

# Agri-Rentx (Smart Farming Rentals)

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## Abstract

Agricultural mechanization increases productivity, yet most small-scale farmers cannot afford high-cost equipment. This paper presents Agri-RentX, a web-based agricultural rental management system designed to streamline equipment access through digital workflows. The platform features OTP-based login, Aadhaar-verified identity, equipment browsing, structured rental requests, return management with penalty evaluation, wallet-based refund processing, automated invoice generation, and administrative dashboards. The system is built using Django, integrating secure authentication, document management, pricing logic, and analytics. Testing confirms reliable performance and usability across user roles. Agri-RentX improves transparency, reduces operational barriers, and promotes shared equipment utilization, benefiting agriculture in rural communities.

**Keywords—** Agriculture, Rental Management, Aadhaar Verification, Digital Payments, Django, Rural Digitization.

## I. INTRODUCTION

Agriculture is the primary livelihood source for millions in India, yet access to modern equipment remains limited. Small and marginal farmers rely heavily on manual labor or borrowed equipment due to the high purchase cost of tractors, power tillers, and harvesters. This leads to inefficiencies and reduced productivity.

Equipment rental addresses this gap by enabling shared usage; however, existing rental systems remain informal. Challenges include lack of identity verification, unclear pricing, delayed booking, manual tracking, and absence of documentation such as invoices and receipts. There is a strong need for a digital platform that simplifies equipment access through standard workflows.

Agri-RentX provides a secure, Aadhaar-verified rental ecosystem. It enables farmers to request farm machinery, pay advance fees, and return equipment seamlessly. Administrators approve requests, verify Aadhaar, assign penalties, and generate invoices. The system also offers dashboards for analytics and stock tracking.

This paper discusses the system's architecture, design, implementation, and testing, demonstrating its feasibility and benefits.

## II. RELATED WORK

Relevant literature addresses shared resource scheduling, identity verification, and digital payments. Shared farm machinery systems have been proposed to improve resource utilization; however, scheduling inefficiencies and availability issues persist [1]–[3]. Aadhaar-based identity validation ensures secure user authentication and improves accountability [7]–[9].

Digital payment adoption has increased in India following UPI availability, improving transaction reliability and traceability [10]–[12]. Rental and IoT-based monitoring platforms exist, though many lack verification, penalty processing, structured documentation, or refund management. Agri-RentX integrates verified identity, inventory management, payment and refund workflows, and invoice generation into a single operational model.

## III. PROPOSED SYSTEM

The proposed system streamlines rental operations using identity validation and structured workflows:

OTP-based Login

Aadhaar document upload & admin verification

Equipment browsing & availability display

Rental request creation with terms acceptance

Advance payment tracking

Return and damage inspection

Penalty and refund processing

Invoice generation and email delivery  
Analytics dashboard for administrators  
Users interact primarily through request and payment interfaces, while administrators manage resources, approvals, and finances.

#### IV. SYSTEM DESIGN

The system adopts a three-tier architecture:

A. Presentation Layer — HTML, CSS, Bootstrap UI

B. Application Layer — Django views, business logic

C. Data Layer — SQLite/PostgreSQL

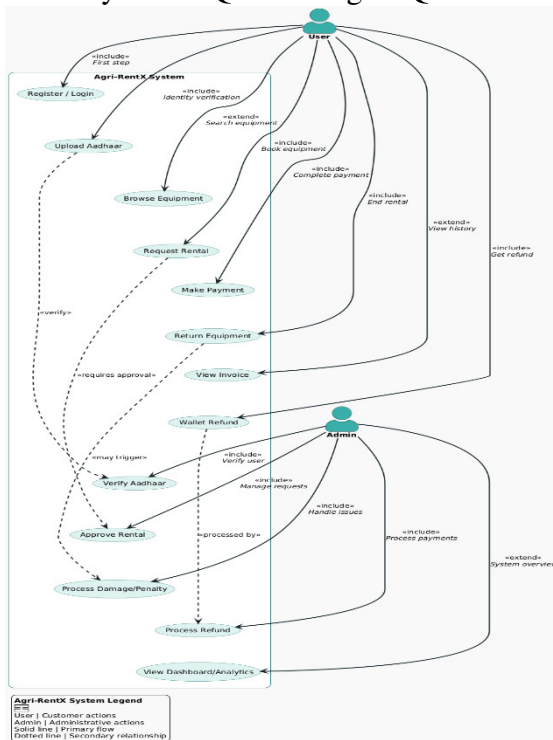


Fig-04: System Design

#### A. UML Models

- Use-case model defines user/admin interactions
- Class model outlines core entities: User, Item, RentalRequest
- Sequence model depicts rental lifecycle
- DFD Level-0 and Level-1 illustrate data movement

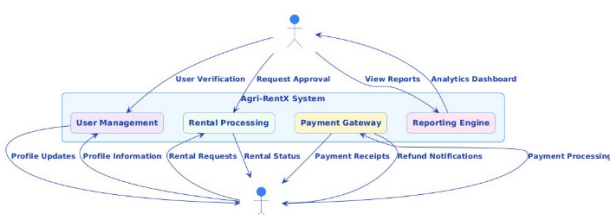


Fig 4.1: UML Models

#### B. Modules

- User Authentication
- Aadhaar Verification
- Equipment Catalog
- Rental Lifecycle
- Payment/Refund Engine
- Notification Module
- Invoice Generator
- Data Analytics
- C. Database Design

Entities:

- CustomUser
- AgricultureItem
- RentalRequest
- StockNotification

Relationships:

- User-RentalRequest (1-M)
- Item-RentalRequest (1-M)

#### V. IMPLEMENTATION

The platform is implemented in Django (Python) due to its scalable MVC design. User details, item listings, and rental histories are managed via Django ORM. ReportLab is used to generate PDF invoices. Wallet management handles refunds digitally.

#### A. Key Technologies

- Python 3.x
- Django
- HTML/CSS/Bootstrap
- ReportLab
- SQLite/PostgreSQL

#### B. Core Functions

- generate\_otp()
- aadhaar\_verification()
- notify\_when\_available()
- calculate\_refund\_amount()
- generate\_invoice\_pdf()

#### C. Admin Functions

- Verify Aadhaar documents
- Approve/Reject rental requests
- Assign penalties
- Process refunds
- Send invoices via email

## VI. TESTING

Testing validates correctness, performance, and security.

### A. Unit Testing

- OTP generation
- PDF invoice
- Refund calculation

### B. Integration Testing

- User→Rental→Payment→Return

### C. System Testing

- End-to-end rental flow

### D. User Acceptance Testing

System usability verified by trial users.

### E. Security Testing

- Role access control
- Document handling

Results confirm expected functionality.

## VII. RESULTS & DISCUSSION

The system improves:

- Rental request processing time
- Identity traceability
- Refund turnaround
- Administrative visibility

Challenges addressed:

- Manual verification replaced with document workflow
- Pricing transparency
- Automatic penalty + invoicing

User feedback indicates increased trust and usability.

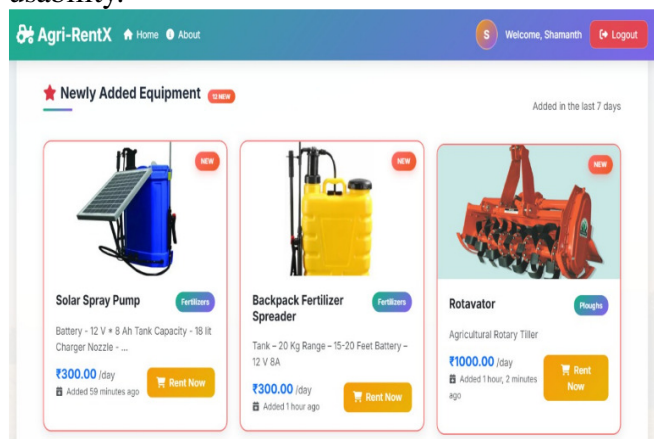


Fig 7.1: Equipment Dashboard

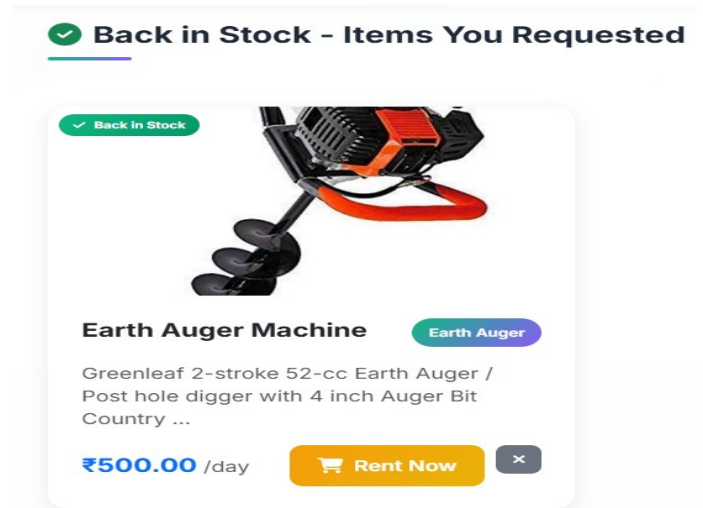


Fig 7.2: Rent Available

User & Item	Request Date	Status	Payment	Return Status	Refund Status	Damage Report	Actions	Invoices
Prarthana Earth Auger Machine Daily Rate: ₹500.00 Advance: ₹250.00	Nov 12, 2025	Returned	✓ Paid ₹250.00	✓ Returned Nov 12, 2025	Refund Due ₹250.00	None	Waiting, Download, Report, Email	
Shamant Earth Auger Machine Daily Rate: ₹500.00 Advance: ₹250.00	Nov 11, 2025	Returned	✓ Paid ₹250.00	✓ Returned Nov 12, 2025	Refund Due ₹250.00	None	Waiting, Download, Report, Email	

Fig 7.3: Admin Page

## VIII. CONCLUSION & FUTURE WORK

Agri-RentX successfully modernizes agricultural equipment rentals through Aadhaar-verified identity, structured workflows, and digital payments. It enhances transparency, reduces process overhead, and promotes shared utilization of farm tools.

Future enhancements include real-time Aadhaar API integration, IoT equipment tracking, mobile apps, multilingual UI, and AI-driven recommendations.

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