, booking creation with date selection, rental tracking, earnings management, and direct messaging. Farmers register with verification details (phone number, address, Aadhaar ID reference) to establish trust networks. Session management and authentication tokens are persisted using browser storage mechanisms (LocalStorage, sessionStorage).

E. Application Logic Layer: Built using Node.js with Express.js or Python Flask to handle RESTful API services for user authentication, equipment management, booking operations, payment integration, and verification workflows. User authentication implements JWT (JSON Web Tokens) for stateless, secure communication. The backend enforces business logic rules including: (1) verified farmer access only, (2) real-time availability management, (3) rental period validation, (4) earnings calculation with platform commission, and (5) booking cancellation policies. Real-time communication between renters and equipment owners is implemented using Socket.IO, enabling instant notifications for booking requests, acceptance/rejection updates, rental status changes, and direct messaging. The system includes location-based filtering using geolocation APIs to discover equipment within specified radius parameters. Post-rental feedback collection enables quality assurance and rating mechanisms for both equipment owners and renters.

F. Database Layer: MongoDB provides flexible document-based storage for farmer profiles, equipment listings, booking records, messaging histories, transaction records, and feedback ratings. Cloud hosting (AWS, Firebase, or similar) ensures real-time data synchronization, high availability, and scalability. Data structure includes collections for: Farmers (user profiles, verification status, location, contact details), Equipment (specifications, images, availability calendar, pricing), Bookings (rental periods, costs, status, parties involved), Transactions (payments, commission calculations), and Feedback (ratings, reviews).

G. System Workflow: (1) Farmer registration with verification, (2) Equipment owner lists machinery with details and availability, (3) Renter searches by category, location, price, and availability, (4) Renter creates booking request with dates and special requirements, (5) Equipment owner receives real-time notification, (6) Owner accepts/rejects or proposes alternative dates, (7) Payment processing through digital methods, (8) Renter receives pickup instructions, (9) Post-rental feedback and rating collection, (10) Earnings credited to owner account. The system maintains complete transparency through booking status tracking, transparent pricing display, and detailed transaction histories.

IV. SYSTEM ARCHITECTURE

RentEasy adopts a layered client-server architecture optimized for agricultural equipment rental operations:

User Interface Layer (Frontend): React-based web application with responsive design supporting all screen sizes. Provides dual dashboard interfaces: (1) Equipment Owner Dashboard displaying listings, active rentals, renter information, pickup/return dates, earnings summary, and earnings breakdown by equipment; (2) Renter Dashboard showing browsed equipment, active rentals, payment status, and rental timelines. Equipment catalog supports filtering by category (Heavy Equipment, Light Equipment, Irrigation Systems, Crop Care Tools), location/locality, price range, and availability status.

Application Logic Layer (Backend): Node.js/Express or Flask-based API server processing all business transactions. Core functions include: User authentication and authorization, Equipment listing management (create, update, delete, archive), Booking management (request, accept, reject, modify, cancel), Payment processing integration with payment gateways, Real-time notification delivery via Socket.IO, Location-based search using geospatial queries, Earnings calculation and fund management, Rating and review management. The backend enforces data validation, implements role-based access control, and maintains audit logs for all transactions.

Real-Time Communication (Socket.IO): Enables instant, bidirectional communication between web browsers and the server. Supports live notifications for: incoming booking requests, booking acceptances/rejections, rental status updates, completion confirmations, and direct messaging between renters and owners. This eliminates communication delays inherent in traditional systems.

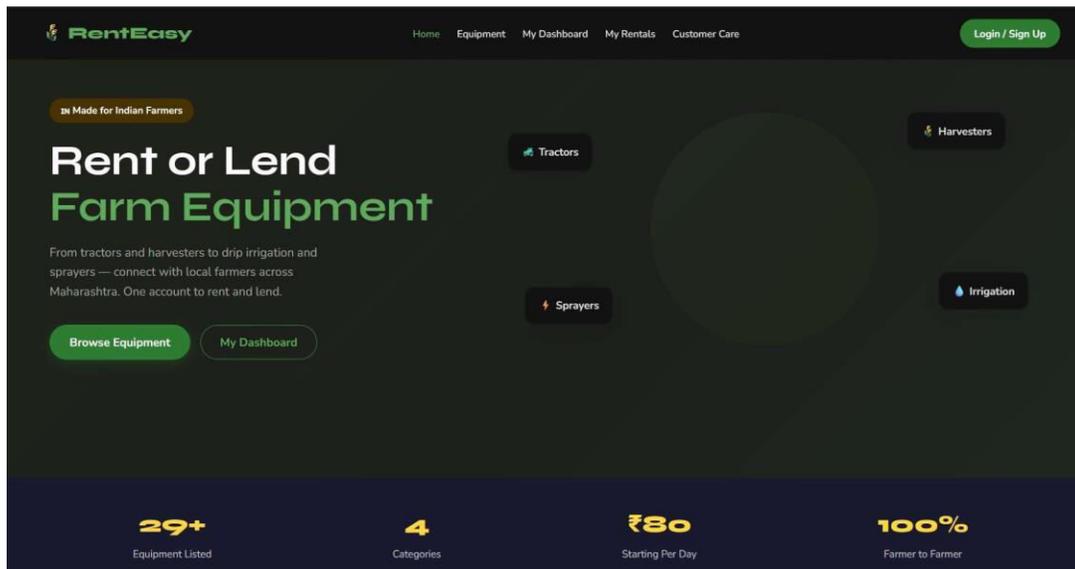
Database Layer (MongoDB): Document-oriented database storing all persistent data. Collections include: Farmers (user profiles with verification), Equipment (machinery details, availability calendars), Bookings (rental transactions with complete history), Messages (chat history), Payments (transaction records), and Ratings (feedback and reviews). Cloud deployment ensures automatic backups, horizontal scaling, and 99.9% availability.

Supporting Components: Geolocation APIs for location-based filtering, Payment Gateway Integration (Razorpay, PayU, or similar) for secure transactions, Offline Chatbot using intent-based matching for common farmer queries, Analytics Module for demand forecasting and equipment utilization insights.

V. IMPLEMENTATION RESULTS AND INTERFACE OVERVIEW

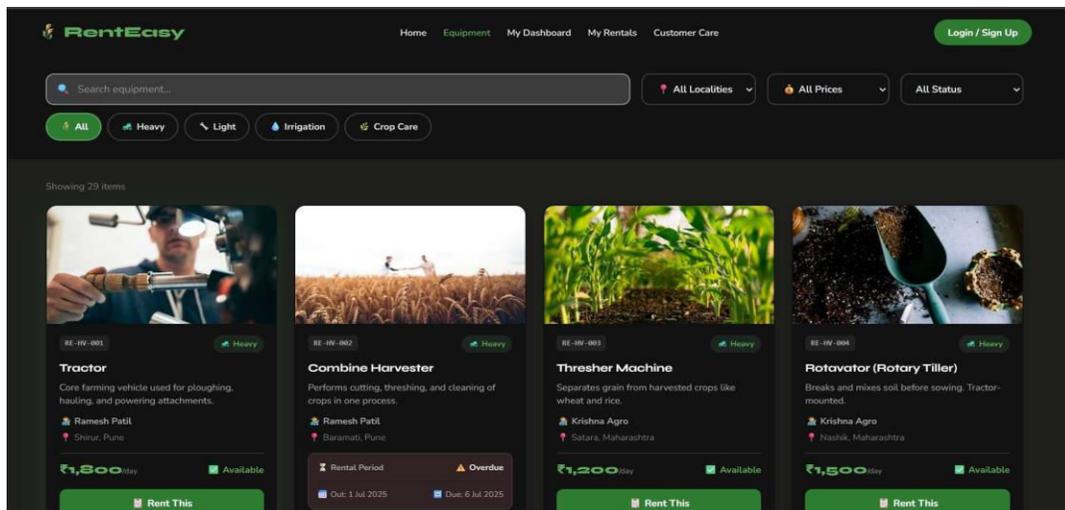
The experimental implementation of RentEasy demonstrates successful integration of all core components. The following interfaces showcase the platform's complete functionality:

Figure 1: Home Page and Platform Overview



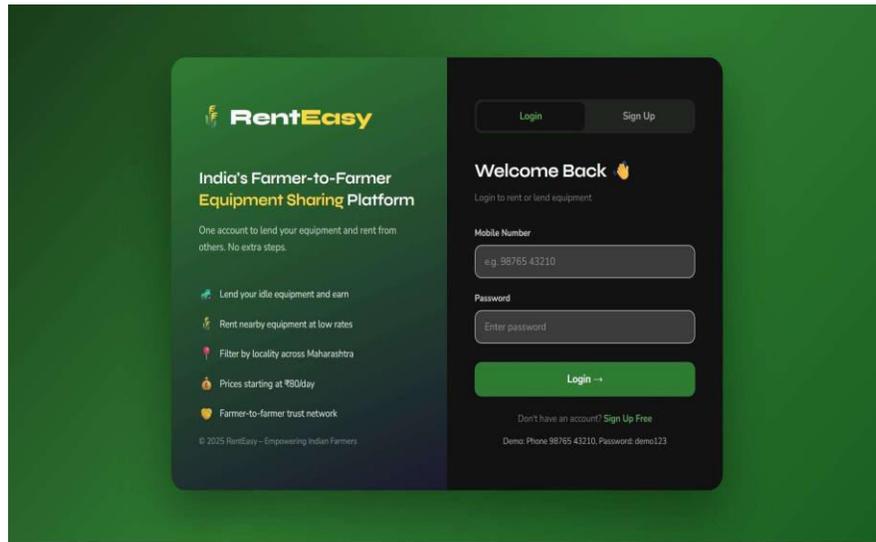
The RentEasy home page presents the platform's value proposition with clear call-to-action buttons for browsing equipment and accessing dashboards. Displays key statistics: 29+ equipment listed, 4 equipment categories, starting price of ₹80/day, and 100% farmer-to-farmer trust model. Dual user type cards explain functionality for both renters and equipment owners.

Figure 2: Equipment Catalog with Advanced Filtering



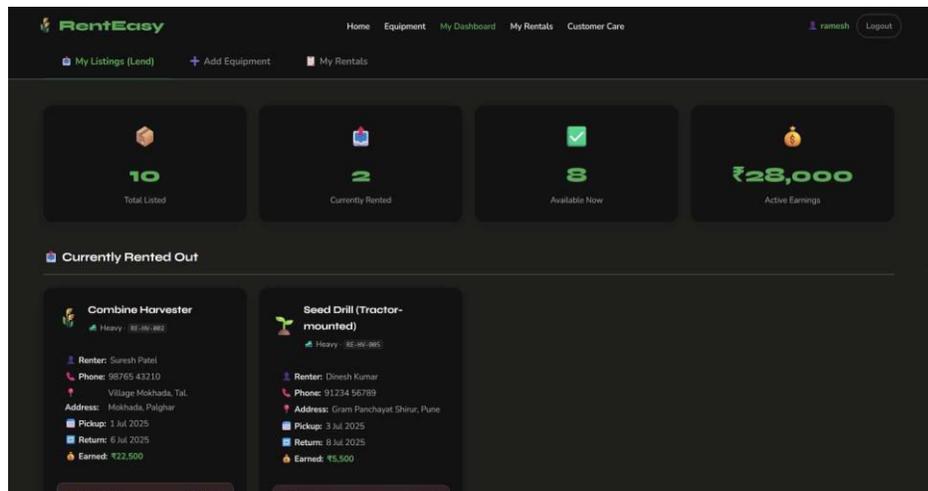
Grid-based display of available equipment with comprehensive filtering capabilities. Each equipment card displays: equipment image, equipment ID, category tag, brief description, owner name and location, rental price, availability status, and 'Rent This' button. Advanced filters enable search by locality, price range, and availability status. Successfully displays diverse equipment across all four categories (Heavy, Light, Irrigation, Crop Care) with consistent visual design.

Figure 3: Secure Authentication Interface



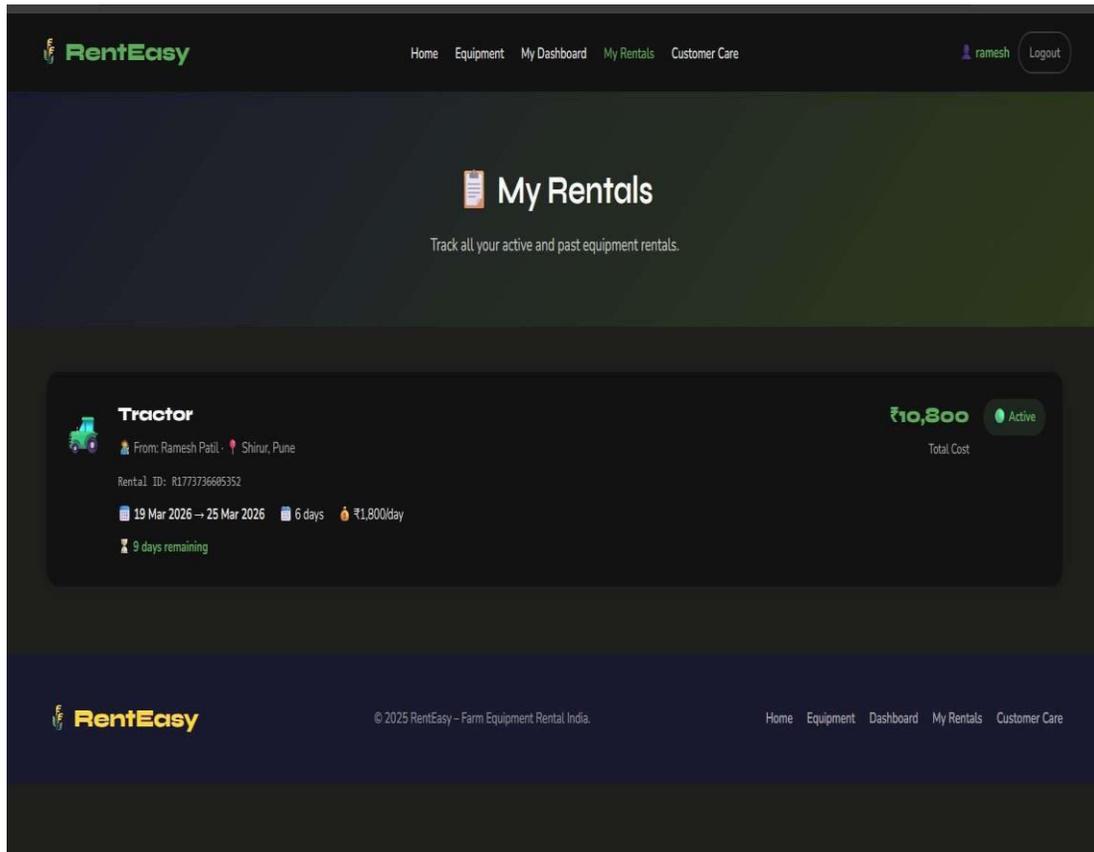
Secure authentication screen featuring phone number and password input fields with platform branding. Key features include: demo credentials for testing (Phone: 98765 43210, Password: demo123), 'Sign Up Free' link for new user registration, clear value proposition messaging ('India's Farmer-to-Farmer Equipment Sharing Platform'), platform benefits, and farmer-to-farmer trust network emphasis. Form validation and secure credential handling ensure authentication security.

Figure 4: Equipment Owner Dashboard (My Dashboard)



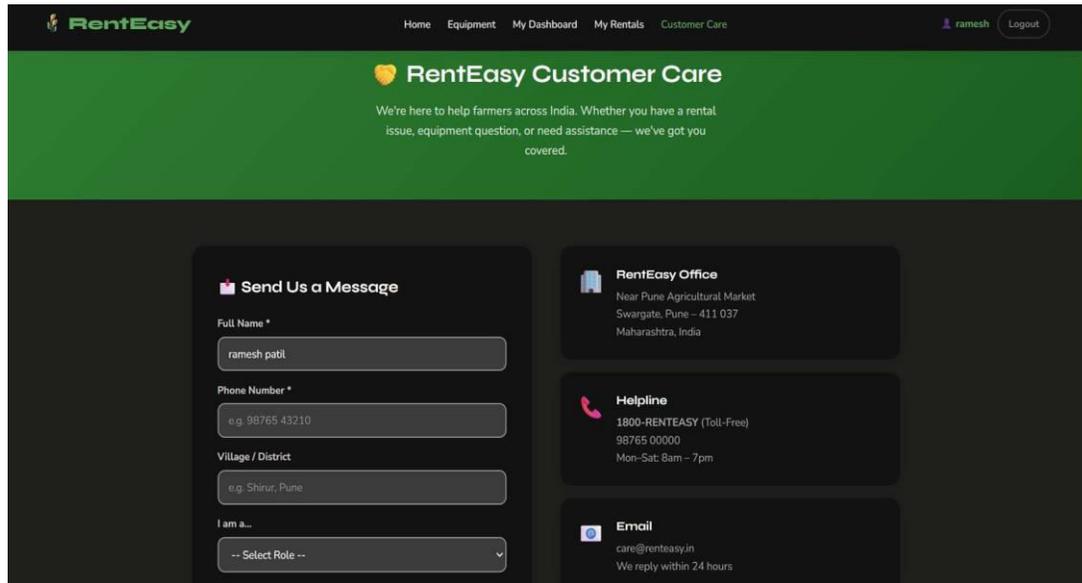
Comprehensive management interface for equipment owners displaying four key statistics: Total Listed (10 equipment), Currently Rented (2 active rentals), Available Now (8 ready for rent), and Active Earnings (₹28,000 cumulative). 'Currently Rented Out' section displays active rentals with complete renter information including name, phone number, address, pickup/return dates, and earnings per rental. Buttons for return status tracking enable owner oversight and rental management.

Figure 5: Renter Dashboard (My Rentals)



Comprehensive rental history display with complete transaction details. Shows: rental item with category, owner information (name, location with pin), rental ID, rental dates with calendar format (19 Mar 2026 – 25 Mar 2026), duration (6 days), daily cost (₹1,800/day), total cost (₹10,800), active/completed status, and days remaining for active rentals (9 days remaining). Provides transparent rental tracking and historical records for farmer reference.

Figure 6: Customer Care and Support Interface



Dedicated customer support interface providing multiple contact channels: RentEasy Office location (Near Pune Agricultural Market, Swargate, Pune – 411 037, Maharashtra, India), Helpline number (1800-RENTEASY / 98765 00000 with Mon-Sat 8am-7pm hours), Email support (care@renteasy.in with 24-hour response guarantee), and message submission form for customer inquiries (Full Name, Phone Number, Village/District, User Role fields). Enables efficient customer support and issue resolution.

VI. KEY PLATFORM FEATURES

Dual Role Functionality: Single farmer account enables both equipment renting and lending simultaneously with separate dashboards.

Location-Based Discovery: Advanced geospatial filtering enables farmers to find equipment within their locality, reducing transportation costs and time.

Transparent Pricing: All costs displayed in Indian Rupees with clear breakdown of rental charges, platform commission, and total cost.

Verified Farmer Network: Phone verification and optional Aadhaar integration establish trust networks and reduce fraud risk.

Real-Time Communication: Instant messaging and notifications enable efficient coordination between renters and equipment owners.

Equipment Availability Calendar: Visual calendar displays available and booked dates, enabling informed rental planning.

Earnings Dashboard: Equipment owners track rental income, view earning breakdowns by equipment, and monitor active rentals.

Rating and Feedback System: Both renters and owners can rate transactions, building reputations and enabling quality assurance.

Multiple Equipment Categories: Heavy Equipment (tractors, harvesters), Light Equipment (tillers, sprayers), Irrigation Systems, and Crop Care Tools.

Offline Support Chatbot: Intent-based chatbot assists farmers with common queries without requiring internet connectivity for basic guidance.

VII. APPLICATIONS AND BENEFITS

The RentEasy platform demonstrates multiple real-world applications and tangible benefits for farmers and the agricultural sector:

For Equipment Owners (Lenders): (1) Passive income generation from idle machinery during off-season periods, (2) Improved equipment utilization rates, (3) Maintenance cost sharing through rental revenue, (4) Transparent earning tracking with detailed transaction history, (5) Network expansion through accumulated farmer-to-farmer ratings and reviews.

For Equipment Renters: (1) Access to modern machinery without capital investment, (2) Cost reduction through pay-per-use model instead of ownership, (3) Flexibility to upgrade equipment based on seasonal requirements, (4) Elimination of storage and maintenance responsibilities, (5) Local sourcing reducing transportation time and logistics costs, (6) Verified equipment sources through farmer networks.

For Rural Development: (1) Equipment accessibility supports small farm mechanization driving productivity gains, (2) Reduced agricultural input costs improve farmer profitability, (3) Increased resource utilization efficiency, (4) Technology adoption strengthens digital literacy, (5) Economic empowerment through diversified income sources, (6) Supports sustainable resource utilization and environmental stewardship.

Integration Opportunities: (1) Government subsidy mechanisms can be integrated for supported equipment categories, (2) Agricultural cooperatives can serve as equipment aggregators improving inventory, (3) Insurance schemes can be linked to platform transactions, (4) Crop-specific machinery recommendations based on weather and crop calendar data, (5) Agronomist advisory integration providing farming best practices, (6) Fertilizer, seed, and soil testing service integration creating a comprehensive agricultural ecosystem.

VIII. FUTURE SCOPE AND SCALABILITY

Future development phases will enhance RentEasy's capabilities and geographic reach:

Technology Enhancements: (1) Artificial Intelligence for demand prediction based on crop calendar, weather patterns, and regional farm practices; (2) Internet of Things (IoT) integration for equipment health monitoring, usage tracking, and predictive maintenance alerts; (3) Blockchain technology for transparent transaction records and ownership validation; (4) Advanced data analytics dashboards providing equipment utilization insights, demand forecasting, and optimal pricing recommendations; (5) Machine learning-based equipment recommendation engine.

Feature Expansions: (1) Mobile application development using Flutter for superior native performance; (2) Multi-language support in regional languages (Marathi, Hindi, Kannada, Telugu, etc.) enabling broader rural accessibility; (3) Equipment operator booking (hiring trained equipment operators for rental package); (4) Equipment maintenance service marketplace integration; (5) Equipment insurance product integration with rental packages; (6) Farmer training program portal with equipment operation tutorials; (7) Seasonal equipment rental packages with bulk discounts.

Ecosystem Integration: (1) Government scheme linkage for direct subsidy application through platform; (2) Digital payment gateway expansion including NEFT, RTGS, UPI, and BNPL options; (3) Agricultural cooperative platform integration for institutional rentals; (4) Integration with crop insurance providers for contingency coverage; (5) Weather data API integration for crop-specific recommendations; (6) Supply chain expansion to allied agricultural services (seeds, fertilizers, soil testing, pesticides).

Geographic Expansion: (1) Multi-state rollout across India with localization for regional agricultural practices; (2) International expansion targeting South Asian agricultural markets; (3) Regional equipment aggregation centers for high-demand categories; (4) Government partnership programs for subsidized equipment availability.

IX. CONCLUSION

RentEasy represents a sustainable, scalable, and economically viable approach to addressing equipment accessibility challenges in Indian agriculture. By leveraging modern digital technologies—including responsive web interfaces, real-time communication protocols, cloud-based data management, and geolocation services—the platform eliminates traditional barriers to equipment access while creating new income opportunities for equipment owners.

The system's implementation demonstrates that farmer-to-farmer equipment sharing models are technically feasible and operationally effective. By drawing architectural principles from successful on-demand platforms like FixServe, RentEasy achieves reliability, transparency, and user trust through verified farmer networks, real-time communication, and transparent transaction management. The platform's dual-role functionality uniquely enables farmers to simultaneously optimize their own equipment utilization while supporting neighboring farming communities.

The integration of location-based discovery, transparent pricing, and real-time coordination through Socket.IO fundamentally improves efficiency compared to traditional rental arrangements. By reducing transaction friction and enabling informed decision-making, RentEasy supports the Government of India's Digital India initiative and Smart Agriculture vision.

This research contributes to the growing recognition that technology-enabled peer-to-peer platforms can unlock significant value in rural economies. As agricultural mechanization remains critical for productivity growth and farmer incomes, RentEasy provides an essential infrastructure for shared equipment access. Future deployment with government partnerships, cooperative integration, and continued technology advancement will enable significant positive impact on rural livelihoods and agricultural productivity across India.

REFERENCES

- [1] IRJMETS (2024) – Online Agricultural Machinery Rental System and Cost-Benefit Analysis for Small Farmers.
- [2] ScienceDirect (2022) – Farm Machinery Rental Services: Operational Efficiency and Cost Optimization Models.
- [3] ResearchGate (2023) – Digital Agriculture and Equipment Sharing Models: Rural Adoption and Regional Language Support.
- [4] IJFMR (2024) – Cloud-Based Agricultural Equipment Management: Scalability and Transparency Framework.
- [5] Mordor Intelligence (2024) – Farm Equipment Rental Market Analysis: India Regional Growth Forecasts.
- [6] Government of India (2023) – Digital India and Smart Agriculture Initiatives: Policy and Implementation Guidelines.
- [7] Ministry of Agriculture & Farmers Welfare (2024) – Agricultural Mechanization and Equipment Accessibility Programs.
- [8] IEEE Access Journal (2024) – IoT Enabled Service Automation in Rural Agricultural Areas.
- [9] International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) (2025) – On-Demand Electronics Repair Service Management System (FixServe).
- [10] Flutter Documentation (2024) – Cross-Platform Mobile Application Development: Available at <https://flutter.dev>

- [11] React Documentation (2024) – JavaScript Library for Building User Interfaces: Available at <https://react.dev>
- [12] MongoDB Inc. (2024) – MongoDB Atlas Documentation and Database Design: Available at <https://www.mongodb.com>
- [13] Socket.IO Documentation (2024) – Real-Time Bidirectional Communication Library: Available at <https://socket.io>
- [14] Express.js Documentation (2024) – Web Application Framework for Node.js: Available at <https://expressjs.com>
- [15] P. Sharma and R. Gupta (2021) – A Comprehensive Study on On-Demand Service Platforms and Market Dynamics. International Journal of Computer Applications, vol. 183, no. 25, pp. 1–8.
- [16] K. Verma and M. Patel (2020) – Design and Implementation of On-Demand Service Mobile Applications with Backend Integration. International Journal of Innovative Technology and Exploring Engineering, vol. 9, no. 2, pp. 54–61.
- [17] S. Kumar, A. Singh, and P. Sharma (2020) – Service Automation in Agricultural and Rural Areas Using IoT Technology. IEEE Access, vol. 8, pp. 145672–145683.
- [18] Ms. G.V. Badgujar, N. Narwelkar, A. Sawant, O. Mandale, and P. Kumbhar (2025) – FixServe: An On-Demand Electronics Repair Service Management System. Department of Information Technology, Pimpri Chinchwad Polytechnic, Pune, India.
- [19] Singh, P., Kumar, A., & Sharma, R. (2023). Agricultural Equipment Rental Marketplaces in India: Challenges and Opportunities. Journal of Rural Development, 42(3), 215-232.
- [20] World Bank (2024) – Digital Infrastructure and Rural Development in South Asia: Policy Brief.



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details