
ITE 3962 – Final Year Project

Final Report For

“Chena” Web-Based Agricultural Supply Chain Management System

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Abstract

The agricultural supply chain in Sri Lanka is characterized by the presence of multiple intermediaries, limited market transparency, inefficient logistics coordination, and unfair pricing mechanisms that disadvantage small-scale farmers. These challenges reduce farmers' income while increasing costs for end consumers. The need for a digital, transparent, and farmer-centric solution has become increasingly critical to improve efficiency and equity within the agricultural trade ecosystem.

This dissertation presents "Chena", a web-based agricultural supply chain management system designed to directly connect farmers, buyers, and transport providers through a unified digital platform. The system eliminates unnecessary middlemen by enabling farmers to list agricultural produce, buyers to place orders at transparent prices, and transport providers to offer logistics services within the same platform. Secure online payments, order tracking, automated reporting, and real-time notifications are integrated to enhance operational efficiency and trust among stakeholders.

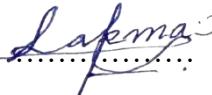
The system was developed using modern web technologies, including React.js for the frontend, Node.js for the backend, and MySQL for database management, following a structured software development methodology. Comprehensive testing was conducted to evaluate functional correctness, system reliability, and usability.

The results demonstrate that the proposed system successfully achieves its objectives by improving price transparency, reducing transaction delays, and enhancing stakeholder coordination. The platform has the potential to contribute significantly to the modernization of Sri Lanka's agricultural supply chain and can be further extended with advanced analytics, mobile integration, and large-scale deployment in future work.

Declaration of the candidate & Supervisor

The following declaration should be made by the candidate following the signature and the date.

"I declare that this is my own work, and this report does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. Also, I hereby grant to the University of Moratuwa the non-exclusive right to reproduce and distribute my report, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works."

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The above candidate has carried out work for the Bachelor of Information Technology Degree report under my supervision.

Name of the supervisor: Thumashi De Silva

Signature of the supervisor : 

Date:05/01/2026.....

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List of Abbreviations

Abbreviations	Description
Admin	Administrator
B2B	Business to Business
B2C	Business to Consumer
API	Application Programming Interface
POD	Print on Demand
UI	User Interface

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1 Chapter - Introduction

Agriculture is one of Sri Lanka's most significant sectors and is a significant contributor to food security rural livelihood and the national economy. Although it is extremely significant, the agricultural supply chain continues to be facing enormous challenges brought about by the participation of intermediaries that determine price and access to market. The farmers earn minimal profit and the buyers pay higher prices resulting in inefficiency and untransparency throughout the system.

With the unprecedented growth of digital technologies, there are chances to introduce modernization in the agricultural supply chain through direct ties between farmers buyers and transport operators. A web based solution can potentially make the marketplace more transparent and fair improve logistics coordination and allow smallholder farmers to compete equally in the new economy. The Chena project aims to counter these challenges by offering an online platform that enables agricultural trade streamlines communication amongst stakeholders and provides for fair pricing. By reducing reliance on middlemen and the exchange of real time data the system is bound to enhance trust efficiency and sustainability in the agricultural sector.

1.1 Background

The Agriculture has been the backbone of Sri Lankan economic activity that engages a large proportion of the population and provides food security for the country. The traditional agricultural value chain, though, is controlled by middlemen such as brokers and wholesalers who also control procurement of farmers' produce and retailing of consumer products. Intermediaries may create some convenience while they also reduce the farmers' margins and increase the cost for the consumer.

Smallholder producers that form the majority of farmers are negatively impacted by the system. Lack of access to real time market information poor bargaining capacity and weak logistics support constrain their ability to compete with large distributors. Buyers, however, are constrained by price transparency product availability and quality assurance. Such inefficiencies highlight the necessity of a more equitable and modernized approach to agricultural trade.

The rapid evolution of information and communication technologies has transformed many industries through the introduction of digital platforms connecting producers directly with consumers. Inspired by such innovations, the Chena project seeks to introduce similar innovations into agriculture in Sri Lanka. By providing farmers with an online platform supported by safe payment logistics coordination and data-informed insights the project aims to bring down barriers imposed by traditional supply chains and allow farmers to exert greater control over their businesses.

1.2 Problem Statement

Farming plays a major role in the economy of Sri Lanka and supports the livelihood of many families. In spite of the fact that agriculture is a major activity in rural areas, farmers still face many challenges selling their products. Most of them sell through middlemen and wholesalers for access to buyers. This gives them minimal control over prices. They normally have to sell their fruits at low farm gate prices, whereas the buyers obtain much higher prices in the market as a result of the extra costs charged by intermediaries. This chain of discrimination creates a sense of distrust between the farmers and the buyers. Farmers feel they are shortchanged for their work, and buyers also feel they are shortchanged. Small farmers have even more obstacles to overcome, since they do not possess bargaining power, good transport facility, and access to large markets. They mostly don't have the correct information about prevailing market prices or demand levels, so planning of their sales becomes even tougher for them. Transportation is yet another key issue since there is no simple way for farmers and customers

to connect with reliable service providers. Such problems reduce the agricultural supply chain efficiency, lead to financial insecurity among farmers, and limit consumers' access to fresh and cheap produce. Farmers cannot expand their markets or attain sustainable growth unless a state of-the-art and clear solution exists.

1.3 Motivation & Significance of Project

The growing use of digital platforms for commerce highlights the necessity for farmers to connect directly with buyers. Farmers can eliminate middlemen obtain good prices for their produce enhance transparency in transactions and establish trust in the supply chain.

This project is particularly significant as it provides

- Cost Savings – Farmers can enhance profit by eliminating unwanted intermediaries
- Market Expansion – Small scale farmers enjoy a greater customer base without brokers or wholesalers
- Customer Centric Approach – Direct communication enables farmers and buyers to better understand demand supply and season requirements
- Operational Efficiency – Consolidated produce listing order management logistics and reporting tools automate processes reduce delays and decrease mismanagement

To farmers in developing countries, this project is an opportunity to modernize agricultural trade increase competitiveness and achieve sustainable development while enabling consumers to enjoy fresh produce at fair and transparent prices.

1.4 Aims & Objectives

This project's primary goal is to develop and deploy a web-based agricultural supply chain management system that empowers farmers to connect directly with buyers and transport providers through a scalable user friendly and cost effective digital platform.

The specific objectives include

- Launch a fully functional platform tailored for farmers buyers and transport providers incorporating key modules such as produce listing order management logistics coordination and reporting
- Reduce dependency on traditional intermediaries by allowing farmers to list and sell their produce directly to buyers improving transparency in pricing and transactions
- Enable farmers to manage their own produce availability pricing and promotional offers through a self service dashboard
- Provide order management features that let farmers and buyers process update and track orders efficiently while coordinating transport services seamlessly
- Support stakeholder engagement by offering built in messaging review and feedback mechanisms for better communication and trust building
- Offer business insights through automated reports real time market data and product performance analytics to help farmers make informed decisions
- Maintain secure authentication and role based access for farmers buyers transport providers and admins ensuring safe and appropriate use of the platform

By achieving these objectives the project aims to redefine the agricultural supply chain model fostering a more efficient transparent and profitable marketplace for farmers and buyers while ensuring reliable logistics and fair trade practices.

1.5 Scope of the Project

The scope of the Chena Web-Based Agricultural Supply Chain Management System defines the boundaries, functionalities, user groups, and operational environments covered within the project. The system is designed to connect farmers, buyers, and transport providers through a unified digital platform that enables transparent trading, efficient logistics coordination, and secure transactions in Sri Lanka's agricultural market.

1.5.1 In-Scope

The project includes the design, development, testing, and deployment of the following capabilities:

User Management

- Registration and approval process for farmers and transport providers
- Role-based access control
- Administrator monitoring and user management

Farmer Operations

- Produce listing with pricing and availability
- Inventory management
- Order acceptance and management

Buyer Operations

- Product browsing and searching
- Order placement
- Secure online payment processing

Transport Provider Operations

- Registration and bidding/price declaration
- Transport assignment and coordination
- Delivery status updates

Transaction and Payment Handling

- Integration with a secure payment gateway (e.g., PayPal)
- Order confirmation and payment verification

Order & Logistics Management

- Order processing workflow
- Transport coordination for deliveries
- Delivery tracking interface

Reporting and Analytics

- Sales and income reports
- Order and delivery performance reports
- Farmer performance analytics

System Management

- Admin dashboard
- Platform monitoring
- Notification handling via email/SMS

Technical Scope

- Web-based system
- React.js frontend
- Node.js backend
- MySQL database
- RESTful API architecture

1.5.2 Out-of-Scope

The following aspects are not covered within the scope of this project:

- Mobile-native application (Android/iOS)

- Blockchain-based payment or smart contracts
- Advanced AI-based demand forecasting or pricing prediction
- Government policy integration or subsidy handling
- Offline transaction support
- Warehouse management system
- Physical logistics management beyond platform coordination
- Integration with banking systems beyond selected payment gateway

1.5.3 Primary Stakeholders

- Farmers: Product suppliers and primary beneficiaries
- Buyers: Consumers, retailers, wholesalers
- Transport Providers: Delivery service operators
- System Administrators: Platform management and maintenance team

1.5.4 Geographic and Operational Scope

- The system is primarily targeted for Sri Lankan agricultural markets
- Supports nationwide access subject to internet availability
- Designed for use on desktop, laptop, and mobile browsers

1.5.5 Time and Resource Scope

- Development constrained within academic project duration
- Implementation limited to prototype-to-production-ready web platform
- Scalable for future enhancements

1.5.6 Success Criteria

- Reduction of dependency on intermediaries
- Transparent pricing and fair transactions
- Improved logistics coordination
- Increased accessibility for smallholder farmers
- Secure and reliable platform operations

1.6 Intended Users / Beneficiaries

The Chena web-based Agricultural Supply Chain Management System is designed to serve a wide range of stakeholders within the Sri Lankan agricultural ecosystem. The primary intended users are small and medium-scale farmers, who will benefit from direct market access, fair pricing, reduced dependency on intermediaries, and improved visibility over their produce and business operations. These farmers gain control over listing produce, setting prices, monitoring orders, and managing logistics, thereby enhancing profitability and sustainability.

The second major user group is buyers, including wholesalers, retailers, restaurants, supermarkets, and individual consumers. They benefit from transparent pricing, assured product availability, verified supplier credibility, and access to fresh agricultural products at fair and competitive prices. The platform also supports transport providers, who gain

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

structured access to delivery requests, route visibility, and income opportunities through delivery coordination features.

Additionally, administrators and policymakers benefit indirectly as the platform provides a centralized digital system that promotes transparency, traceability, and accountability within the agricultural supply chain. This contributes toward national objectives such as food security, market stabilization, digital transformation, and rural economic empowerment.

1.7 Overview of the Proposed Solution

Chena proposes a web-based centralized digital marketplace that connects farmers, buyers, and transport providers within a unified platform, eliminating the inefficiencies and price exploitation prevalent in the traditional agricultural supply chain. The platform enables farmers to list their produce along with pricing and availability details, while buyers can browse, compare, and order products seamlessly. Integrated secure payment mechanisms ensure safe and transparent financial transactions.

Logistics coordination is facilitated through transport provider registration and delivery management features, allowing transporters to manage routes, accept delivery tasks, and update delivery statuses. Role-based dashboards ensure that each stakeholder has tailored functionalities to support their specific needs. Automated reporting, analytics, and order tracking capabilities further enhance decision-making and operational transparency.

Overall, Chena delivers a scalable, secure, and user-friendly ecosystem that strengthens trust, improves operational efficiency, and ensures equitable trade practices across the agricultural sector.

1.8 Research Questions / Key Challenges

The development of Chena is guided by several key research questions that address the gaps and challenges within the existing agricultural supply chain:

- How can digital technology be effectively utilised to connect farmers directly with buyers while ensuring trust, transparency, and fair pricing?
- What system design and functional features are essential to support efficient produce listing, order management, payment processing, and logistics coordination?
- How can the platform cater to users with varying levels of digital literacy, particularly rural farmers, while remaining intuitive and accessible?
- How can security, data privacy, and transaction integrity be maintained in an online agricultural trading environment?
- What mechanisms can be incorporated to handle operational risks such as delivery failures, price fluctuations, and order disputes?

These research questions are supported by the literature review, which critically analyses existing digital agricultural platforms and identifies technological, social, and economic barriers that must be addressed through the proposed solution.

1.9 Structure of the Report

This report is structured systematically to present the development journey of the Chena system from concept to implementation and evaluation.

- **Chapter 1** introduces the project, presenting background, problem context, motivation, objectives, intended users, scope, and an overview of the proposed solution.
- **Chapter 2** discusses the literature review and background, analysing existing systems, research findings, theoretical foundations, and technological context relevant to the project.
- **Chapter 3** presents the system specification and design, including requirements analysis, architecture design, modelling diagrams, and methodological approaches.
- **Chapter 4** explains the implementation phase, describing how the system was developed, key modules implemented, tools used, and technical challenges addressed.
- **Chapter 5** provides results and evaluation, including system testing, performance analysis, user feedback, and system validation.
- **Chapter 6** discusses future enhancements and potential improvements to strengthen system capability and scalability.
- **Chapter 7** presents the conclusions derived from the research and development activities.
- **Chapter 8** includes reflection, highlighting lessons learned, skills gained, and professional development outcomes from the project.

Supporting materials such as references and appendices are provided to ensure completeness and academic integrity.

1.10 Summary of Chapter 1

Chapter 1 presented an overview of the Chena Web-Based Agricultural Supply Chain Management System, outlining the motivation, context, and importance of the project within Sri Lanka's agricultural sector. The chapter highlighted how the existing agriculture supply chain is heavily dominated by intermediaries, leading to price manipulation, reduced farmer profitability, lack of transparency, and inefficiencies that negatively affect both farmers and buyers. This background established the foundation for identifying the real-world problem that Chena aims to address.

The aims and objectives of the project were then defined, emphasizing the development of a scalable, user-friendly, and secure digital platform that directly connects farmers, buyers, and transport providers. The project intends to introduce fair pricing mechanisms, efficient logistics coordination, transparent transactions, and data-driven decision support tools to enhance operational efficiency across the supply chain. The intended users and beneficiaries of the proposed system were also identified, clarifying how each stakeholder gains value through improved accessibility, communication, cost reduction, and market expansion.

The proposed solution overview provided insight into how Chena will operate as a centralized platform integrating key functionalities such as product listing, order processing, secure payments, logistics coordination, reporting, and stakeholder engagement. Furthermore, the chapter briefly discussed the broader research challenges, including technological constraints, system trustworthiness, user adoption, integration dependencies, and the need for secure and reliable infrastructure.

Finally, the chapter outlined how the rest of the report is structured, guiding the reader on what to expect in subsequent chapters, such as literature review, system specification and design, implementation, evaluation, future enhancements, and conclusions. Overall, Chapter 1 established the foundation of the project by clearly defining the problem, justification, objectives, proposed solution direction, and the value the Chena system aims to deliver to the Sri Lankan agricultural ecosystem.

2 Chapter - Literature Review

2.1 Introduction to Chapter

This chapter presents a comprehensive review of the agricultural supply chain domain, existing digital agricultural platforms, and previously proposed technological interventions. It critically evaluates how current systems operate, identifies their limitations, and highlights the issues faced by farmers, buyers, and logistics providers. The objective of this review is to understand the broader research context, recognize key shortcomings in existing solutions, and justify the need for a system such as Chena, which integrates farmers, buyers, and transport providers within a unified digital environment.

2.2 Wider Context of Agricultural Supply Chains

Agricultural supply chains play a crucial role in ensuring food security, economic stability, and livelihood generation, particularly in developing countries like Sri Lanka. Traditionally, agricultural distribution involves multiple intermediaries such as wholesalers, brokers, retailers, and logistics handlers before produce reaches the final consumer. While intermediaries provide certain support functions, their dominance often results in reduced profit margins for farmers and inflated costs for consumers.

With advancements in Information and Communication Technologies (ICT), many countries have begun modernizing agricultural operations through online trading platforms, market information systems, and digital logistics coordination. These developments demonstrate the potential of ICT-enabled agricultural ecosystems to enhance transparency, improve pricing fairness, and empower small-scale farmers.

2.3 Problem Landscape in Traditional Agricultural Supply Chains

Despite the importance of agriculture, traditional supply chains continue to face several challenges:

- Lack of price transparency leading to exploitation of farmers.
- Dependency on intermediaries, resulting in reduced farmer income.
- Limited access to broader markets, restricting business growth.
- Poor logistics coordination causing delays and post-harvest losses.
- Inadequate trust between stakeholders.
- Limited use of digital tools to manage operations and transactions.

These persistent challenges highlight the need for a digital, coordinated, and equitable agricultural trading platform.

2.4 Stakeholders in the Problem Domain

The agricultural supply chain involves multiple stakeholders, each affected differently by existing inefficiencies:

Farmers

Suffer from unfair pricing, limited bargaining power, restricted market access, and logistical difficulties.

Buyers

Face higher prices, limited visibility of product origins, and inconsistencies in product availability and quality.

Transport Providers

Lack structured opportunities to engage with agricultural trading platforms and face difficulties in managing delivery schedules and costs.

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Government and Agricultural Authorities

Are affected by lack of data transparency, reduced regulatory visibility, and challenges in supporting farmer welfare.

Recognizing stakeholder needs is essential in shaping a solution like Chena.

2.5 Review of Existing Similar Systems

In this section, the existing similar systems are analyzed and critically evaluated for their strengths and weaknesses.

2.5.1 Good Market (<https://online.goodmarket.lk/>)



Figure 1- Good Market Online Selling Platform

Pros

- Fair pricing model that supports both sellers and customers.

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- Encourages sustainable and healthy products.

Cons

- No feature to directly connect farmers with buyers on a large scale.
- No option to add or coordinate transport providers for delivery services.

2.5.2 Kapruka (<https://www.kapruka.com/>)

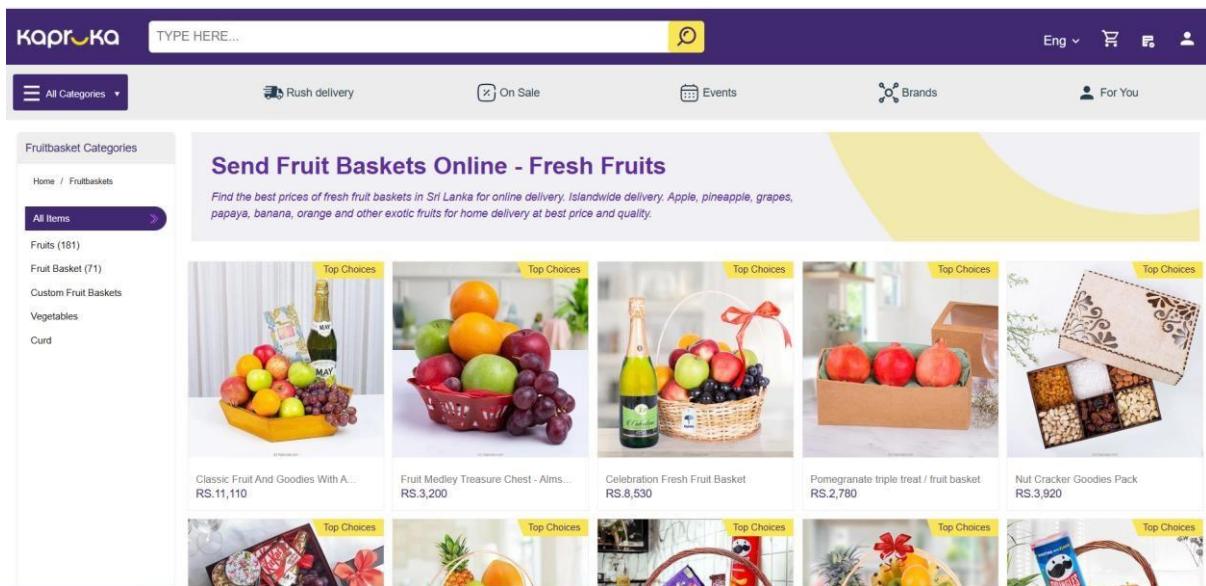


Figure 2 - Kapruka Online Selling Platform

Pros

- Well designed platform with wide customer reach.
- Convenient for online ordering and delivery in urban areas.

Cons

- High cost for fruits and vegetables compared to market price.
- No option for farmers or transport providers to join and list their services.

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2.5.3 Go4fresh (<https://go4fresh.com/>)

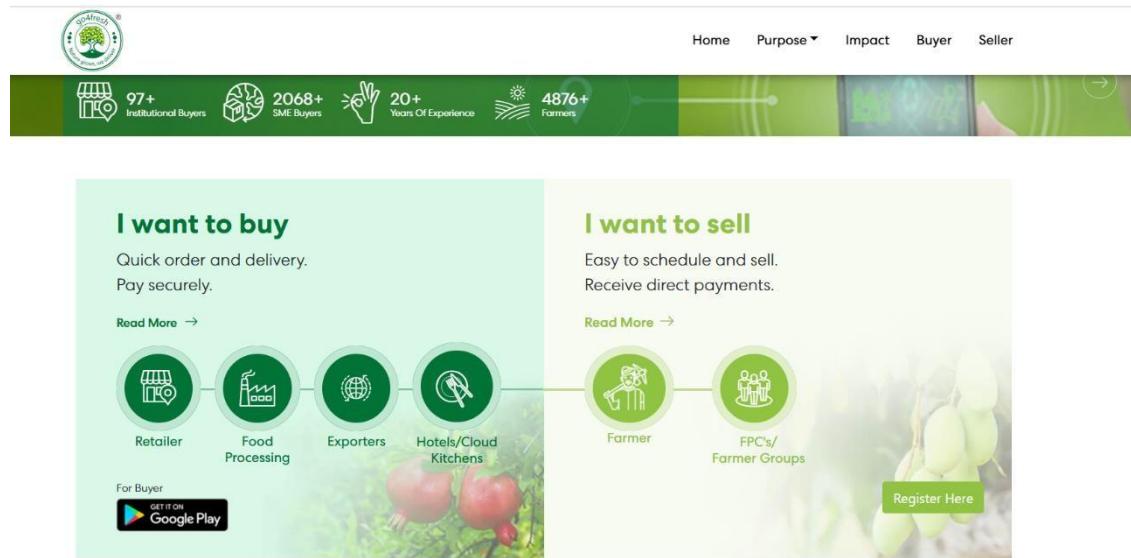


Figure 3- Go4fresh Online Selling Platform

Pros

- Provides a platform to connect farmers directly with customers.
- Integrated with multiple apps for wider accessibility and convenience.

Cons

- No dedicated feature to connect or manage transport providers.
- Limited focus on full supply chain management beyond basic farmer–customer interaction.

2.5.4 The Good Food Collective (<https://www.thegoodfoodcollective.co.nz/>)

This is farmers online market place in New Zealand.



Figure 4- The Good Food Collective Online Selling Platform

Pros

- Fair pricing supported by New Zealand government regulations.
- Promotes sustainable and healthy food options.

Cons

- No direct connection between farmers and transport providers.
- Limited flexibility for farmers to manage their own sales.

2.5.5 Whole Foods House (<https://onlinestore.wholefoodshouse.com.au/>)

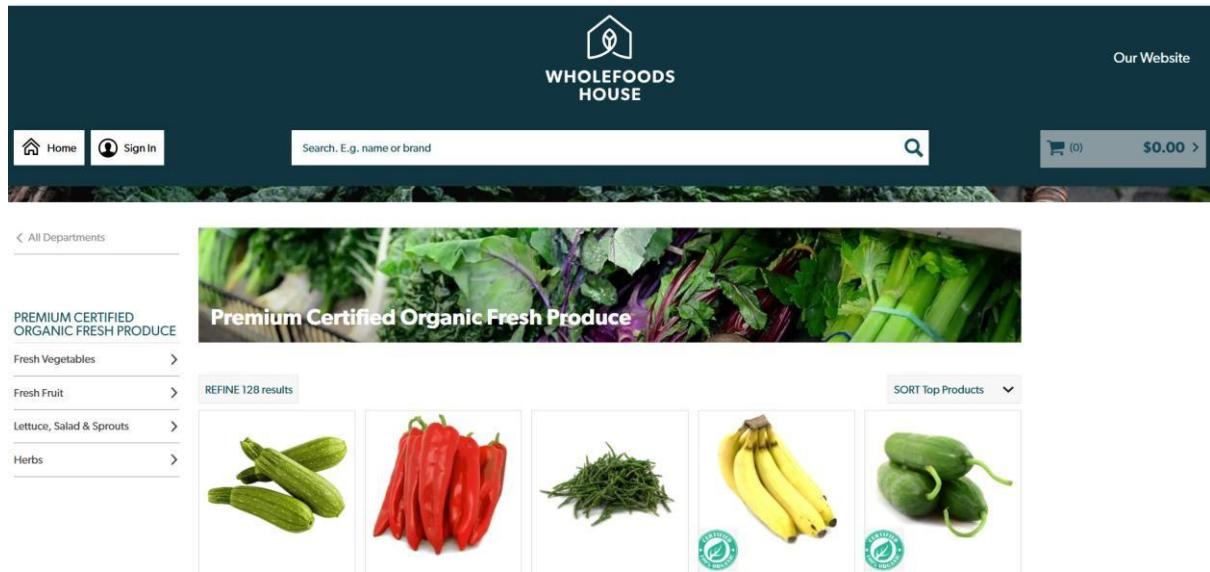


Figure 5- Whole Foods House Online Selling Platform

Pros

- Fair pricing model for consumers in Australia.
- Trusted for quality and sustainability.,

Cons

- Limited product variety compared to wider marketplaces.
- No option to involve farmers and transport providers directly in the system.

2.6 Summary Comparison of Existing Systems

Feature	Good Market	Kapruka	Go4Fresh	The Good Food Collective	Whole Foods House
Business Model	Online marketplace for local produce.	Online store and delivery service.	Online platform connecting farmers and customers.	Online and physical market for healthy foods.	Retail store with some online sales.
Target Users	Farmers, consumers, small vendors.	General customers.	Farmers and consumers.	Consumers and registered vendors.	Consumers in Australia.
Farmer Access	No direct connection for farmers.	No direct connection for farmers.	Direct connection for farmers.	No direct connection for farmers.	Limited farmer interaction.
Transport Provider Access	No option.	No option.	Farmers can select transport providers.	No option.	No option.
Pricing	Fair pricing.	High cost for produce.	Fair and transparent pricing.	Fair pricing based on regulations.	Fair pricing.
Product Variety	Local fruits and vegetables.	Fruits, vegetables, groceries.	Wide range of fresh produce.	Sustainable and healthy foods.	Limited products.
Ease of Use	Easy for buyers.	Easy for buyers.	Easy for farmers and buyers.	Easy for buyers.	Easy for buyers.
Market Reach	Local customers.	Urban customers.	Local and regional.	New Zealand focused.	Australia focused.

Integration	Basic online platform.	Standalone.	Integrated with transport selection.	Limited online features.	Standalone.
Analytics & Insights	Basic sales tracking.	Limited analytics.	Basic insights for farmers and buyers.	Limited analytics.	Limited analytics.

Table 1 - comparative analysis table for the existing systems

2.7 Identified Research Gap

The review reveals a clear research and system implementation gap:

- No Sri Lankan solution offers a platform that integrates trading, logistics, pricing transparency, and communication.
- Existing platforms prioritize vendors rather than empowering farmers.
- Lack of mechanisms to promote trust through transparent data sharing.
- Insufficient digital support for operational decision-making in agriculture.

Chena aims to bridge this gap by providing an end-to-end integrated agricultural supply chain management platform.

2.8 Link to Research Questions and Project Aim

The findings of this literature review directly inform the project's research direction. The identified limitations guide the formulation of research questions such as:

- How can farmers be connected directly to buyers while ensuring fairness and transparency?
- How can transport providers be systematically integrated into agricultural transactions?
- How can technology improve operational efficiency and decision-making in agriculture?

These research challenges align with Chena's aim to develop a scalable, transparent, and farmer-empowering web-based agricultural supply chain management system.

2.9 Summary of Chapter 2

This chapter provided a comprehensive review of the literature and existing digital platforms related to agricultural supply chain management. It first examined the broader agricultural context, highlighting inefficiencies and challenges within traditional supply chains such as price manipulation by intermediaries, lack of transparency, limited farmer bargaining power, and weak logistics support. The discussion further outlined the key stakeholders in the agricultural ecosystem, including farmers, buyers, transport providers, administrators, and consumers, emphasizing their roles and expectations in a modernized digital supply chain environment.

The review then critically evaluated several existing platforms, including Good Market, Kapruka, Go4Fresh, The Good Food Collective, and Whole Foods House. Each system demonstrated valuable strengths such as fair pricing, sustainability focus, strong customer reach, and digital accessibility. However, the evaluations also revealed significant limitations, particularly the absence of direct farmer-buyer connections, lack of integrated transport coordination, limited control for farmers over pricing and operations, and inadequate support for full supply chain management. These constraints highlighted why existing solutions cannot fully address the unique challenges faced by Sri Lankan farmers and buyers.

From this evaluation, a clear research gap emerged — the need for a comprehensive, end-to-end web-based platform that not only connects farmers directly with buyers but also integrates transport providers, secure payment processing, real-time communication, and analytical support for informed decision-making. This gap provides strong justification for the development of the Chena Web-Based Agricultural Supply Chain Management System, which aims to create a transparent, efficient, and equitable agricultural marketplace. The findings of this chapter directly inform the research questions and shape the design and implementation direction discussed in the subsequent chapters.

3 Chapter – System Specification, Design and Methodology

3.1 Introduction to Chapter

This chapter presents the detailed system specification, architectural design, and development methodology adopted for the implementation of the Chena Web-Based Agricultural Supply Chain Management System. It provides a comprehensive description of the functional and non-functional requirements, system scope, assumptions, constraints, and architectural decisions. Additionally, the chapter explains the system components, data design, processing logic, and the development approach used to ensure scalability, security, and usability. This chapter serves as the technical foundation that demonstrates how the proposed solution addresses the challenges identified in earlier chapters.

3.2 System Specification

The system specification defines what the Chena platform is expected to achieve in terms of functionality, performance, and operational behavior. It outlines the business model, system scope, functional and non-functional requirements, and the constraints under which the system is developed.

3.2.1 Business Model and System Scope

The Chena system follows a direct-to-market digital business model, where farmers can sell agricultural produce directly to buyers without relying on traditional intermediaries. Transport providers act as independent service providers who support delivery operations by offering competitive pricing based on vehicle type and distance.

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The system scope includes:

- Enabling farmers to list, manage, and sell agricultural products online
- Allowing buyers to browse products, place orders, and make secure payments
- Supporting transport providers in managing delivery services
- Providing administrators with full system oversight and control

The system does not aim to replace physical marketplaces but instead complements them by introducing transparency, efficiency, and digital coordination across the agricultural supply chain.

3.2.2 Functional Requirements

This section defines the functional capabilities that the Chena Web-Based Agricultural Supply Chain Management System must provide in order to achieve the stated project aims. The functional requirements are grouped according to major system domains: User Management, Product & Order Management, Transport & Delivery, and Payment & Reporting.

User Management

The system must manage multiple user roles with controlled access to ensure security, accountability, and smooth operation of the platform.

Functional Requirements

FR-UM-01: The system shall allow three user types (Farmers, Buyers, and Transport Providers) to register independently by providing their required personal and business details.

- FR-UM-02: The system shall create user accounts immediately upon successful registration without requiring administrator approval.
 - FR-UM-03: The system shall provide an administrator account pre-created by the system, which cannot be registered through the public registration process.
-

- FR-UM-04: The system shall assign role-based access to users based on their selected user type (Farmer, Buyer, Transport Provider, or Administrator).
- FR-UM-05: The system shall allow users to change their passwords after registration to maintain account security.
- FR-UM-06: The system shall provide four separate dashboards, each mapped to a specific user role (Farmer, Buyer, Transport Provider, Administrator), displaying role-specific functionalities.
- FR-UM-07: The system shall restrict access to system functionalities based on user roles to prevent unauthorized access.

Product & Order Management

This module enables farmers to manage produce listings and buyers to place and manage orders efficiently.

Functional Requirements

- FR-POM-01: The system shall allow approved farmers to add, update, and remove agricultural product listings.
- FR-POM-02: Each product listing shall include details such as product name, category, description, price, and available quantity.
- FR-POM-03: The system shall display real-time product availability to buyers.
- FR-POM-04: The system shall allow buyers to search, browse, and filter products based on category, price, and availability.
- FR-POM-05: The system shall allow buyers to place orders for selected products.

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- FR-POM-06: The system shall verify product availability before confirming an order.
- FR-POM-07: The system shall automatically update inventory levels after order confirmation.
- FR-POM-08: The system shall record all order details, including order date, quantity, total price, and order status.

Transport & Delivery Management

This module supports logistics coordination by integrating transport providers into the supply chain.

Functional Requirements

- FR-TDM-01: The system shall allow transport providers to register vehicle details, including vehicle type and price per kilometer.
 - FR-TDM-02: The system shall allow administrators to review, manage, and update transport pricing information.
 - FR-TDM-03: The system shall assign delivery requests to available transport providers.
 - FR-TDM-04: The system shall allow transport providers to accept and manage delivery assignments.
 - FR-TDM-05: The system shall allow transport providers to update delivery status (e.g., picked up, in transit, delivered).
 - FR-TDM-06: The system shall provide real-time order delivery tracking to buyers and farmers.
 - FR-TDM-07: The system shall notify relevant stakeholders of delivery status changes via system notifications.
-

Payment and Reporting

This module ensures secure financial transactions and provides analytical insights to stakeholders.

Payment Management

- FR-PR-01: The system shall integrate a secure third-party payment gateway (PayPal) for online transactions.
- FR-PR-02: The system shall redirect buyers to the payment gateway during checkout.
- FR-PR-03: The system shall record payment status (successful, failed, pending) for each transaction.
- FR-PR-04: The system shall ensure that order confirmation occurs only after successful payment.

Reporting and Analytics

- FR-PR-05: The system shall generate sales and income reports for farmers.
- FR-PR-06: The system shall generate order, delivery, and platform performance reports for administrators.
- FR-PR-07: The system shall provide historical sales data and farmer performance reports.
- FR-PR-08: The system shall support analysis of market demand trends, pricing patterns, and product performance.

3.2.3 Non-Functional Requirements

Non-functional requirements define the quality attributes, constraints, and operational characteristics of the Chena Web-Based Agricultural Supply Chain Management System. These requirements ensure that the system not only performs its intended functions but also operates efficiently, securely, and reliably under real-world conditions.

Performance

The system must provide acceptable response times for all critical user interactions. Product searches, order placement, payment processing, and report generation should be completed within a reasonable time frame, even during peak usage periods. The platform is expected to support concurrent access by multiple farmers, buyers, transport providers, and administrators without noticeable degradation in performance. Efficient database queries and optimized API responses are essential to maintain smooth system operation.

Reliability

The Chena platform must be reliable and consistently available to users, particularly during active trading hours. The system should handle unexpected failures gracefully, ensuring that data such as orders, payments, and delivery updates are not lost or corrupted. Backup mechanisms and error-handling procedures must be in place to recover from system crashes or network interruptions. Reliability is critical to maintaining user trust and ensuring uninterrupted agricultural transactions.

Security

Security is a critical non-functional requirement of the system. All communications between users and the platform must be secured using HTTPS protocols. Sensitive information such as user

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credentials and payment-related data must be encrypted and stored securely. Role-based access control must be enforced to ensure that only authorized users can access specific system functionalities. Integration with trusted third-party payment gateways such as PayPal further enhances transaction security and reduces financial risk.

Scalability

The system must be scalable to accommodate future growth in users, transactions, and data volume. The modular architecture and use of RESTful APIs allow the platform to be extended with new features such as mobile applications, advanced analytics, or integration with government and logistics systems. The database and server infrastructure should support increased workloads without requiring major architectural changes.

Usability

The platform must be user-friendly and accessible to users with basic digital literacy, including farmers from rural areas. The user interface should be intuitive, consistent, and easy to navigate across different devices such as desktops, laptops, tablets, and smartphones. Clear visual layouts, simple workflows, and informative feedback messages are essential to ensure a positive user experience. Adhering to established UI design standards improves usability and reduces the learning curve for new users.

3.2.4 Assumptions and Dependencies

Assumptions

- Users will have access to a stable internet connection.
- Farmers, transport providers, and buyers have basic digital literacy.
- Availability of secure third-party payment gateways to ensure reliable transactions.

Dependencies

- The project relies on the Bootstrap framework for responsive UI design.
- External logistics providers must integrate with the platform for delivery operations.
- Integration with third-party APIs for payment processing.

3.2.5 Design and Implementation Constraints

Technological Constraints

- Must use MySQL as a database and node.Js for backend development.
- Frontend development is restricted to React.Js , JavaScript and Bootstrap.

Hardware Limitations

The system must operate efficiently on devices with a minimum of 4GB RAM and 1.5 GHz processor.

Security Considerations

All communications must be used by HTTPS, and sensitive data must be encrypted.

Design Standards

Must follow Material Design principles for user interfaces to ensure consistency and usability.

User Documentation

The following user documentation components will accompany the software:

- User Manual provided as pdf
- Online Help give by using FAQ forum

3.3 System Architecture

The Chena Web-Based Agricultural Supply Chain Management System is designed using a modular and layered architecture to support direct interaction between farmers, buyers, transport providers, and administrators. The system architecture ensures scalability, security, maintainability, and efficient communication between all system components while eliminating the need for intermediaries.

The architecture integrates software, database, and hardware components to form a cohesive platform that supports agricultural product listing, order processing, payment handling, delivery coordination, and reporting functionalities.

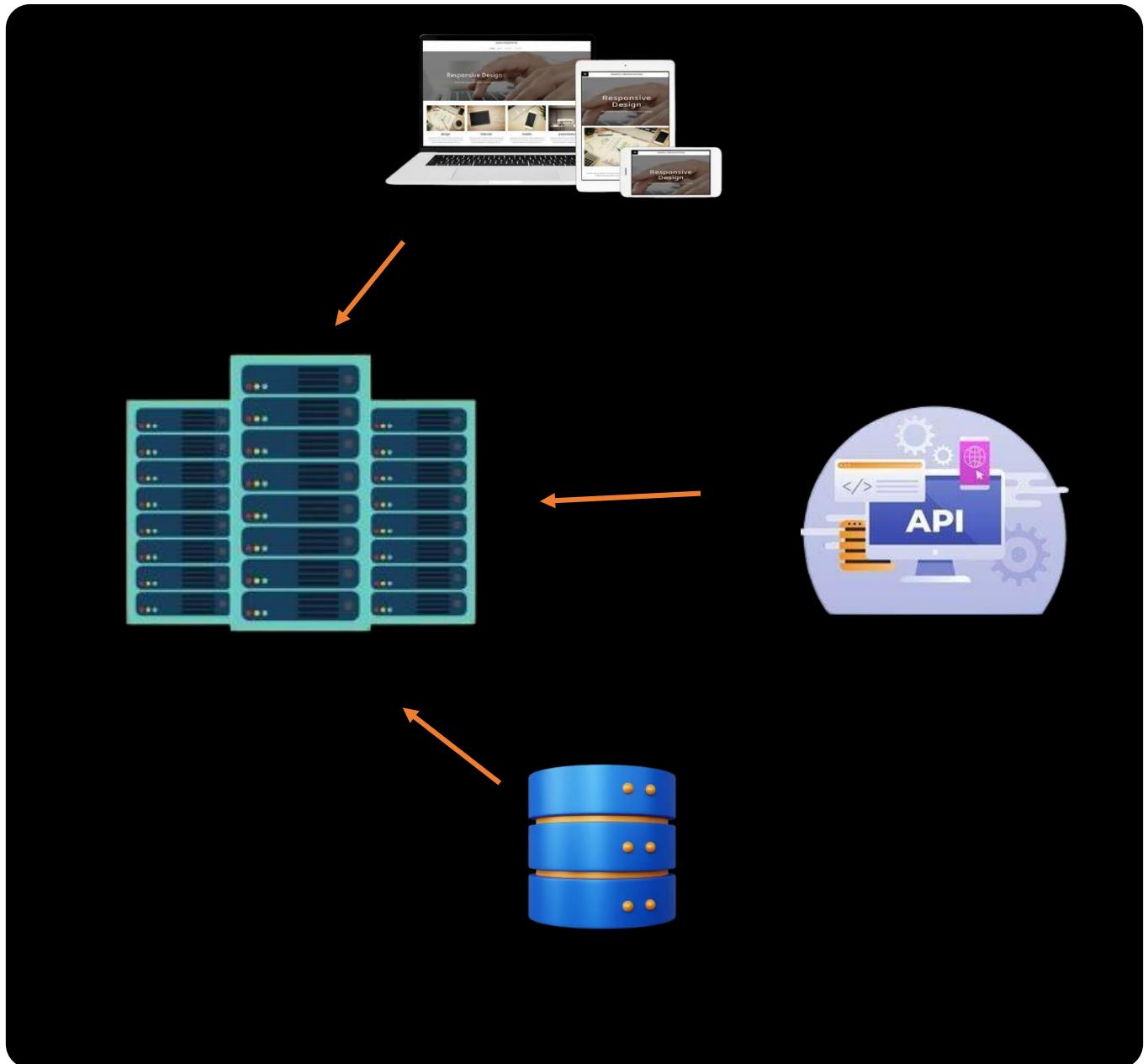
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Figure 6 - System Architecture

3.3.1 Overall System Architecture Overview

The system follows a web-based client–server architecture. Users access the platform through standard web browsers on desktops, laptops, or mobile devices. The frontend handles user interaction and presentation, while the backend processes business logic and communicates with the database and external services.

All client requests are transmitted securely using HTTP/HTTPS protocols to ensure data protection. The backend manages authentication, authorization, transaction processing, and coordination between system modules.

3.3.2 Context and Origin

The Chena platform was developed in response to persistent challenges faced by Sri Lankan farmers, particularly smallholder cultivators, such as unfair pricing, lack of market access, and dependency on intermediaries. The system leverages modern web technologies to create a transparent, scalable digital marketplace.

By directly connecting farmers, buyers, and transport providers, the system redefines the traditional agricultural supply chain and empowers stakeholders with tools for improved control, visibility, and profitability.

3.3.3 Relation to Larger Systems

Although Chena operates as a standalone web-based system, it is designed to integrate with external systems to enhance its functionality. These integrations support secure and efficient operations across the supply chain.

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- **Payment Gateway Integration**

Secure payment services such as PayPal are integrated to enable encrypted online transactions between buyers and farmers.

- **Logistics and Notification Systems**

The platform can integrate with third-party logistics services, SMS, and email notification systems to improve delivery coordination and user communication.

These integrations allow the system to evolve with user needs while maintaining flexibility and scalability.

3.3.4 Major System Components

The system architecture consists of multiple interconnected components that work together to deliver a seamless user experience:

- **User Interfaces**

Accessible through web browsers on desktops and mobile devices. Role-based dashboards are provided for farmers, buyers, transport providers, and administrators.

- **Backend System**

Handles core functionalities including user authentication, inventory management, order processing, payment validation, delivery coordination, and report generation through RESTful APIs.

- **External APIs**

Integrated APIs support PayPal payment processing and SMS/email notifications to keep users informed about transactions and delivery updates.

- **Data Storage**

A centralized MySQL database stores user data, product listings, order details, transaction records, transport information, and feedback securely.

These components collectively ensure reliable data flow, secure transactions, and efficient system operation.

3.4 Detailed System Design

This section describes the detailed design of the Chena Web-Based Agricultural Supply Chain Management System, focusing on how system components, user interfaces, and interactions are structured to support the functional requirements identified earlier. The design emphasizes usability, transparency, and efficient coordination among farmers, buyers, transport providers, and administrators. The system follows a modular and role-based design approach to ensure scalability, maintainability, and ease of use.

3.4.1 User Interface Design

The user interface of the Chena platform is designed to be simple, intuitive, and role-specific, ensuring that users with varying levels of technical expertise can interact with the system effectively. The interface is accessible through standard web browsers on desktops, laptops, smartphones, and tablets.

The platform follows consistent design standards to provide a uniform look and feel across all user roles while displaying only relevant features to each user type. Navigation is structured to minimize complexity and reduce the learning curve, particularly for farmers and buyers with basic digital literacy.

User Dashboards

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The system provides dedicated dashboards for each user category, enabling efficient access to role-specific functionalities are ,

- **Farmer Dashboard**

Allows farmers to list and manage produce, update prices and quantities, view and manage orders, coordinate with transport providers, and monitor sales, income, and performance reports.

- **Buyer Dashboard**

Enables buyers to browse available products, place and manage orders, track delivery status, and complete secure payments.

- **Transport Provider Dashboard**

Supports transport providers in managing delivery assignments, updating transport prices based on vehicle type and distance, optimizing schedules, and updating delivery status.

- **Administrator Dashboard**

Provides full access to system management features including user approval, role management, monitoring system activity, managing transport pricing, and generating analytical reports.

Each dashboard presents real-time information relevant to the user's role, ensuring efficient task execution and improved transparency across the supply chain.

Wireframes (already in appendix — reference here)

3.4.2 System Features Design

This section describes the detailed design of the core system features implemented in the Chena Web-Based Agricultural Supply Chain Management System. Each feature is designed to support efficient interactions among farmers, buyers, transport providers, and

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administrators while ensuring transparency, security, and ease of use across the agricultural supply chain.

The User Management feature controls access to the system and defines role-based permissions. Farmers and transport providers are allowed to self-register by submitting their personal and professional details. These registrations remain pending until reviewed and approved by an administrator, ensuring platform security and authenticity. Buyers are not required to register and are allowed to browse products and place orders directly.

Administrators manage user roles, permissions, and transport pricing details through the admin dashboard. All sensitive actions are logged to maintain accountability and system integrity.

3.4.2.1 User Registration

The User Registration feature enables controlled onboarding of farmers and transport providers. During registration, users submit required information such as personal details, business information, and vehicle details (for transport providers). The system stores these requests securely and notifies administrators for approval.

Only approved users gain access to system functionalities based on their assigned roles. This approach ensures that unauthorized users cannot misuse platform services while maintaining trust among stakeholders.

3.4.2.2 Product Management

Product Management allows approved farmers to list, update, and manage agricultural products. Each product includes details such as name, description, price, available quantity, and category. Product listings are displayed in real time, enabling buyers to view up-to-date availability and pricing information.

The system validates all product data to prevent incomplete or incorrect listings. Farmers can modify or remove products as stock levels or pricing change, ensuring accurate market representation.

3.4.2.3 Order Placement

Order Placement enables buyers to browse available products, select quantities, and place orders without registration. When an order is placed, the system verifies stock availability and initiates the payment process.

Once confirmed, the order is recorded and prepared for delivery coordination. This feature ensures a smooth purchasing experience while minimizing manual intervention.

3.4.2.4 Transport Price Management

Transport Price Management allows transport providers to submit delivery pricing details, including vehicle type and price per kilometer. These details are reviewed and managed by administrators to ensure fairness and accuracy.

The system stores transport pricing data securely and makes it available during delivery coordination, supporting transparent logistics operations.

3.4.2.5 Payment Gateway Integration

The Payment Gateway Integration feature enables secure online payments through PayPal. During checkout, buyers are redirected to the PayPal interface to complete transactions safely. The system records payment success or failure and updates the order status accordingly. This feature ensures secure financial transactions and builds trust among users.

3.4.2.6 Order Tracking

Order Tracking provides real-time visibility into delivery progress. Buyers can view the current status of their orders, while transport providers and administrators update delivery stages as the order moves through the supply chain.

This feature enhances transparency and allows buyers to stay informed throughout the delivery process.

3.4.2.7 Reporting

The Reporting feature generates analytical reports to support decision-making. Farmers can view sales and income reports, while administrators can access system-wide analytics related to orders, deliveries, and platform performance.

Reports are generated automatically based on stored transactional data, enabling performance monitoring and strategic planning.

3.4.3 Database Design

The database design of the Chena system ensures efficient storage, retrieval, and management of data related to users, products, orders, payments, transport operations, and reports. A relational database model is adopted using MySQL to maintain data integrity, consistency, and scalability.

The database design follows a structured approach consisting of an Entity Relationship (ER) model, a logical data model, and a relational schema.

ER Diagram

The Entity Relationship (ER) diagram illustrates the relationships among key entities such as User, Farmer, Buyer, Product, Order, Cart, Transport Provider, Payment, Report, and Feedback. The diagram highlights primary keys, foreign keys, and cardinality constraints that define how entities interact within the system.

The complete ER Diagram for the Chena system is provided in **Appendix D**.

Logical Model

The logical data model defines the structure of the database by identifying entities, attributes, and relationships without considering physical implementation details. It ensures normalization of data and reduces redundancy by organizing related data into well-defined tables.

The logical model represents how users, products, orders, transport details, and transactions are logically connected to support core system functionalities such as product management, order processing, delivery coordination, and reporting.

Relational Schema

The relational schema translates the logical model into actual database tables, columns, primary keys, and foreign key relationships implemented in MySQL. Each table is designed to support efficient queries and maintain referential integrity across the system.

The detailed relational schema, including table structures and relationships, is provided in **Appendix E**.

3.4.4 Data Flow and Process Modeling

Data flow and process modeling are used to describe how information moves through the Chena system and how users interact with system processes. These models help in understanding system behavior, functional flow, and user interactions.

Use Case Models

Use case models describe interactions between system users and system functionalities. The Chena system includes use cases for farmers, buyers, transport providers, and administrators, covering activities such as product listing, order placement, payment processing, delivery coordination, and report generation.

The complete use case diagram is included in **Appendix A**.

Activity Diagrams

Activity diagrams illustrate the sequence of actions involved in key system processes such as user registration approval, order placement, payment confirmation, and delivery tracking. These diagrams help visualize workflow logic and decision points within the system.

The activity diagrams for the Chena system are provided in **Appendix C**.

3.4.5 Algorithms and Key Processing Logic

This section describes the core processing logic used in the Chena system to support critical operations.

- **Pricing Logic**

Farmers define product prices while transport providers specify delivery charges based on vehicle type and price per kilometer. The system calculates total order cost by combining product prices and applicable transport charges.

- **Order Allocation Logic**

When a buyer places an order, the system verifies product availability, records the order, and initiates payment processing. Once payment is confirmed, delivery coordination is prepared for transport providers.

- **Delivery Tracking Logic**

Transport providers update delivery status at different stages. The system reflects these updates in real time for buyers and administrators to track order progress.

- **Reporting Logic**

The system aggregates transactional data to generate sales, income, and performance reports for farmers and administrators.

These algorithms ensure accurate transaction handling, transparency, and efficient coordination across the agricultural supply chain.

3.5 Technologies Adopted

The development of the Chena Web-Based Agricultural Supply Chain Management System utilized modern web technologies to ensure scalability, security, and ease of maintenance.

- **Front-end Technologies**

The user interface was developed using **React.js**, **JavaScript**, **CSS**, and **Bootstrap** to create responsive, user-friendly dashboards for farmers, buyers, transport providers, and administrators.

- **Back-end Technologies**

Node.js was used for server-side development to handle business logic, user authentication, order processing, and communication between system components.

- **Database Management System**

MySQL was adopted as the relational database management system for storing user data, product listings, orders, transport details, payments, and reports.

- **Payment Gateway Integration**

PayPal was integrated to enable secure online payments between buyers and farmers.

- **Notification Services**

SMS and email notification mechanisms were used to inform users about order updates, delivery status, and system alerts.

- **Server and Hosting**

The application was hosted using web servers such as **Apache** or **Nginx**, supporting reliable deployment and system availability.

3.6 Technical Justification of Technology Choices

The selection of technologies for the “Chena” system was based on scalability, maintainability, performance, and ease of integration.

React.js was selected for frontend development due to its component-based architecture, which enables reusable UI components and efficient state management. This approach improves user experience by allowing dynamic updates without full page reloads, which is essential for real-time order tracking and data visualization.

Node.js was chosen for backend development because of its non-blocking, event-driven architecture, which is well-suited for handling concurrent user requests efficiently. This is particularly important for an agricultural marketplace where multiple users may access the system simultaneously.

MySQL was used as the relational database management system due to its reliability, structured data handling, and strong support for relational integrity. The database design ensures consistency between orders, users, products, and transactions.

The PayPal payment gateway was integrated to provide secure and reliable online transactions. It reduces the complexity of handling sensitive financial data while ensuring compliance with industry-standard security practices.

Together, these technologies form a robust, scalable, and secure platform capable of supporting real-world agricultural supply chain operations.

3.7 Development Methodology

The Chena system was developed following an **Agile Software Development Life Cycle**, allowing flexibility, iterative improvements, and continuous feedback throughout the project.

Approach Used

An **Agile and incremental development approach** was adopted to deliver system features in manageable iterations. This approach enabled early identification of issues, timely enhancements, and better alignment with user requirements.

Development Phases

- Requirement Analysis**

Functional and non-functional requirements were identified based on user needs and project objectives.

- **Design Phase**

System architecture, wireframes, database schema, and diagrams were created to define the system structure.

- **Development Phase**

Front-end and back-end components were implemented using React.js, Node.js, JavaScript, HTML, CSS, and MySQL.

- **Testing Phase**

Unit testing and integration testing were conducted to ensure correct functionality and system stability.

- **Deployment and Maintenance**

At the current stage, the Chena system is hosted on a **local host environment** for development and testing purposes. This setup supports functionality verification, debugging, and validation of system features. The system is designed to allow future deployment to a production or cloud environment with minimal changes.

Tools Used

- Development: Visual Studio Code
- Database: MySQL
- Testing: Unit and integration testing tools
- Hosting: Web servers (Apache / Nginx)

Version Control

GitHub was used for version control and collaboration. It supported source code management, change tracking, and teamwork throughout the development lifecycle.

3.8 Testing and Deployment Plan

This section describes the testing strategy and deployment approach adopted for the Chena Web-Based Agricultural Supply Chain Management System to ensure system reliability, correctness, and readiness for future expansion.

3.8.1 Testing Strategy

Testing was carried out throughout the development process to identify and resolve defects early. A structured testing approach was followed to verify that individual modules and integrated components function as expected.

3.8.2 Test Types

Unit Testing

Individual modules such as user management, product management, order processing, and payment handling were tested separately to ensure correct functionality.

Integration Testing

Integrated testing was performed to confirm that different system components work together correctly, including frontend–backend communication, database interactions, and payment gateway integration.

3.8.3 Deployment Strategy

At the current stage, the system is deployed on a local host environment for development and testing purposes. This deployment approach allows thorough validation of features and system behavior in a controlled setting. Database backup and basic security measures are implemented to protect system data. The system architecture supports future deployment to a production or cloud environment when required.

3.9 Risk Management and Mitigation

Risk management is essential to ensure the successful development and operation of the Chena Web-Based Agricultural Supply Chain Management System. Potential risks were identified during development, and appropriate mitigation strategies were considered to minimize their impact.

3.9.1 Technical Risks

Technical risks include issues related to system performance, integration failures, or software bugs. These risks may arise from improper handling of database operations, API integrations, or scalability limitations.

Mitigation Actions

Modular system design, regular testing, and incremental development were adopted to detect and resolve technical issues early in the development process.

3.9.2 Operational Risks

Operational risks involve challenges related to user adoption, incorrect system usage, or dependency on external services such as payment gateways and logistics providers.

Mitigation Actions

User-friendly interfaces, role-based access control, and clear system workflows were implemented to reduce operational errors. The system design also allows alternative workflows in case external services are temporarily unavailable.

3.9.3 Security Risks

Security risks include unauthorized access, data breaches, and fraudulent transactions. Since the system handles sensitive user and payment information, security threats pose a significant concern.

Mitigation Actions

Secure authentication mechanisms, role-based access control, encrypted communication using HTTPS, and integration with trusted third-party payment gateways were used to protect system data and transactions.

3.10 Ethical Considerations

The development and deployment of the "Chena" agricultural supply chain management system were guided by ethical principles related to data privacy, system security, and responsible technology usage. Since the platform handles sensitive user information such as personal details, pricing data, and transaction records, appropriate measures were taken to ensure confidentiality and data protection.

User authentication and role-based authorization mechanisms were implemented to restrict access to system functionalities based on user roles such as farmer, buyer, transport provider, and administrator. Sensitive data, including login credentials and payment-related information, are processed securely, and no unauthorized access to user data is permitted.

The system is designed to promote fairness and transparency by preventing price manipulation and ensuring that farmers retain control over the pricing of their produce. No misleading information or hidden charges are introduced within the platform. Additionally, the system avoids any form of bias against specific user groups and aims to provide equal access to all stakeholders regardless of scale or geographic location.

Overall, the "Chena" platform adheres to ethical software engineering practices by prioritizing user trust, data security, and social responsibility, particularly in supporting small-scale farmers and sustainable agricultural trade.

3.11 Summary of Chapter 3

This chapter presented the detailed specification, design, and methodological approach used to develop the Chena Web-Based Agricultural Supply Chain Management System. It described the system architecture, functional and non-functional requirements, user roles, system features, database design, and development methodology.

The chapter also discussed testing strategies, deployment planning, and risk management considerations to ensure system reliability, security, and scalability. Together, these elements provide a solid technical foundation for the implementation and evaluation of the proposed system, which are discussed in subsequent chapters.

4 Chapter – Implementation

4.1 Introduction to Chapter

This chapter presents the implementation details of the Chena Web-Based Agricultural Supply Chain Management System. It explains how the system specifications and design decisions described in Chapter 3 were realized through practical software development. Rather than listing complete source code, this chapter focuses on the implementation of critical system modules, core processing logic, integrations, and technical decisions that were essential to achieving the project objectives. Challenges encountered during development and the solutions adopted to overcome them are also discussed.

4.2 Implementation Environment

The system was implemented in a controlled development environment to ensure stability and correctness during development and testing.

- Frontend: React.js with JavaScript and Bootstrap for responsive UI components
- Backend: Node.js for handling business logic and API services
- Database: MySQL for structured data storage
- Payment Gateway: PayPal (sandbox environment)
- Hosting: Localhost (development and testing phase)
- Version Control: GitHub for source code management

This environment supported modular development, debugging, and iterative testing.

4.3 Core Module Implementation

The Chena system was implemented using a modular architecture, where each functional area was developed as an independent module. This approach improved maintainability and allowed individual features to be tested and enhanced without affecting the entire system.

4.3.1 User Authentication and Authorization

User authentication was implemented to ensure secure access to the platform. Farmers and transport providers register by submitting their details, which remain inactive until approved by an administrator. Role-based authorization ensures that users can access only the features relevant to their role.

Buyers are allowed limited access without registration, enabling them to browse products and place orders while restricting access to management features. This balance improves usability while maintaining system security.

4.3.2 Farmer Module Implementation

The farmer module enables farmers to manage their agricultural activities digitally. Farmers can add, update, and remove product listings, manage inventory quantities, process orders, and view sales and income reports.

Backend APIs handle all product and order-related operations, while frontend dashboards display real-time updates. Validation logic ensures that invalid or incomplete product information is not stored, and inventory checks prevent overselling.

4.3.3 Buyer Module Implementation

The buyer module provides a simple and intuitive purchasing experience. Buyers can browse available products, search for products by specific farmers, place orders, make secure payments, and track delivery status.

A key implementation feature is the **lowest-price display logic**, where only the lowest-priced product among identical items is shown on the home page. This logic promotes fair pricing and transparency while still allowing buyers to explore products from individual farmers if required.

4.3.4 Transport Provider Module Implementation

Transport providers can register, submit vehicle details and pricing information, and manage delivery assignments. Once an order is confirmed, transport providers update delivery progress, which is reflected in real time for buyers and administrators.

This module plays a critical role in coordinating logistics and ensuring timely delivery of agricultural products.

4.3.5 Administrator Module Implementation

The administrator module provides full control over the platform. Administrators approve user registrations, manage roles, oversee transport pricing, monitor system activities, and generate reports.

Administrative actions are logged to ensure accountability and transparency. This module ensures the smooth and secure operation of the platform.

4.4 Payment Gateway Integration

PayPal was integrated to handle secure online payments. Buyers are redirected to PayPal during checkout, and payment confirmation is sent back to the system. The system records payment status and updates order progress accordingly.

Using a trusted third-party payment gateway reduces security risks and ensures encrypted financial transactions.

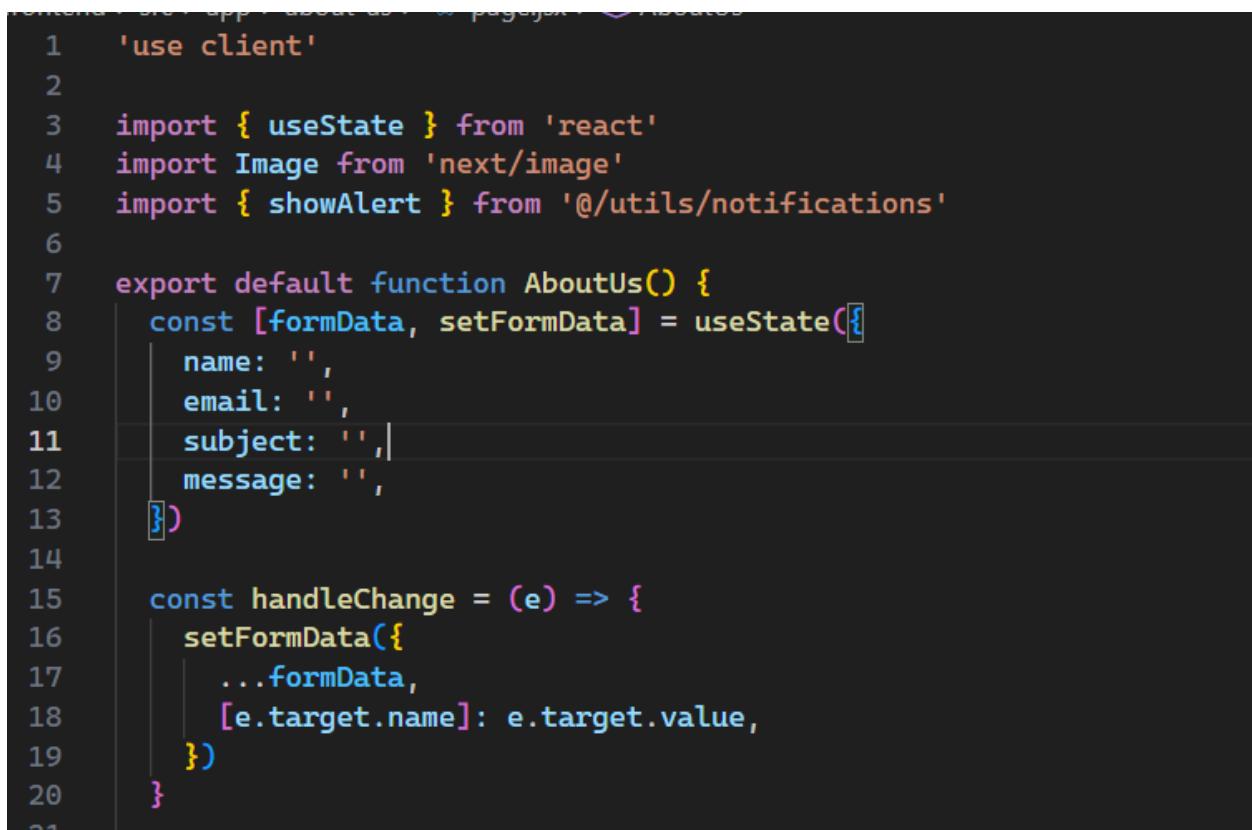
4.5 Pricing and Order Processing Logic

Pricing logic ensures transparency and fair competition. When multiple farmers list the same product, the system automatically identifies the lowest price and displays only that product on the home page. If prices are equal, the product added first is prioritized.

Order processing logic verifies stock availability, confirms payment, and prepares delivery coordination. These automated steps reduce manual intervention and improve system efficiency.

4.6 Coding Segment

This section describes the implementation of the system's core functionalities using the selected technologies, including frontend development, backend logic, database integration, and security mechanisms. It explains how the designed system architecture was translated into working code, highlighting key modules, algorithms, and implementation decisions that ensure system reliability, efficiency, and maintainability.



The screenshot shows a code editor with a dark theme displaying a portion of a React component. The code is written in JavaScript with syntax highlighting for keywords like 'use client', 'useState', and 'const'. The component is named 'AboutUs' and uses the useState hook to manage form data. It includes imports for 'react', 'next/image', and '@/utils/notifications'. The state object contains fields for name, email, subject, and message. A handleChange function is defined to update the state when input fields are changed.

```
1  'use client'
2
3  import { useState } from 'react'
4  import Image from 'next/image'
5  import { showAlert } from '@/utils/notifications'
6
7  export default function AboutUs() {
8    const [formData, setFormData] = useState({
9      name: '',
10     email: '',
11     subject: '',
12     message: '',
13   })
14
15   const handleChange = (e) => {
16     setFormData({
17       ...formData,
18       [e.target.name]: e.target.value,
19     })
20   }
21 }
```

Figure 7 - About Us page code block 1

```

const handleSubmit = async (e) => {
  e.preventDefault()
  // TODO: Implement contact form submission
  console.log('Contact form submitted:', formData)
  await showAlert('Thank you for contacting us! We will get back to you soon.', 'success')
  setFormData({ name: '', email: '', subject: '', message: '' })
}

return (
  <div className="min-h-screen bg-white">
    <div className="container mx-auto px-4 py-12">
      {/* Main Content Section with Image */}
      <div className="grid grid-cols-1 lg:grid-cols-2 gap-12 items-start mb-16">
        {/* Left Side - Content */}
        <div className="space-y-8">
          {/* Why Chena Section */}
          <div>
            <h2 className="text-3xl font-bold text-gray-800 mb-6 flex items-center">
              <span className="text-[#1e6b3e] mr-2">💡</span> Why Chena ?
            </h2>
            <p className="text-gray-700 leading-relaxed mb-6">
              Chena is a web-based agricultural supply chain platform designed to transform Sri Lanka's
            </p>
          
```

Figure 8 - About Us page code block 2

```
57      <div className="flex items-start">
58        <span className="text-[#1e6b3e] text-xl mr-3 mt-1">•</span>
59        <div>
60          <h3 className="font-semibold text-lg text-gray-800 mb-2">
61            <span className="text-[#1e6b3e]">What We Do:</span> Provide a direct marketplace for
62            farmers to sell their produce directly to consumers, bypassing middlemen.
63          </h3>
64        </div>
65      </div>
66
67      <div className="flex items-start">
68        <span className="text-[#1e6b3e] text-xl mr-3 mt-1">•</span>
69        <div>
70          <h3 className="font-semibold text-lg text-gray-800 mb-2">
71            <span className="text-[#1e6b3e]">Why Chena:</span> We eliminate middlemen, promote
72            transparency, and support sustainable agriculture.
73        </div>
74      </div>
75
76      <div className="flex items-start">
77        <span className="text-[#1e6b3e] text-xl mr-3 mt-1">•</span>
78        <div>
79          <h3 className="font-semibold text-lg text-gray-800 mb-2">
80            <span className="text-[#1e6b3e]">Our Vision:</span> Build a smarter, fairer, and more
81            sustainable agricultural supply chain.
82        </div>
83      </div>
84    </div>
85  </div>
```

Figure 9 - About Us page code block 3

```
86      /* Right Side - Chef Image */
87      <div className="flex justify-center items-start lg:justify-end">
88          <div className="relative w-full max-w-md">
89              <Image
90                  src="/images/about us/chef.png"
91                  alt="Chef with fresh vegetables"
92                  width={500}
93                  height={500}
94                  className="rounded-lg shadow-lg w-full h-auto"
95                  priority
96              />
97          </div>
98      </div>
99  </div>
100
101
102     /* Contact Us Section */
103  <div id="contact" className="mt-16">
104      <div className="text-center mb-12">
105          <h2 className="text-4xl font-bold text-gray-800 mb-4">Contact Us</h2>
106          <p className="text-xl text-gray-600 max-w-3xl mx-auto">
107              Have questions? We'd love to hear from you. Send us a message and we'll respond as soon as
108          </p>
109      </div>
110
111      <div className="grid grid-cols-1 lg:grid-cols-2 gap-8">
112          /* Contact Form */
113          <div className="bg-white rounded-lg shadow-md p-8 border border-gray-200">
114              <h3 className="text-2xl font-semibold text-gray-800 mb-6">Send us a Message</h3>
115              <form onSubmit={handleSubmit} className="space-y-6">
116                  <div>
117                      <label htmlFor="name" className="block text-sm font-medium text-gray-700 mb-2">
118                          Full Name
119                      </label>
120                      <input
```

Figure 10 - About Us page code block 4

Customer Dashboard

```

IntelliJ > src > app > customer-dashboard > page.js > CustomerDashboard > useEffect callback
1  'use client'
2
3  import { useState, useEffect } from 'react'
4  import { useRouter } from 'next/navigation'
5  import ProfileTab from '@/components/customer-profile/ProfileTab'
6  import ViewProductsTab from '@/components/customer-profile/ViewProductsTab'
7  import CartTab from '@/components/customer-profile/CartTab'
8  import OrdersTab from '@/components/customer-profile/OrdersTab'
9  import { authAPI, tokenManager } from '@/services/api'
10
11 export default function CustomerDashboard() {
12   const router = useRouter()
13   const [activeTab, setActiveTab] = useState('profile')
14   const [isSidebarOpen, setIsSidebarOpen] = useState(true)
15   const [cartItemCount, setCartItemCount] = useState(0)
16   const [userData, setUserData] = useState(null)
17   const [loading, setLoading] = useState(true)
18
19   // Check if user is logged in and fetch user data
20   useEffect(() => {
21     const checkAuth = async () => {
22       const accessToken = tokenManager.getAccessToken()
23       const userType = localStorage.getItem('userType')
24
25       if (!accessToken || userType !== 'customer') {
26         router.push('/login/customer-login')
27         return
28     }
29
30     try {
31       // Fetch current user data from backend using JWT token
32       const response = await authAPI.getCurrentUser()
33       if (response.success) {
34         setUserData(response.data)
35       }
36     } catch (error) {
37       console.error('Failed to fetch user data:', error)
38       // Token might be invalid, redirect to login
39       tokenManager.clearTokens()
40       router.push('/login/customer-login')
41     } finally {
42       setLoading(false)
43     }
44   }
45
46   checkAuth()
47 }, [router])
48
49   // Update cart count
50   useEffect(() => {
51     const updateCartCount = () => {
52       const cart = JSON.parse(localStorage.getItem('cart') || '[]')
53       const totalItems = cart.reduce((sum, item) => sum + item.quantity, 0)
54       setCartItemCount(totalItems)
55     }
56   }

```

Figure 11 - Customer Dashboard page code block

Farmer Dashboard

```

3 import { useState, useEffect } from 'react'
4 import { useRouter } from 'next/navigation'
5 import ProfileTab from '@/components/farmer-profile/ProfileTab'
6 import ProductsTab from '@/components/farmer-profile/ProductsTab'
7 import OrdersTab from '@/components/farmer-profile/OrdersTab'
8 import ReportsTab from '@/components/farmer-profile/ReportsTab'
9 import { authAPI, tokenManager } from '@/services/api'

10 export default function FarmerDashboard() {
11   const router = useRouter()
12   const [activeTab, setActiveTab] = useState('profile')
13   const [isSidebarOpen, setIsSidebarOpen] = useState(true)
14   const [userData, setUserData] = useState(null)
15   const [loading, setLoading] = useState(true)

16   // Check if user is logged in and fetch user data
17   useEffect(() => {
18     const checkAuth = async () => {
19       const accessToken = tokenManager.getAccessToken()
20       const userType = localStorage.getItem('userType')

21       if (!accessToken || userType !== 'farmer') {
22         router.push('/login/farmer-login')
23         return
24       }

25       try {
26         // Fetch current user data from backend using JWT token
27         const response = await authAPI.getCurrentUser()
28         if (response.success) {
29           setUserData(response.data)
30         }
31       } catch (error) {
32         console.error('Failed to fetch user data:', error)
33         // Token might be invalid, redirect to login
34         tokenManager.clearTokens()
35         router.push('/login/farmer-login')
36       } finally {
37         setLoading(false)
38       }
39     }
40     checkAuth()
41   }, [router])

42   const handleLogout = () => {
43     authAPI.logout()
44     router.push('/login/farmer-login')
45   }
46 }

```

Figure 12 - Farmer Dashboard page code block

Transport Provider Dashboard

```

3 import { useState, useEffect } from 'react'
4 import { useRouter } from 'next/navigation'
5 import ProfileTab from '@/components/transport-profile/ProfileTab'
6 import DeliveriesTab from '@/components/transport-profile/DeliveriesTab'
7 import { authAPI, tokenManager } from '@/services/api'
8
9 export default function TransportDashboard() {
10   const router = useRouter()
11   const [activeTab, setActiveTab] = useState('profile')
12   const [isSidebarOpen, setIsSidebarOpen] = useState(true)
13   const [userData, setUserData] = useState(null)
14   const [loading, setLoading] = useState(true)
15
16   // Check if user is logged in and fetch user data
17   useEffect(() => {
18     const checkAuth = async () => {
19       const accessToken = tokenManager.getAccessToken()
20       const userType = localStorage.getItem('userType')
21
22       if (!accessToken || userType !== 'transport') {
23         router.push('/login/transport-login')
24         return
25       }
26
27       try {
28         // Fetch current user data from backend using JWT token
29         const response = await authAPI.getCurrentUser()
30         if (response.success) {
31           setUserData(response.data)
32         }
33       } catch (error) {
34         console.error('Failed to fetch user data:', error)
35         // Token might be invalid, redirect to login
36         tokenManager.clearTokens()
37         router.push('/login/transport-login')
38       } finally {
39         setLoading(false)
40       }
41     }
42
43     checkAuth()
44   }, [router])
45
46   const handleLogout = () => {
47     authAPI.logout()
48     router.push('/login/transport-login')
49   }
50

```

Figure 13 - Transport Provider Dashboard page code block

4.7 Database Operations and Data Handling

Database operations were implemented to manage users, products, orders, payments, transport details, and reports. Structured queries and relational constraints maintain data integrity and consistency.

All Create, Read, Update, and Delete (CRUD) operations are handled through backend APIs, ensuring controlled and secure data access.

4.8 Error Handling and Validation

Input validation is applied at both frontend and backend levels to prevent incorrect or malicious data entry. User-friendly error messages guide users when invalid actions occur.

Exception handling mechanisms ensure that system failures do not compromise data integrity or user experience.

4.9 Challenges Encountered During Implementation

Several challenges were faced during development,

- ❖ Payment integration complexity - Handling asynchronous payment responses required careful validation.

Solution - Extensive testing using PayPal sandbox mode.

- ❖ Inventory consistency - Managing real-time product availability across multiple buyers.

Solution - Database validation and controlled order confirmation logic.

- ❖ Time constraints - Limited time restricted implementation of advanced analytics features.

Solution - Core features were prioritized, with enhancements planned as future work.

These challenges contributed significantly to development effort and learning.

4.10 Summary of Chapter 4

This chapter described the practical implementation of the Chena Web-Based Agricultural Supply Chain Management System. It explained how system design concepts were translated into functional modules, covering authentication, product management, order processing, transport coordination, payment integration, and database handling.

The chapter also highlighted key processing logic, validation mechanisms, and challenges encountered during development. Overall, the implementation demonstrates that the system successfully meets its functional requirements and provides a stable foundation for testing and evaluation, which are discussed in the next chapter.

5 Chapter – Results and Evaluation

5.1 Introduction

This chapter presents the results and evaluation of the Chena Web-Based Agricultural Supply Chain Management System. The purpose of this chapter is to assess the extent to which the implemented system satisfies the project objectives and functional requirements defined in earlier chapters. The evaluation is based on systematic testing of core system modules and analysis of observed outcomes. The chapter also provides a critical assessment of system performance, strengths, limitations, and areas for future improvement.

The evaluation process focused on validating whether the system operates correctly under realistic usage scenarios. Functional testing was carried out on user management, product and order handling, pricing logic, payment processing, delivery tracking, and reporting features. The results demonstrate how well the system supports transparent agricultural trade, secure transactions, and efficient coordination among farmers, buyers, and transport providers.

5.2 Evaluation Approach

The evaluation approach involved executing predefined test cases that represent typical and critical user interactions within the system. Test cases were designed to validate both successful operations and error-handling scenarios. Particular attention was given to data validation, role-based access control, pricing accuracy, and payment security. Unit testing was used to verify individual modules, while integration testing was applied to ensure correct interaction between frontend components, backend services, database operations, and external payment systems.

5.3 Achievement of Project Objectives

The evaluation results indicate that the primary objectives of the project were achieved. The system successfully enables farmers to list and manage produce, allows buyers to browse products and place orders, and supports transport providers in delivery coordination. The pricing logic ensures transparency by displaying the lowest available price, while secure payment integration ensures reliable financial transactions. Automated reporting features provide valuable insights for farmers and administrators. Overall, the system demonstrates an effective digital solution to the challenges identified in the traditional agricultural supply chain.

5.4 Test Case Results

This section presents the results of key functional tests conducted on the system.

5.4.1 User Management and Authentication Test Results

User management testing focused on registration, login, role-based access control, and data validation. The system correctly handles farmer and transport provider registrations by

requiring administrator approval before activation. Buyers are allowed to browse products and place orders without mandatory registration. Validation mechanisms ensure that duplicate registrations are prevented and that only authorized users can access restricted features.

User Management Test Results

Table 2 - User Management Test Results

Test Case ID	Test Case Description	Input	Expected	Result
			Output	
TC-01	User login with empty credentials	Empty username and password	Error message displayed	Pass
TC-02	User login with incorrect credentials	Invalid username and password	Login failure message	Pass
TC-03	User login with valid credentials	Correct username and password	Redirect to role-based dashboard	Pass
TC-04	Registration with missing fields	Empty required fields	Validation error message	Pass
TC-05	Registration with invalid email	Incorrect email format	Email validation error	Pass
TC-06	Farmer registration with	Existing NIC number	Duplicate NIC error message	Pass

	duplicate NIC			
TC-07	Transport provider registration with duplicate NIC	Existing NIC number	Registration rejected	Pass

These results confirm that the system enforces proper identity validation and secure access control, maintaining data integrity and platform reliability.

5.4.2 Product and Order Management Test Results

Product and order management testing was conducted to verify that farmers can correctly manage product listings and that buyers can browse products, place orders, and view order details. The tests also ensured that inventory levels are updated automatically and accurately after each order to prevent overselling and data inconsistency.

Product and Order Management Test Results

Table 3 - Product and Order Management Test Results

Test Case ID	Test Description	Input	Expected Output	Result
TC-08	Add new product with valid details	Product name, category, price, quantity	Product successfully	Pass

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

			added and visible to buyers	
TC-09	Add product with missing required fields	Incomplete product details	Validation error message displayed	Pass
TC-10	Update existing product details	Updated price or quantity	Product details updated successfully	Pass
TC-11	Remove product listing	Product selected for deletion	Product removed from buyer product list	Pass
TC-12	Buyer browses product listings	Product search and filter inputs	Relevant products displayed	Pass
TC-13	Buyer places order with sufficient stock	Valid product and quantity	Order confirmed and inventory updated	Pass
TC-14	Buyer places order with insufficient stock	Quantity exceeds available stock	Order rejected with error message	Pass

These results confirm that the product and order management module functions correctly by maintaining accurate product information, supporting smooth order placement, and ensuring real-time inventory updates. The system successfully prevents invalid operations and provides clear feedback to users, contributing to reliable and transparent agricultural transactions.

5.4.3 Pricing Logic Test Results

Pricing logic testing was conducted to evaluate the system's ability to determine and display the lowest available price for products listed by multiple farmers. The system was also tested for consistent behavior when identical prices were present.

Pricing Logic Test Results

Table 4 - Pricing Logic Test Results

Test Case ID	Test Case Description	Input	Expected Output	Result
TC-15	Single farmer product listing	One product with defined price	Product displayed correctly	Pass
TC-16	Same product with different prices	Multiple farmers list same product	Lowest price shown on home page	Pass
TC-17	Same product with same prices	Identical prices	First listed product displayed	Pass
TC-18	Buyer searches product by specific farmer	Farmer-specific search	Selected farmer's product shown	Pass
TC-19	Farmer updates product price	New price value	Updated price reflected	Pass

TC-20	Farmer removes product	Product deletion	Product excluded from pricing logic	Pass
-------	------------------------	------------------	-------------------------------------	------

The results confirm that the pricing logic functions as intended, promoting transparency and fair competition while allowing buyers flexibility in selecting preferred farmers.

5.4.4 Payment and Order Tracking Test Results

Payment integration testing verified secure redirection to the PayPal gateway and accurate recording of transaction status. Orders were confirmed only after successful payment. Order tracking tests confirmed that delivery status updates were reflected in real time for buyers and administrators.

Payment and Order Tracking Test Results

Table 5 - Payment and Order Tracking Test Results

Test Case ID	Test Case Description	Input	Expected Output	Result
TC-21	Payment with invalid details	Incorrect payment information	Payment failure message	Pass
TC-22	Payment with insufficient balance	Low account balance	Insufficient balance error	Pass
TC-23	Successful payment	Valid payment details	Payment confirmed	Pass

			and order placed	
TC-24	Order tracking update	Delivery status change	Real-time status update	Pass

5.5 Critical Evaluation of Results

The evaluation results demonstrate that the system performs reliably across all core functionalities. Key strengths include accurate pricing logic, strong validation mechanisms, secure payment processing, and effective logistics coordination. The system successfully meets its functional requirements and provides a stable user experience. A limitation of the current evaluation is that the system is deployed in a local host environment, which restricts large-scale performance and stress testing. These limitations can be addressed through future deployment and extended testing.

5.6 Performance and Security Evaluation

The performance of the “Chena” system was evaluated based on response time, system stability, and concurrent user handling. Core system functionalities such as user authentication, product listing, order placement, and order tracking demonstrated acceptable response times under normal operating conditions. The use of optimized database queries and asynchronous server-side processing contributed to efficient system performance.

From a security perspective, multiple measures were implemented to safeguard the system against unauthorized access and data breaches. User authentication mechanisms ensure that

only registered users can access system functionalities. Role-based access control prevents users from performing actions outside their authorized scope.

Input validation and error handling mechanisms were applied to prevent common vulnerabilities such as invalid data submission and injection attacks. Secure communication with the payment gateway ensures that financial transactions are processed safely without exposing sensitive information to the system.

While the system meets essential performance and security requirements for its current scope, further enhancements such as load testing, encryption of sensitive database fields, and advanced intrusion detection mechanisms can be implemented during large-scale deployment.

5.7 Confidence Level and Further Testing

Based on the conducted tests, there is a high level of confidence that the system meets its stated requirements and objectives. To further increase confidence before large-scale deployment, additional testing such as load testing, security penetration testing, and usability testing with real users is recommended. These tests would provide deeper insight into system performance under real-world conditions.

5.8 Summary of Chapter 5

This chapter presented a detailed evaluation of the Chena Web-Based Agricultural Supply Chain Management System through structured testing and result analysis. The test results confirm that the system successfully achieves its objectives by enabling transparent pricing, secure transactions, and efficient coordination among stakeholders. Validation mechanisms, pricing logic, and reporting features function as designed, ensuring reliability and trustworthiness. While minor limitations related to deployment environment exist, the overall evaluation confirms that the system is technically sound and ready for further enhancement and real-world deployment.

6 Chapter - Future Work

6.1 Introduction

The development of the Chena Web-Based Agricultural Supply Chain Management System achieved its primary objectives within the defined scope and timeframe. However, due to time, resource, and scope limitations, several potential enhancements could not be fully explored or implemented. This chapter outlines possible future improvements and extensions that could further strengthen the system, improve usability, and increase its impact on the agricultural supply chain. These suggestions also provide a foundation for continued development and future research.

6.2 Platform Expansion

The Chena Web-Based Agricultural Supply Chain Management System can be extended by introducing dedicated mobile applications for Android and iOS platforms. This enhancement would improve accessibility for farmers and transport providers, particularly in rural areas where mobile devices are more commonly used than desktop systems. Additional support for low-bandwidth environments and offline functionality would further improve usability and adoption.

6.3 Advanced Analytics and Decision Support

Future versions of the system can incorporate advanced analytics to provide deeper insights for farmers and administrators. Features such as demand forecasting, dynamic pricing recommendations, seasonal crop trend analysis, and profit prediction models would support

better decision-making. Integration with government agricultural databases and weather information systems could further enhance the accuracy and usefulness of these analytical tools.

6.4 Logistics and Delivery Optimization

The logistics module can be enhanced through real-time GPS tracking and route optimization mechanisms. Automated transport assignment based on distance, vehicle capacity, delivery urgency, and cost efficiency would improve overall supply chain performance. These improvements would reduce delivery delays, lower transportation costs, and provide more accurate delivery timelines to buyers.

6.5 Security and Deployment Enhancements

Security can be further strengthened by implementing advanced authentication mechanisms such as multi-factor authentication and enhanced monitoring for suspicious activities. Migrating the system from a local host environment to a cloud-based infrastructure would improve scalability, reliability, and availability, enabling the platform to support a larger user base and higher transaction volumes.

6.6 Functional and Stakeholder Extensions

The system can be expanded to support additional stakeholders such as agricultural cooperatives, wholesalers, and exporters. Introducing multilingual support, digital certification for organic or quality-assured produce, and integrated user training modules would increase platform adoption and extend its impact across the agricultural sector.

6.7 Summary of Chapter 6

This chapter discussed potential future enhancements for the Chena Web-Based Agricultural Supply Chain Management System beyond its current implementation. The proposed improvements include platform expansion, advanced analytics, logistics optimization, enhanced security, and functional extensions. These future directions provide a clear roadmap for further development and ensure that the system can evolve to meet the growing and changing needs of the agricultural sector.

7 Chapter - Conclusions

7.1 Introduction

This chapter concludes the final year project by presenting a comprehensive summary of the aims, implementation outcomes, and overall contributions of the Chena Web-Based Agricultural Supply Chain Management System. It consolidates the key findings discussed throughout the report and evaluates the extent to which the project objectives were achieved. The chapter provides an objective assessment of what the project accomplished, what was learned through its development, and how effectively the proposed solution addressed the identified problem within the defined scope.

7.2 Achievement of Project Aims and Objectives

The primary aim of the project was to design and develop a web-based platform that directly connects farmers with buyers and transport providers, thereby reducing dependency on traditional intermediaries and improving transparency in agricultural trade. This aim was successfully realized through the implementation of the Chena system, which supports direct

product listing by farmers, buyer-driven order placement, secure online payments, and coordinated logistics management.

All major objectives outlined at the beginning of the project were addressed. The system enables farmers to manage their own produce listings and pricing, empowering them with greater control over their businesses. Buyers benefit from transparent access to available products and fair pricing, while transport providers are integrated into the supply chain through structured delivery management features. Secure payment handling and automated reporting further enhance trust, accountability, and decision-making across all stakeholder groups.

7.3 Evaluation of System Effectiveness

The effectiveness of the Chena system was evaluated through functional testing and result analysis, which demonstrated that the implemented features operate as intended within the defined scope. Core modules such as user management, product and order management, payment processing, delivery tracking, and reporting performed reliably during testing. The system architecture supports modularity and scalability, indicating that the platform can be extended with additional features in future iterations.

From a usability perspective, the role-based dashboards and simplified workflows support users with varying levels of digital literacy. The system successfully balances technical robustness with ease of use, particularly for farmers and buyers who may not have advanced technical experience. These outcomes indicate that the system is practical, usable, and aligned with real-world agricultural trade requirements.

7.4 Contribution and Practical Significance

The Chena system contributes to the modernization of agricultural supply chain management by demonstrating how digital platforms can address long-standing inefficiencies in traditional market structures. By enabling direct interaction between farmers, buyers, and transport providers, the system promotes fair pricing, reduces operational delays, and enhances transparency. The project also contributes academically by applying software engineering principles, system design methodologies, and evaluation techniques to a real-world problem relevant to Sri Lanka's socio-economic context.

7.5 Limitations of the Project

Although the project achieved its intended goals, certain limitations remain. The system is currently deployed in a local host environment and has not been evaluated under large-scale production conditions. Advanced features such as mobile applications, real-time GPS tracking, and predictive analytics were beyond the scope of the current implementation due to time and resource constraints. These limitations do not detract from the project's success but highlight areas for future enhancement.

7.6 Summary of Chapter 7

This chapter summarized the overall achievements and outcomes of the Chena Web-Based Agricultural Supply Chain Management System. It demonstrated that the project successfully met its aims by delivering a secure, transparent, and efficient digital platform for agricultural trade. The conclusions reaffirm the value of the system in addressing inefficiencies in traditional supply chains while acknowledging current limitations. Overall, the project provides a strong foundation for future development and represents a meaningful contribution to both academic study and practical application.

8 Chapter - Reflection

8.1 Introduction

Reflection plays a vital role in identifying transferable learning and evaluating the deeper impact of the project experience. This chapter reflects on the development of the Chena system by examining the assumptions, decisions, and learning processes involved throughout the project lifecycle. Rather than focusing solely on technical skills, the reflection emphasizes changes in understanding, decision-making approaches, and problem-solving strategies, aligning with the concept of lifelong learning and double-loop learning.

8.2 Reflection on Understanding the Problem Domain

One of the most significant learning experiences from this project was the realization that technical solutions must be grounded in a deep understanding of the problem domain. Initially, the agricultural supply chain problem appeared to be primarily a technical challenge. However, further research and analysis revealed complex social, economic, and operational factors influencing farmer livelihoods and market behavior. This understanding shaped key design decisions, such as prioritizing transparency, simplifying user workflows, and avoiding unnecessary complexity.

The project challenged early assumptions about user capabilities and access to technology. Designing a system for users with diverse levels of digital literacy required continuous reassessment of interface design and functionality. This experience highlighted the importance of validating assumptions early and designing systems that are inclusive and user-centered.

8.3 Reflection on Design Choices and Methodology

The choice of an Agile and incremental development approach proved to be effective in managing project complexity. Iterative development allowed features to be refined progressively and enabled early identification of design flaws. This reinforced the understanding that flexibility and adaptability are critical in software development, particularly when requirements evolve during the project lifecycle.

Design decisions such as adopting a modular architecture and role-based access control were informed by both technical considerations and user needs. Encountering challenges during third-party integration, especially with payment services, emphasized the importance of documentation, experimentation, and contingency planning. These experiences contributed to improved decision-making and problem-solving skills.

8.4 Reflection on Technical and Transferable Skills

The project significantly enhanced both technical and transferable skills. Technically, the project strengthened knowledge of full-stack web development, database design, system integration, and testing strategies. More importantly, it fostered transferable skills such as time management, independent learning, analytical thinking, and resilience.

Balancing project milestones with academic responsibilities required disciplined planning and prioritization. Debugging complex issues and resolving integration problems improved persistence and logical reasoning. Writing the final report enhanced the ability to communicate complex technical ideas clearly and professionally, reinforcing the importance of documentation in software engineering practice.

8.5 Reflection on Professional Growth

The project experience contributed to a broader understanding of professional responsibilities in system development. It highlighted the need for ethical considerations, user trust, and data security when designing systems that handle sensitive information. The experience also emphasized the importance of continuous improvement and openness to feedback, both of which are essential for professional growth.

8.6 Summary of Chapter 8

This chapter reflected on the learning outcomes derived from the development of the Chena Web-Based Agricultural Supply Chain Management System. It demonstrated how the project influenced assumptions, decision-making processes, and problem-solving approaches. The reflection highlighted growth in both technical competence and transferable professional skills, aligning with the principles of lifelong learning. Overall, the project experience provided valuable insights that will inform future academic work and professional practice.

Glossary

Terms

- Direct Market System - A platform enabling farmers to sell agricultural products directly to buyers without intermediaries.
- User Interface (UI) - The graphical interface through which users interact with the system.
- Farmer - A user who registers on the platform to list, manage, and sell agricultural produce.
- Buyer - A user who registers on the platform to browse, purchase, and review products.

- Transport Provider - A user who registers to coordinate and provide delivery services for agricultural products.
- Middleman - An intermediary who traditionally facilitates transactions between farmers and buyers but is eliminated in this system.
- Admin - A user who manages and oversees the platform, ensuring smooth operation and handling user management.
- Product Listing - A digital representation of an agricultural product on the platform, including its name, description, price, and availability.
- Payment Gateway - A service that facilitates secure online payments between buyers and farmers.

Table of Abbreviations

Abbreviation	Full Form
API	Application Programming Interface
BIT	Bachelor of Information Technology
CRUD	Create, Read, Update, Delete
DBMS	Database Management System
ERD	Entity Relationship Diagram
FAQ	Frequently Asked Questions
FR	Functional Requirement
HTTP	Hypertext Transfer Protocol

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

HTTPS	Hypertext Transfer Protocol Secure
JSON	JavaScript Object Notation
NIC	National Identity Card
OTP	One-Time Password
REST	Representational State Transfer
SRS	Software Requirements Specification
UI	User Interface
UML	Unified Modeling Language
UX	User Experience

Appendix

Appendix A : Use Case Daigram

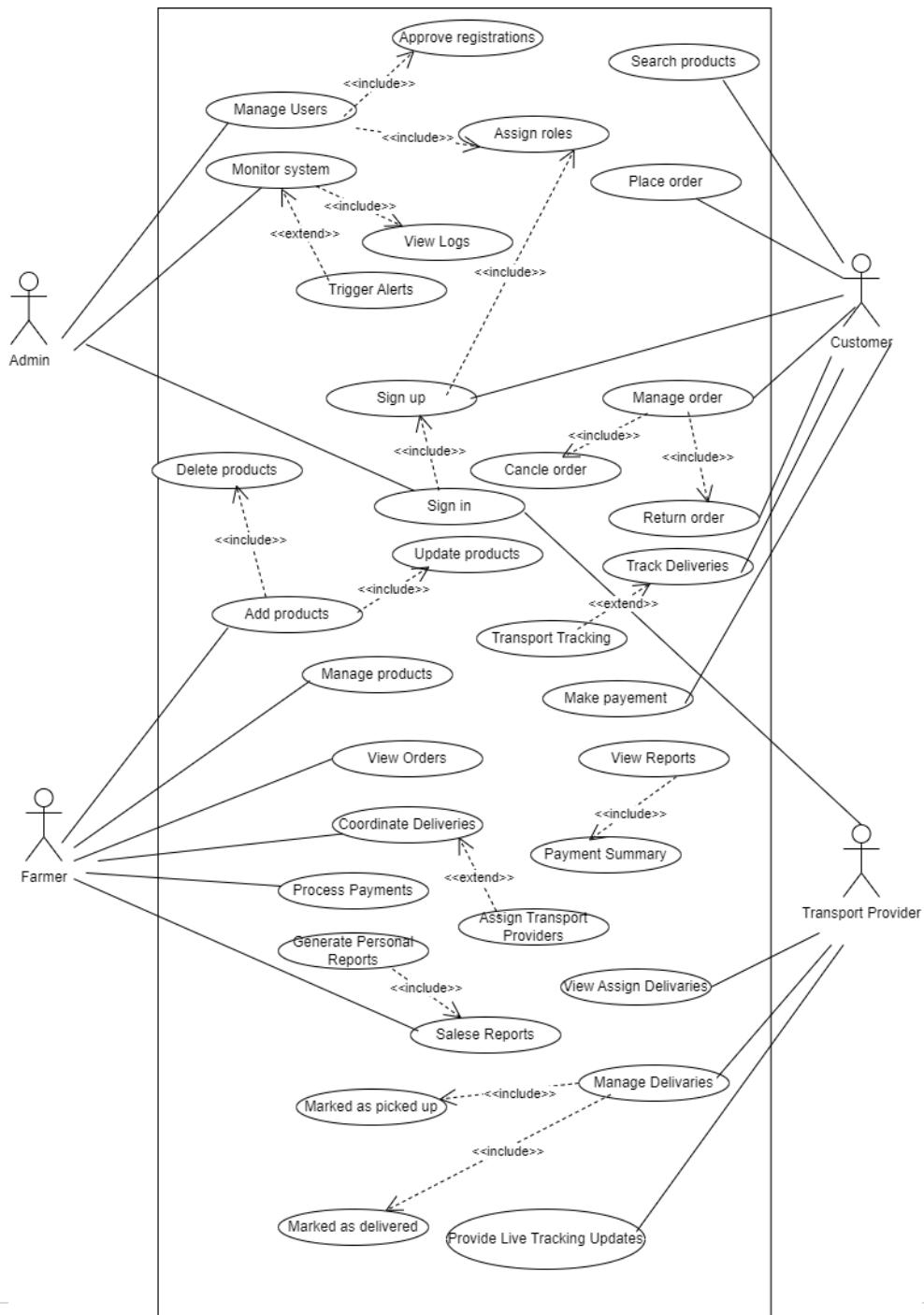


Figure 14 - Use Case Daigram

Appendix B : Activity Diagram for Entire System

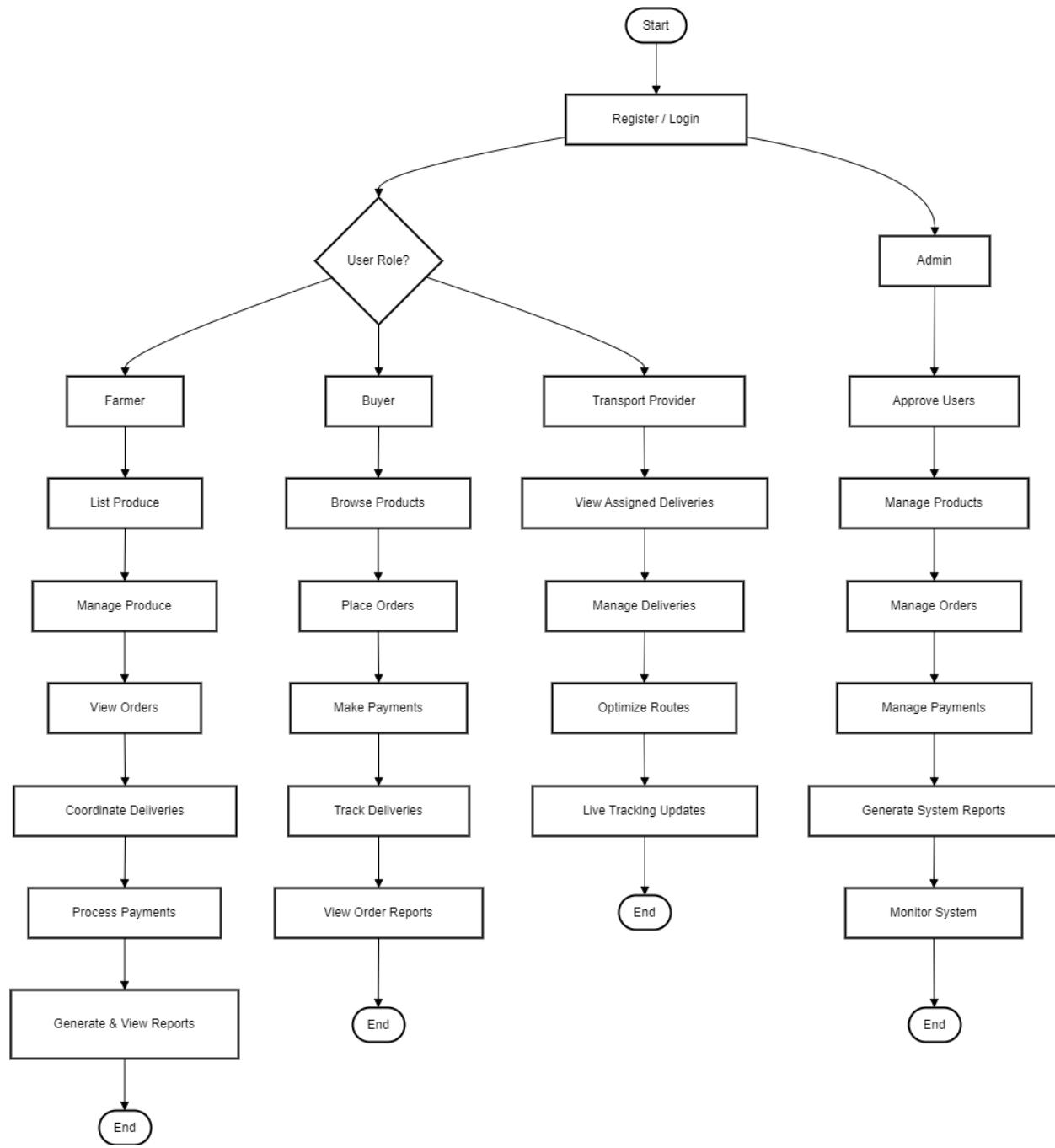


Figure 15 - Activity Diagram

Appendix C : Activity Diagrams

Activity Diagram for User Register

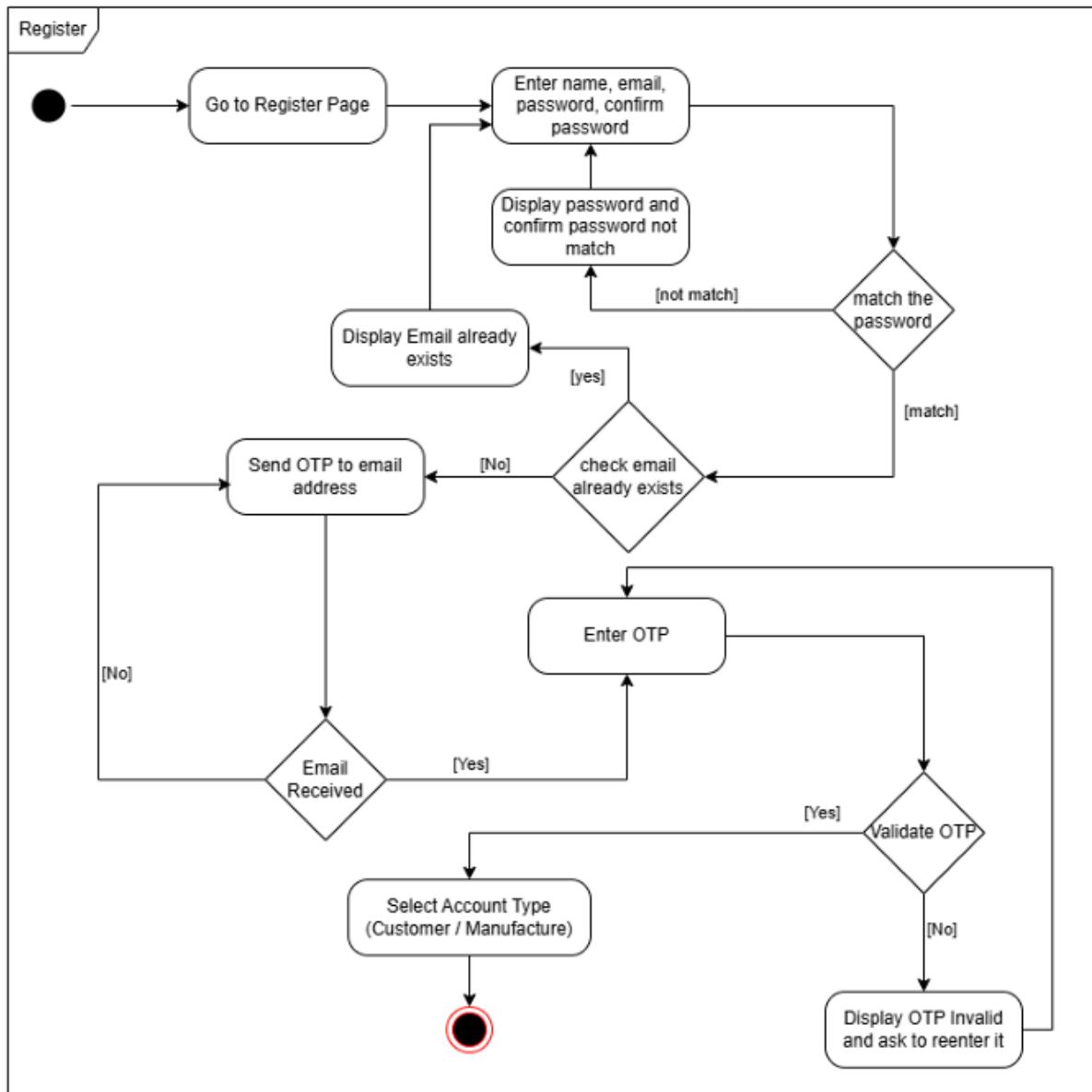
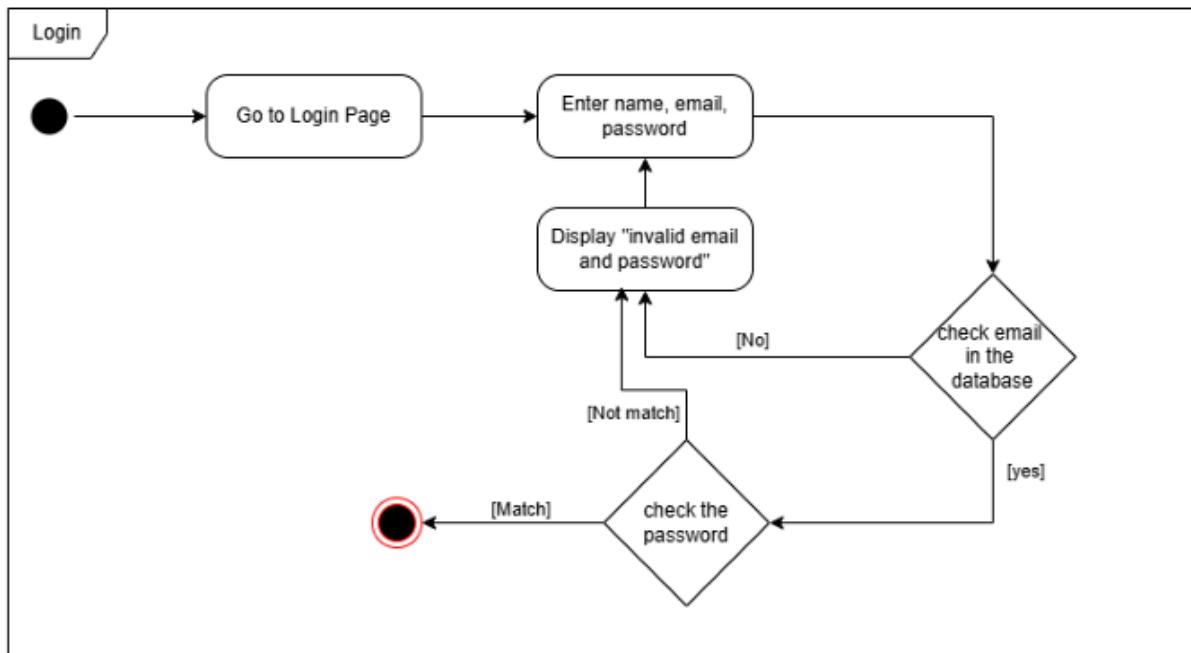


Figure 16- Activity Diagram For User Registration

Activity Diagram for User login*Figure 17- Activity Diagram For User Login*

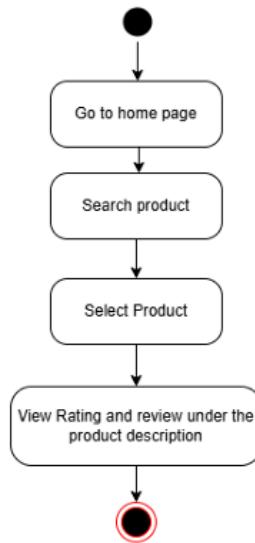
Activity Diagram for View Product

Figure 18- Activity Diagram For View Product

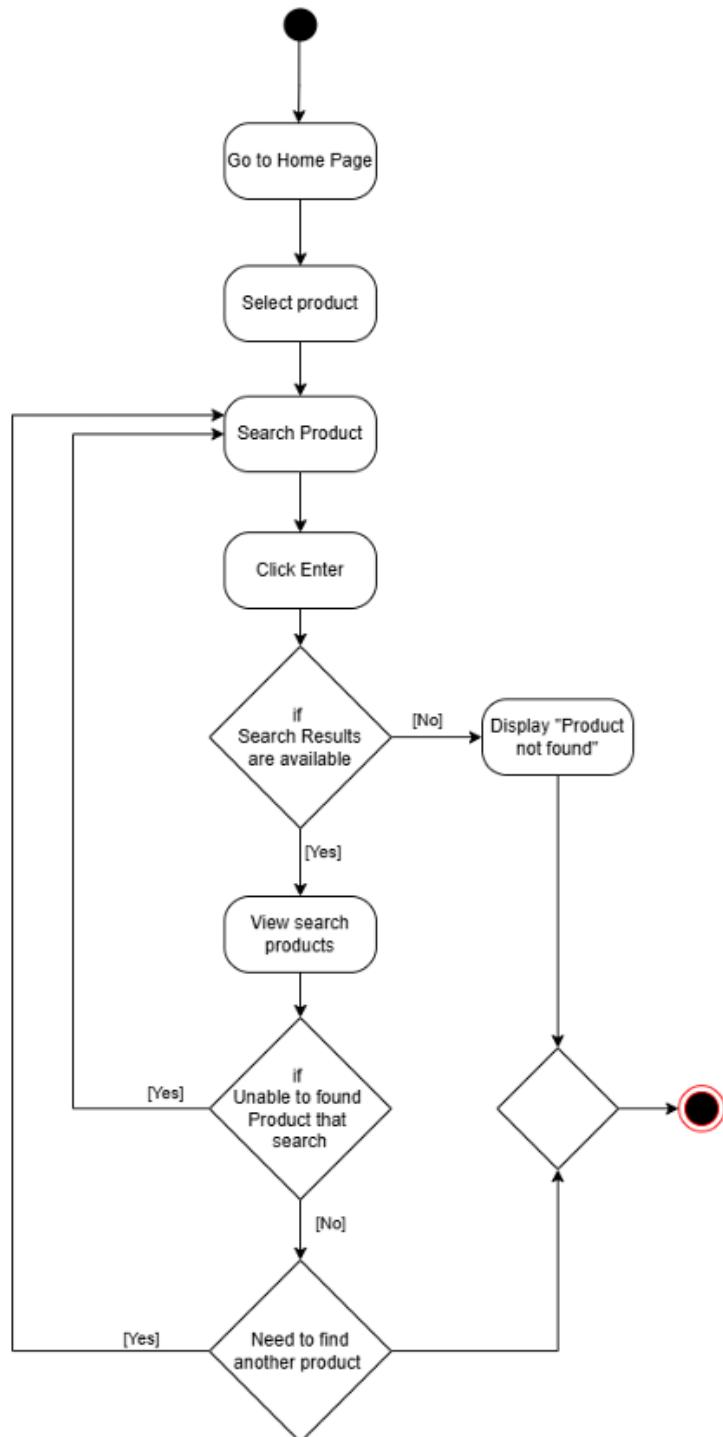
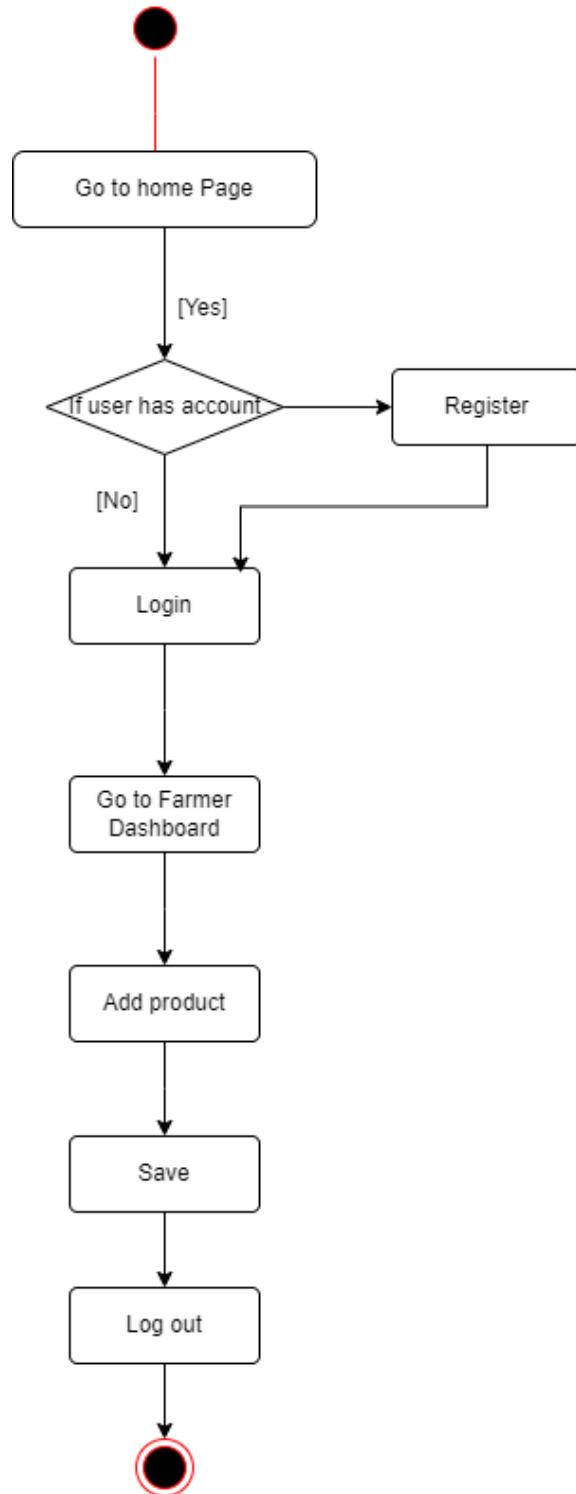
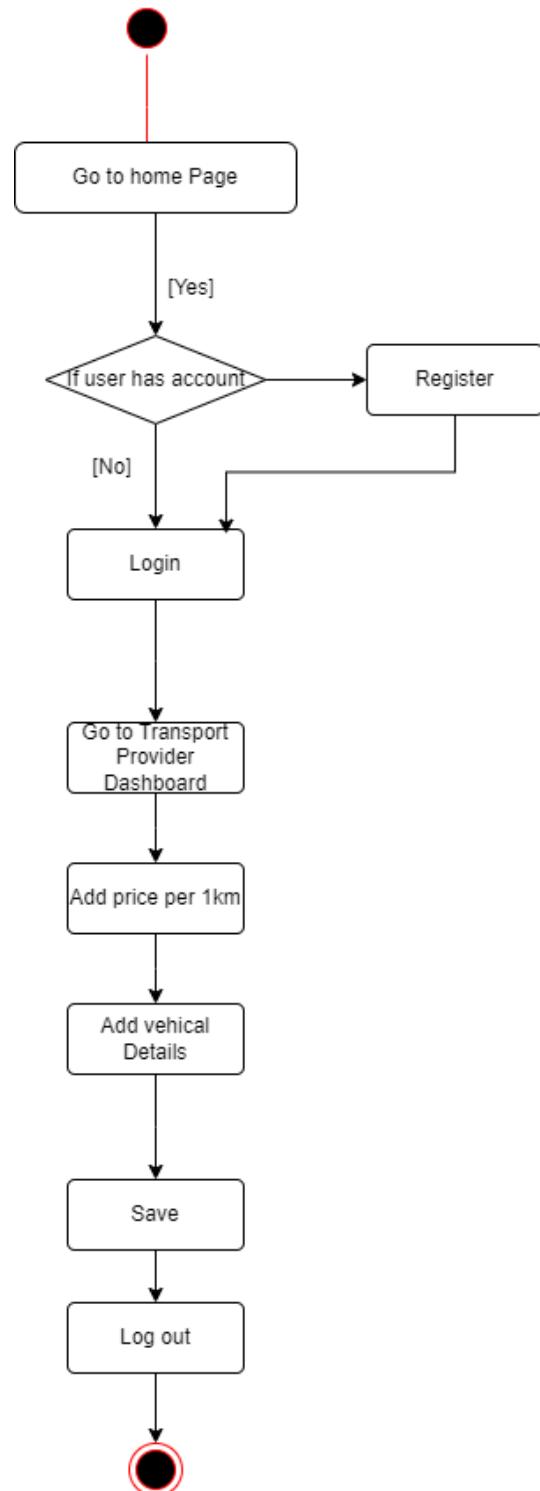
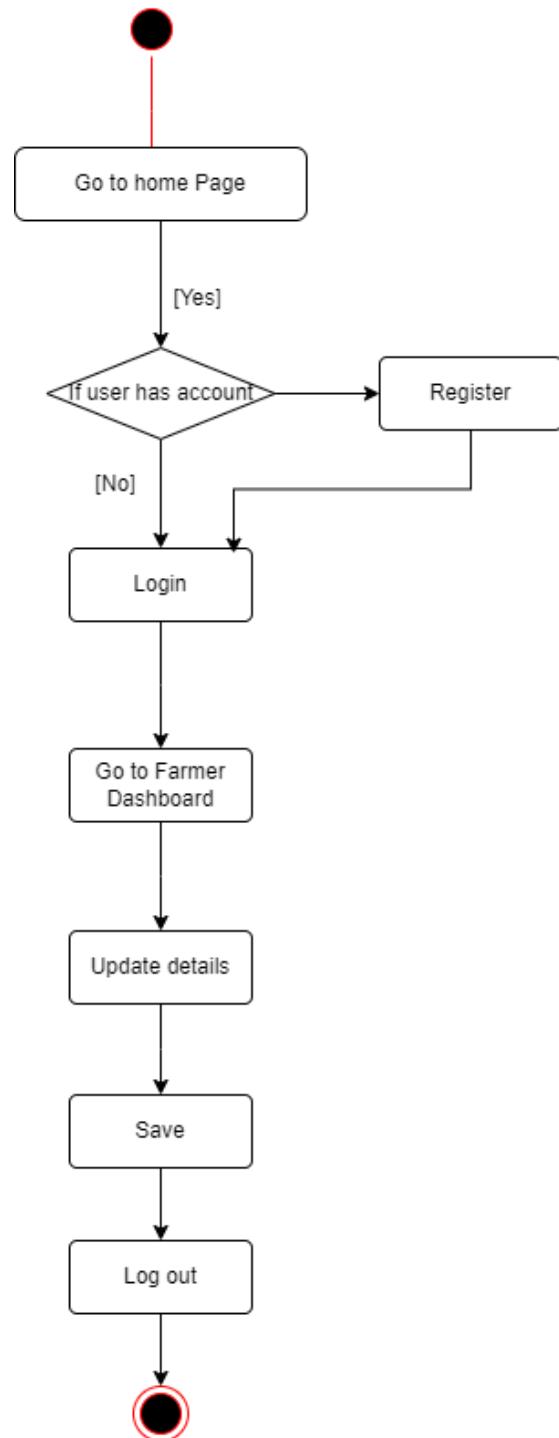
Activity Diagram for Brows Product

Figure 19- Activity Diagram For Brows Product

Activity Diagram for Add Product by Farmer*Figure 20 - Activity Diagram For Add Product by Farmer*

Activity Diagram for Add Transport Details by Transport Provider*Figure 21- Activity Diagram For Add Details by Transport Provider*

Activity Diagram for Update Products by Farmer*Figure 22- Activity Diagram For Update Product by Farmer*

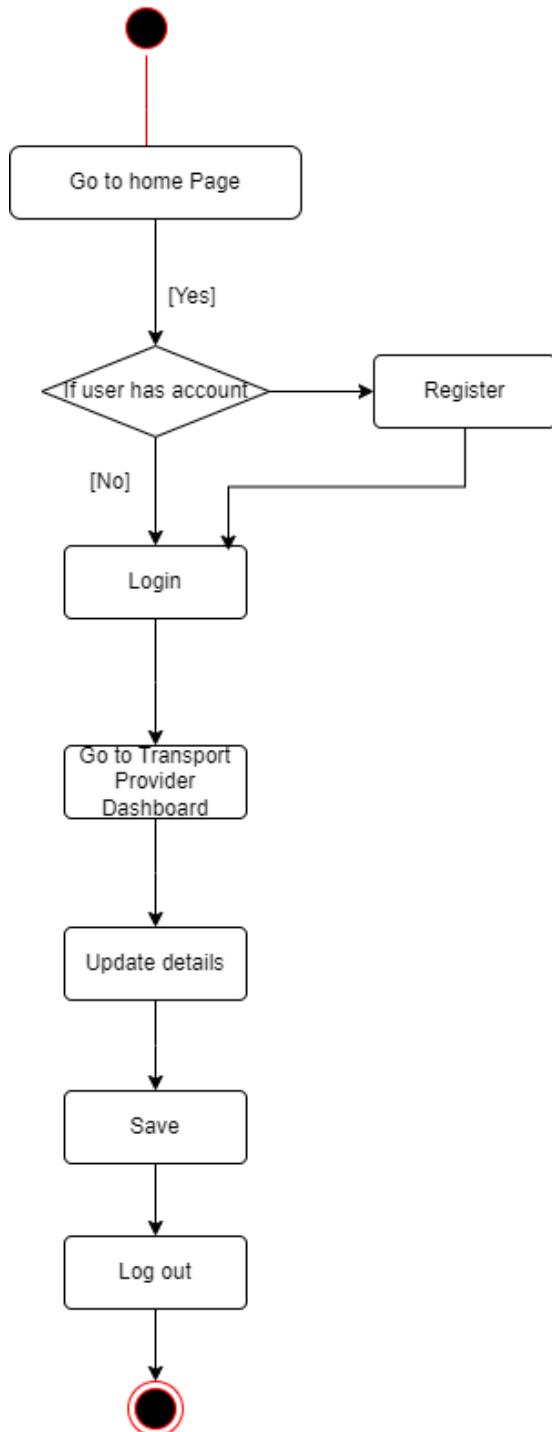
Activity Diagram for Update by Transport Provider

Figure 23- Activity Diagram For Update Details by Transport Provider

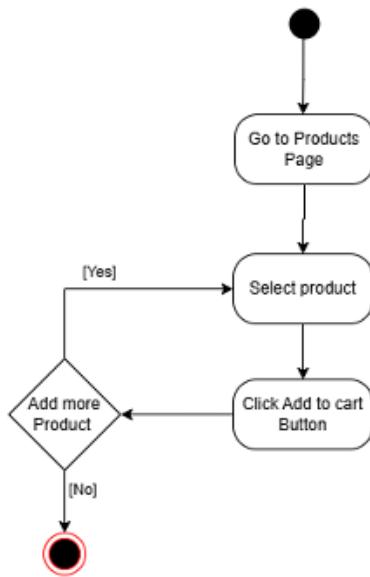
Activity Diagram for Add to Cart

Figure 24 - Activity Diagram For Add to Cart

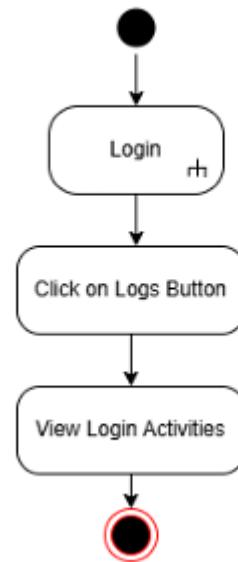
Activity Diagram for Admin view system activity log

Figure 25 - Activity Diagram for Admin view system activity log

Activity Diagram for Place Order

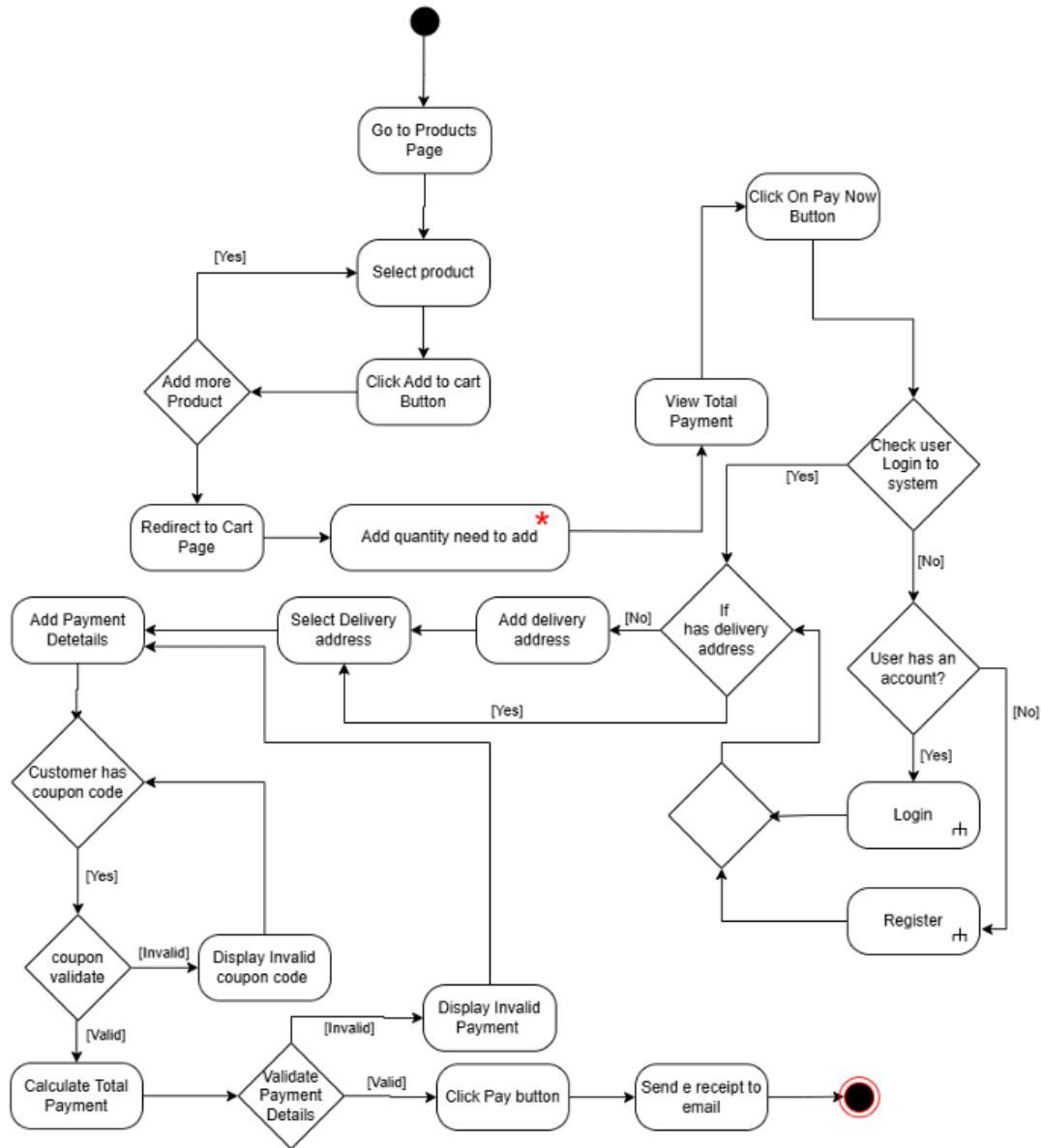


Figure 26 - Activity Diagram for Place Order

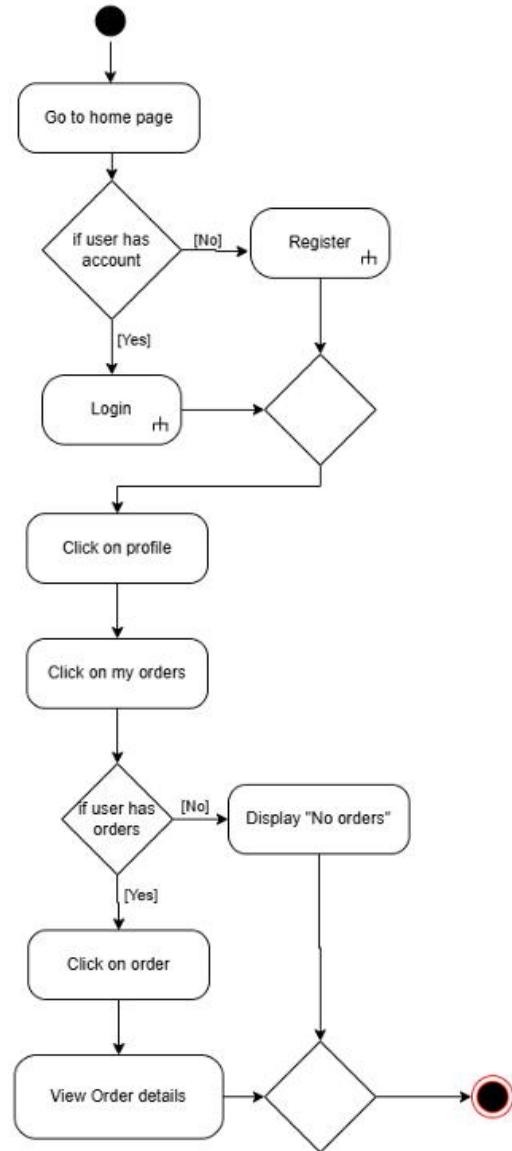
Activity Diagram for View Order

Figure 27 - Activity Diagram for View Order

Appendix D : ERD

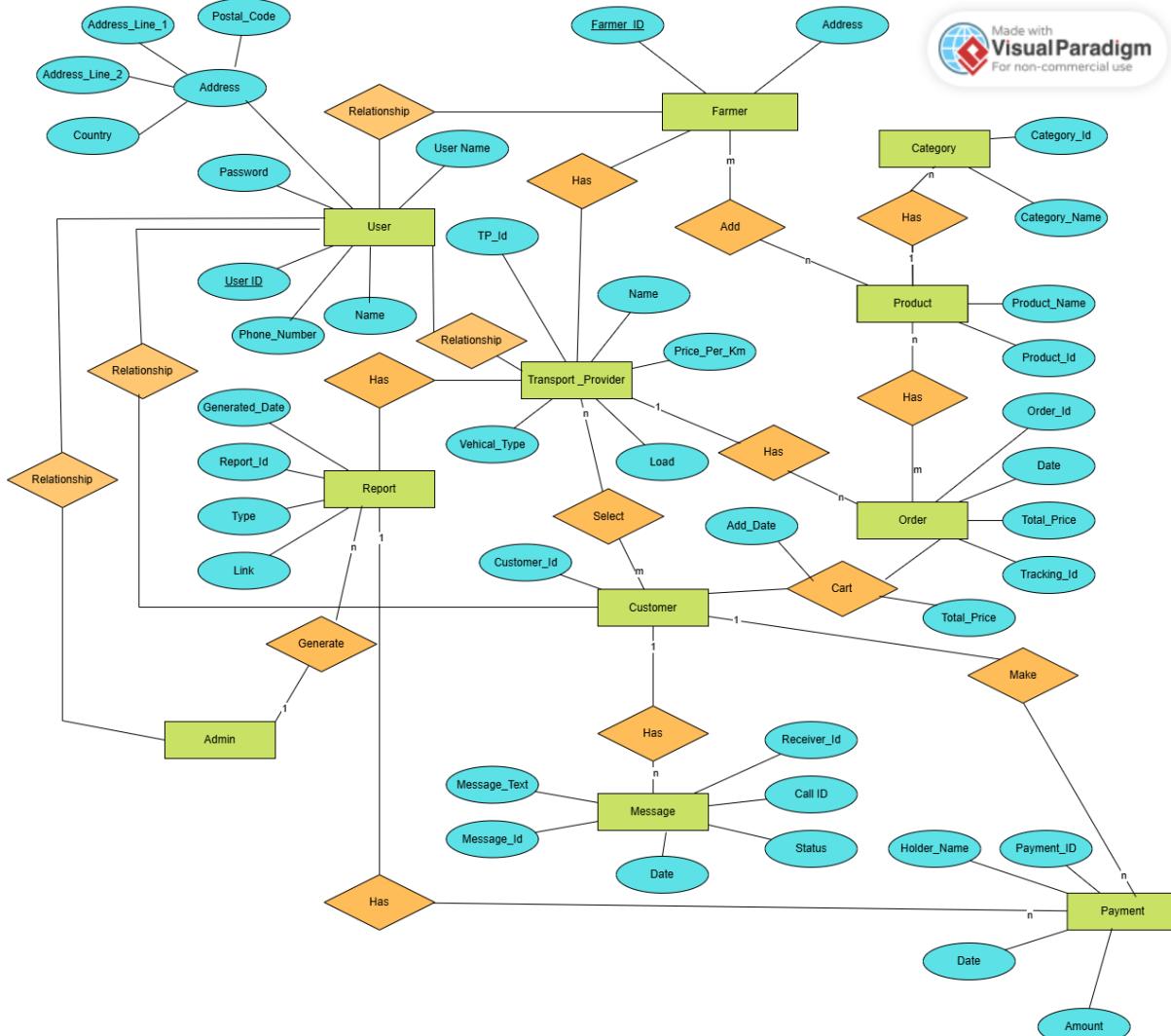


Figure 28- Entity Relationship Diagram

Appendix E : Relational Database Schema

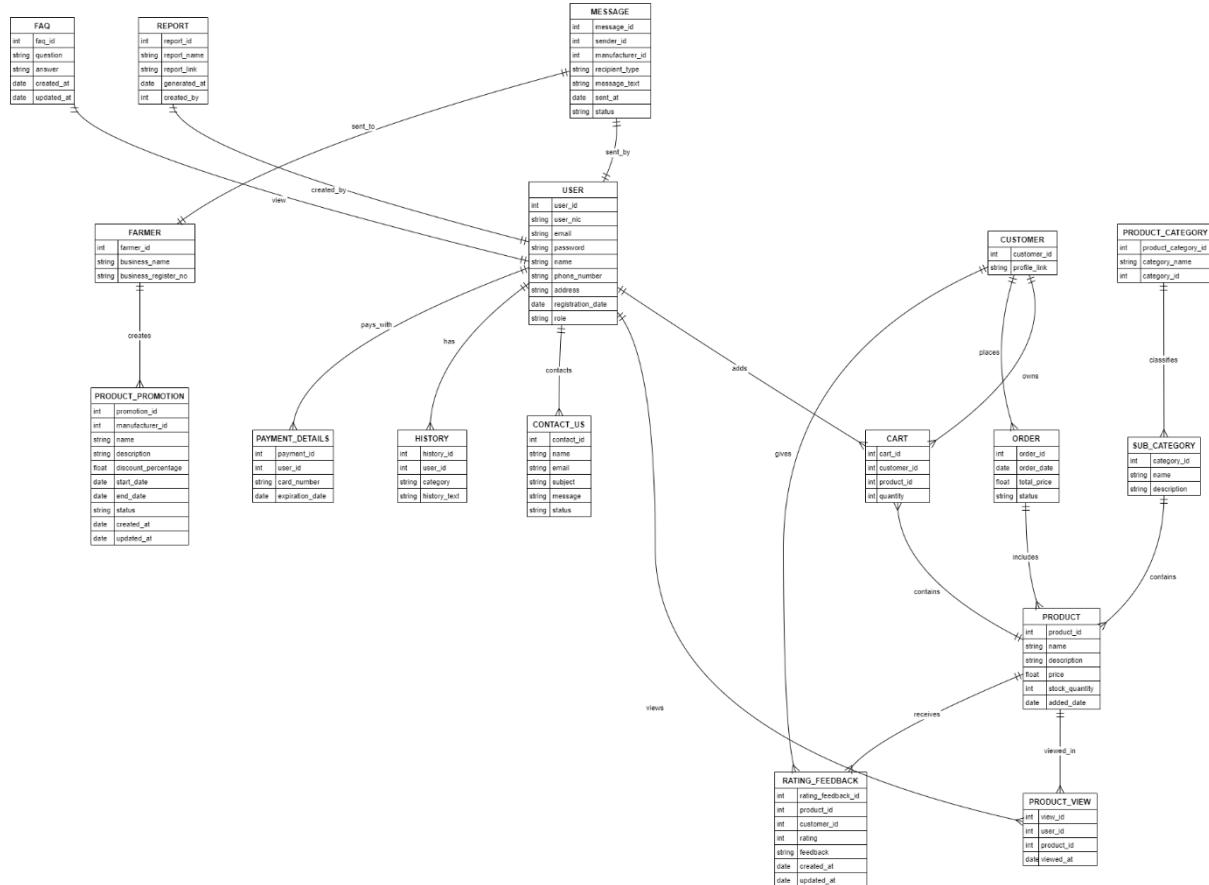


Figure 29 - Relational Database Schema

Appendix F : Class Diagram

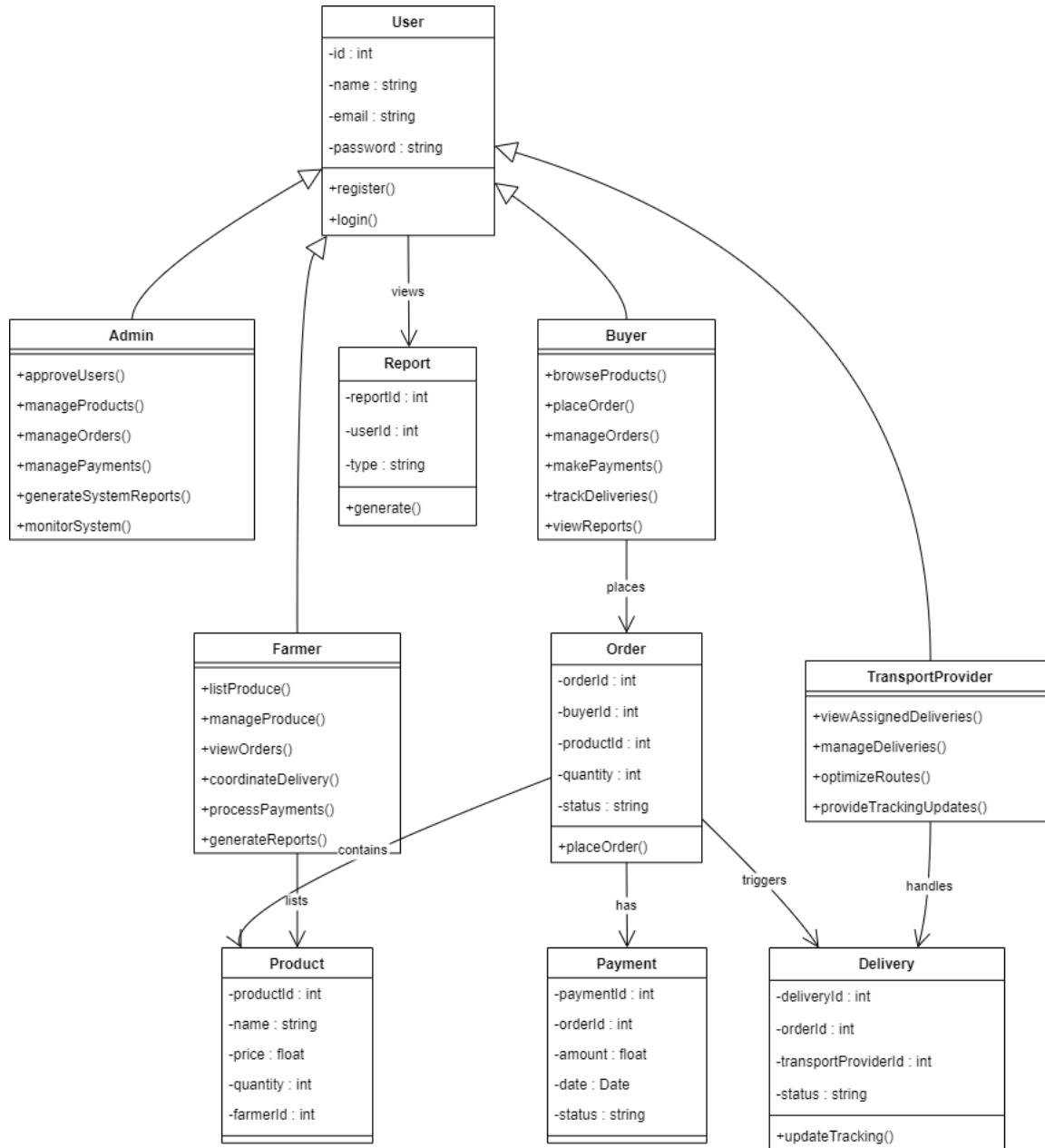


Figure 30 - Class Diagram

Appendix G : Sequence Diagram

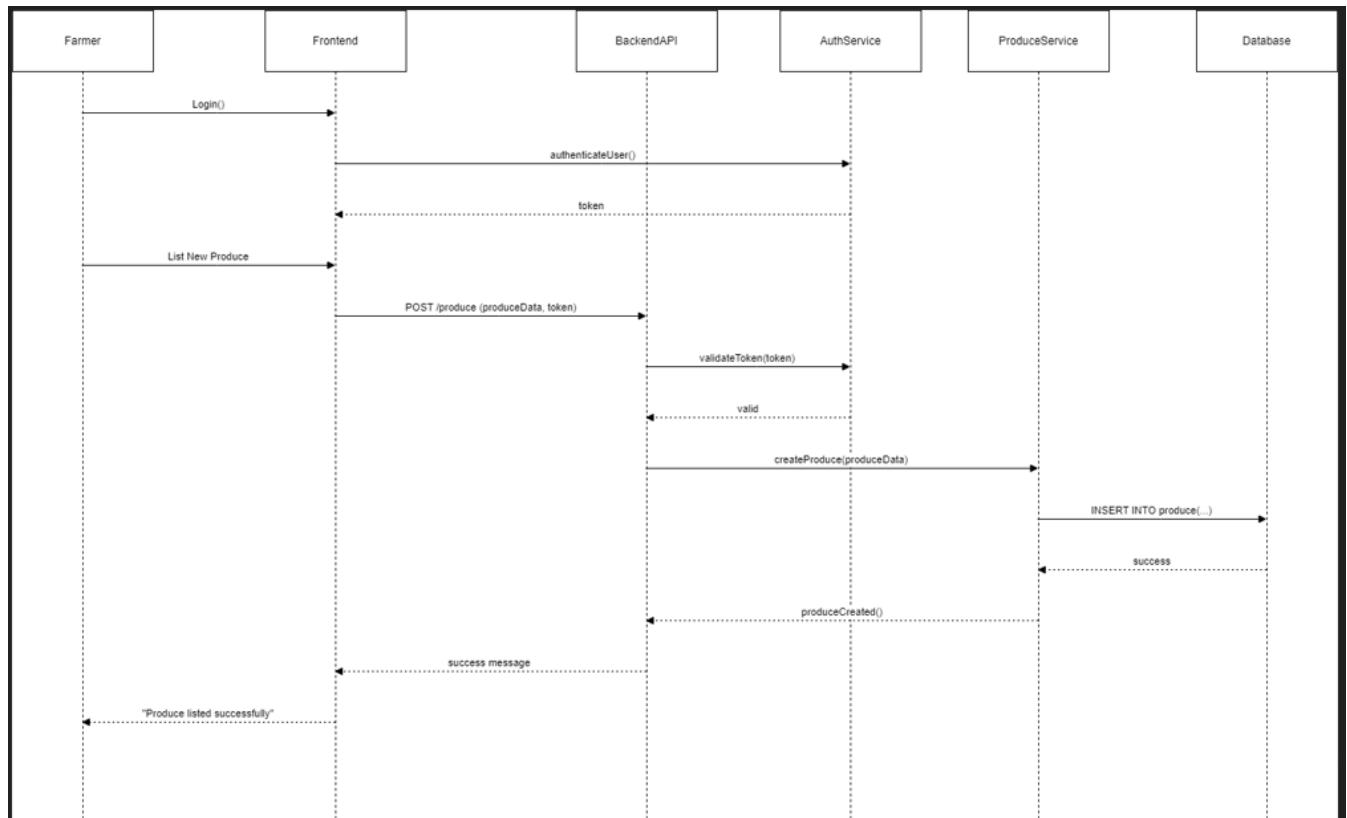


Figure 31- Sequence Diagram

Appendix H :Issues List

Issue ID	Description	Category	Date Identified	Status	Resolution / Action Taken
IS001	Unclear scope of Transport Provider role	Requirement Gathering	2025-01-15	Resolved	Conducted a follow-up interview with client to clarify role-specific activities.
IS002	Lack of clarity on whether all users can self-register	Requirement Gathering	2025-01-22	Resolved	Confirmed with client that Farmer, Buyer, and Transport Provider should register themselves.
IS003	Farmer dashboard had too many functions clustered together	UI Design	2025-03-20	Resolved	Redesigned dashboard layout with grouped sections and a sidebar menu.
IS004	Overlap between Buyer and Farmer UI components	UI Design	2025-04-02	Resolved	Customized shared components based on role, limiting actions appropriately.
IS005	Initial Figma mockups lacked mobile responsiveness	UI Design	2025-05-08	Resolved	Updated UI design to include responsive versions for mobile and tablet.

Table 6 - Issues List

Appendix I : Test Plan and Test Case Results

This appendix presents the test plan and test case results for the Chena Web-Based Agricultural Supply Chain Management System. The purpose of this appendix is to provide detailed evidence supporting the system evaluation discussed in Chapter 5. It demonstrates that the system has been tested systematically to verify correctness, reliability, and compliance with functional requirements.

Test Strategy

The testing strategy for the Chena system followed a structured and incremental approach. Testing activities were carried out throughout the development lifecycle to identify defects early and ensure stable system behavior. Both functional and integration-level testing were performed to validate individual modules as well as interactions between system components.

Testing focused on critical system areas including user management, product and order management, transport and delivery handling, payment processing, and reporting functionalities. Test cases were designed based on functional requirements defined in Chapter 3 to ensure traceability between requirements and test outcomes.

Manual testing was primarily used due to the nature of user interface interactions and role-based workflows. Test inputs included both valid and invalid data to verify proper validation, error handling, and system responses.

Test Case Tables

The following tables present representative test cases executed during system testing. Each test case includes a unique identifier, description, input conditions, expected output, and actual result.

User Management Test Results

Table 7 - User Management Test Results

Test Case ID	Test Case Description	Input	Expected	Result
			Output	
TC-01	User login with empty credentials	Empty username and password	Error message displayed	Pass
TC-02	User login with incorrect credentials	Invalid username and password	Login failure message	Pass
TC-03	User login with valid credentials	Correct username and password	Redirect to role-based dashboard	Pass
TC-04	Registration with missing fields	Empty required fields	Validation error message	Pass
TC-05	Registration with invalid email	Incorrect email format	Email validation error	Pass
TC-06	Farmer registration with duplicate NIC	Existing NIC number	Duplicate NIC error message	Pass
TC-07	Transport provider registration	Existing NIC number	Registration rejected	Pass

	with duplicate NIC			
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These results confirm that the system enforces proper identity validation and secure access control, maintaining data integrity and platform reliability.

Product and Order Management Test Results

Table 8 - Product and Order Management Test Results

Test Case ID	Test Case Description	Input	Expected Output	Result
TC-08	Add new product with valid details	Product name, category, price, quantity	Product successfully added and visible to buyers	Pass
TC-09	Add product with missing required fields	Incomplete product details	Validation error message displayed	Pass
TC-10	Update existing product details	Updated price or quantity	Product details updated successfully	Pass
TC-11	Remove product listing	Product selected for deletion	Product removed from buyer product list	Pass
TC-12	Buyer browses product listings	Product search and filter inputs	Relevant products displayed	Pass

TC-13	Buyer places order with sufficient stock	Valid product and quantity	Order confirmed and inventory updated	Pass
TC-14	Buyer places order with insufficient stock	Quantity exceeds available stock	Order rejected with error message	Pass

These results confirm that the product and order management module functions correctly by maintaining accurate product information, supporting smooth order placement, and ensuring real-time inventory updates. The system successfully prevents invalid operations and provides clear feedback to users, contributing to reliable and transparent agricultural transactions.

Pricing Logic Test Results

Table 9 - Pricing Logic Test Results

Test Case ID	Test Case Description	Input	Expected Output	Result
TC-15	Single farmer product listing	One product with defined price	Product displayed correctly	Pass
TC-16	Same product with different prices	Multiple farmers list same product	Lowest price shown on home page	Pass

TC-17	Same product with same prices	Identical prices	First listed product displayed	Pass
TC-18	Buyer searches product by specific farmer	Farmer-specific search	Selected farmer's product shown	Pass
TC-19	Farmer updates product price	New price value	Updated price reflected	Pass
TC-20	Farmer removes product	Product deletion	Product excluded from pricing logic	Pass

The results confirm that the pricing logic functions as intended, promoting transparency and fair competition while allowing buyers flexibility in selecting preferred farmers.

Payment and Order Tracking Test Results

Table 10 - Payment and Order Tracking Test Results

Test Case ID	Test Case Description	Input	Expected Output	Result
TC-21	Payment with invalid details	Incorrect payment information	Payment failure message	Pass
TC-22	Payment with insufficient balance	Low account balance	Insufficient balance error	Pass
TC-23	Successful payment	Valid payment details	Payment confirmed and order placed	Pass
TC-24	Order tracking update	Delivery status change	Real-time status update	Pass

Each table clearly demonstrates that the system behaves as expected under normal and error conditions. All critical functional paths were tested, including boundary cases such as duplicate NIC numbers during registration, insufficient stock during order placement, and invalid payment attempts.

Test Results Summary

All executed test cases produced the expected outcomes, indicating that the system meets its functional requirements. Input validation mechanisms worked correctly by preventing invalid

data submission and displaying appropriate error messages. Integration with the payment gateway functioned as expected in both successful and failed transaction scenarios.

Minor issues identified during early testing phases were resolved through iterative improvements. Overall, the test results provide a high level of confidence in the correctness, reliability, and readiness of the Chena system for deployment.

This appendix serves as concrete evidence supporting the system evaluation presented in Chapter 5.

Appendix J : User Manual

This appendix provides a user guide for the Chena Web-Based Agricultural Supply Chain Management System. It explains how different user roles interact with the system and perform their respective tasks. The purpose of this appendix is to demonstrate system usability, completeness, and ease of adoption.

Farmer User Guide

- ❖ Farmers can register on the platform by submitting their personal and business details. Once approved by the administrator, farmers gain access to their dashboard. From the dashboard, farmers can add new product listings, update prices and quantities, remove products, and manage incoming orders.

- ❖ Farmers can view order details, coordinate delivery with transport providers, and track payment status. The reporting section allows farmers to view sales, income, and performance reports to support business decision-making.

Buyer User Guide

- ❖ Buyers can browse available agricultural products without registering. They can search and filter products by category, price, and availability. Buyers can place orders by selecting products and quantities and proceed to checkout.
- ❖ Payments are completed securely through the integrated payment gateway. Buyers can track order delivery status in real time and view order history for reference.

Transport Provider User Guide

- ❖ Transport providers register by submitting vehicle details and pricing information. After administrator approval, transport providers can access their dashboard to manage delivery assignments.
- ❖ They can accept delivery requests, update delivery status at different stages, and manage transport pricing. This ensures efficient coordination between farmers and buyers during delivery operations.

Administrator Guide

- ❖ Administrators have full access to all system modules. They are responsible for approving user registrations, managing user roles, monitoring platform activity, and managing transport pricing details.
- ❖ Administrators can generate system-wide reports related to orders, deliveries, user activity, and overall platform performance. They also handle system monitoring and ensure smooth platform operation.
- ❖ This user manual demonstrates that the system is intuitive, role-based, and suitable for users with basic digital literacy.

Appendix K : Wireframes / UI Screenshots

This appendix presents the wireframes and user interface screenshots of the Chena Web-Based Agricultural Supply Chain Management System. The purpose of this appendix is to provide visual evidence of the system's user interface design as discussed in Chapter 3.4.1.

The included wireframes and screenshots illustrate the layout, navigation structure, and role-based dashboards implemented in the system.

GUI Standards

- modern design using a consistent color
 - Main Color - #FFFFFF
 - Primary Text Color - #000000
 - Secondary Text Color - # 1C5D2F
 - Primary Button Color - # 1C5D2F with #FFFFFF text
- Rounded corners and shadows ◦ Success message for #15803D color
- Error message for #EF4444 color
- Other messages # 1D4ED8 color

Landing Page

Chena is a web-based agricultural marketplace that connects farmers, buyers, and transport providers through a transparent and secure digital platform. It enables fair pricing, efficient logistics, and direct trade by eliminating unnecessary intermediaries.

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

[Home](#) [Our Services](#) [About Us](#) [Login](#)

Bringing the Farm to Your Front Door

With Fresh Produce, Fair Prices, and Fast Delivery.

Our Platform

Comprehensive Solutions

Empowering farmers, delighting customers, and connecting transport providers



Farmer Services

- ✓ Product listing and management
- ✓ Inventory tracking
- ✓ Direct customer connections
- ✓ Price management
- ✓ Order notifications
- ✓ Sales analytics

[Get Started →](#)



Customer Services

- ✓ Browse fresh products
- ✓ Advanced search filters
- ✓ Secure online ordering
- ✓ Multiple payment options
- ✓ Order tracking
- ✓ Customer support

[Start Shopping →](#)



Transport Services

- ✓ Delivery management
- ✓ Route optimization
- ✓ Earnings tracking
- ✓ Schedule management
- ✓ Real-time updates
- ✓ Performance metrics

[Join Network →](#)

Why Choose Chena?



Easy to Use
Intuitive interface designed for users of all technical levels



Secure Platform
Your data and transactions are protected with industry-standard security



24/7 Support
Our dedicated team is always ready to help you succeed



Fair Pricing
Transparent pricing with no hidden fees or commissions

Figure 32 - Landing page

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Header

The header provides quick access to key sections such as Home, Products, About Us, and Login based on user roles. It ensures easy navigation and a consistent user experience across the platform.

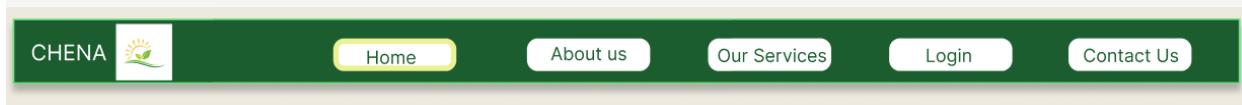


Figure 33 - Header before user login

Header after user login



Figure 34 - Header after user login

Footer

The footer contains essential links, contact information, and platform policies for user reference. It also displays copyright information and reinforces trust and credibility.

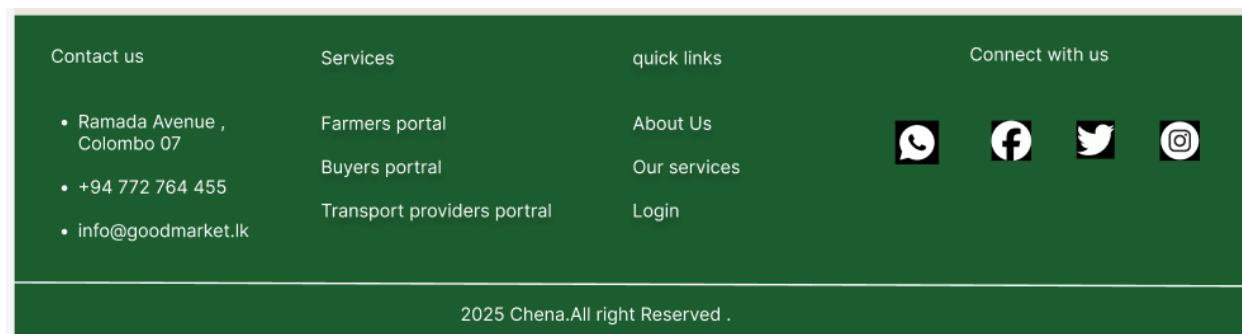


Figure 35 - Footer

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

About Us Page

Chena was developed to modernize the agricultural supply chain by enabling direct interaction between farmers, buyers, and transport providers. The platform focuses on transparency, fairness, and efficiency to support sustainable agricultural trade.

CHENA

Why Chena ?

Chena is a web-based agricultural supply chain platform designed to transform Sri Lanka's farming trade.

- **Our Mission:** Empower farmers, ensure fair trade, and connect all players in the agriculture ecosystem.
- **What We Do:** Provide a direct marketplace for farmers, fresh produce for buyers, and reliable transport options.
- **Why Chena:** We eliminate middlemen, promote transparency, and help local farmers earn more.
- **Our Vision:** Build a smarter, fairer, and more sustainable future for agriculture in Sri Lanka.

Figure 36 - About us page

CHENA

Contact Us

Have questions? We'd love to hear from you. Send us a message and we'll respond as soon as possible.

Send us a Message

Full Name
John Doe

Email Address
john@example.com

Subject
How can we help?

Message
Tell us more about your inquiry...

Contact Information

Address
123 Agricultural Road, Colombo, Sri Lanka

Phone
+94 XX XXXX XXXX

Email
support@chena.com

Business Hours
Monday - Friday: 8:00 AM - 6:00 PM
Saturday: 9:00 AM - 4:00 PM
Sunday: Closed

Figure 37 - Contact us page

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Providing Fresh Produce Every Single Day

Direct Marketplace for Farmers



We empower farmers by giving them direct access to buyers, eliminating middlemen. Through Chena, they can list produce, manage orders and earn a fair price, all from their fingertips.

Fast & Reliable Delivery



Chena connects with verified transport providers to ensure quick and safe delivery from farm to doorstep. Our logistics system is designed for speed, reliability, and customer satisfaction.

Fair & Transparent Pricing



We ensure fair pricing for both farmers and buyers through real-time market data and direct negotiation. No hidden fees, no unfair cuts — just honest trade for all.

Fresh Vegetables for Buyers



Buyers can explore a wide range of freshly harvested vegetables directly from trusted local farmers. Chena ensures quality, transparency, and convenience every step of the way.

Figure 38 - Our services page

Login and Registration Screens

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

These screens show the user login interface and registration forms for farmers and transport providers, including validation messages.

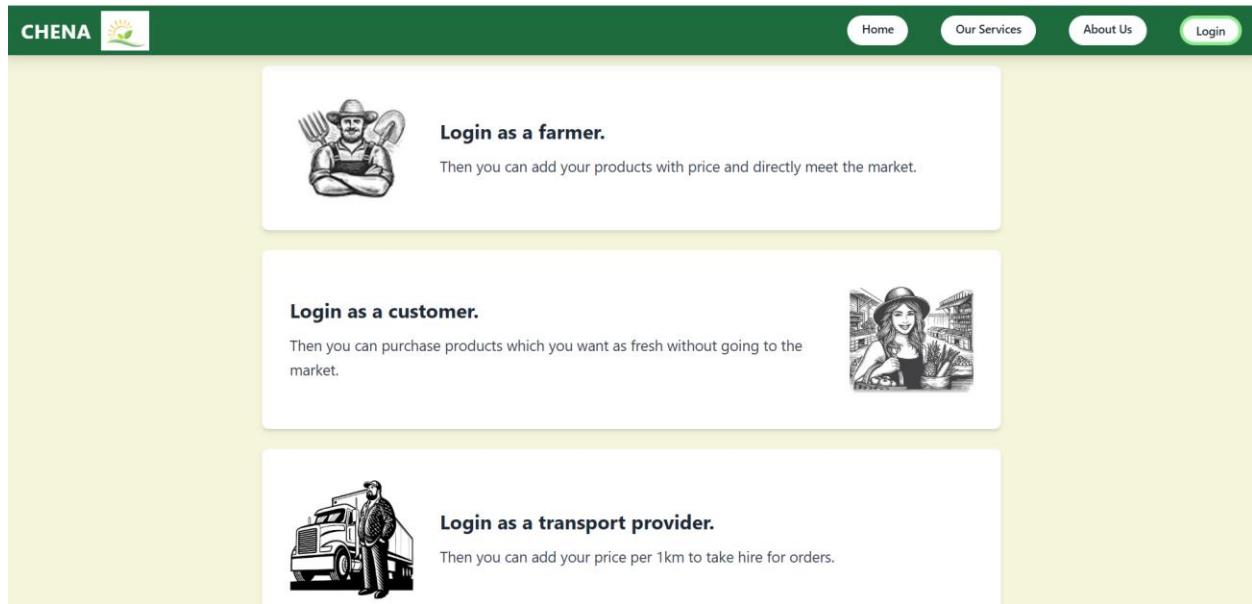


Figure 39 - User login page

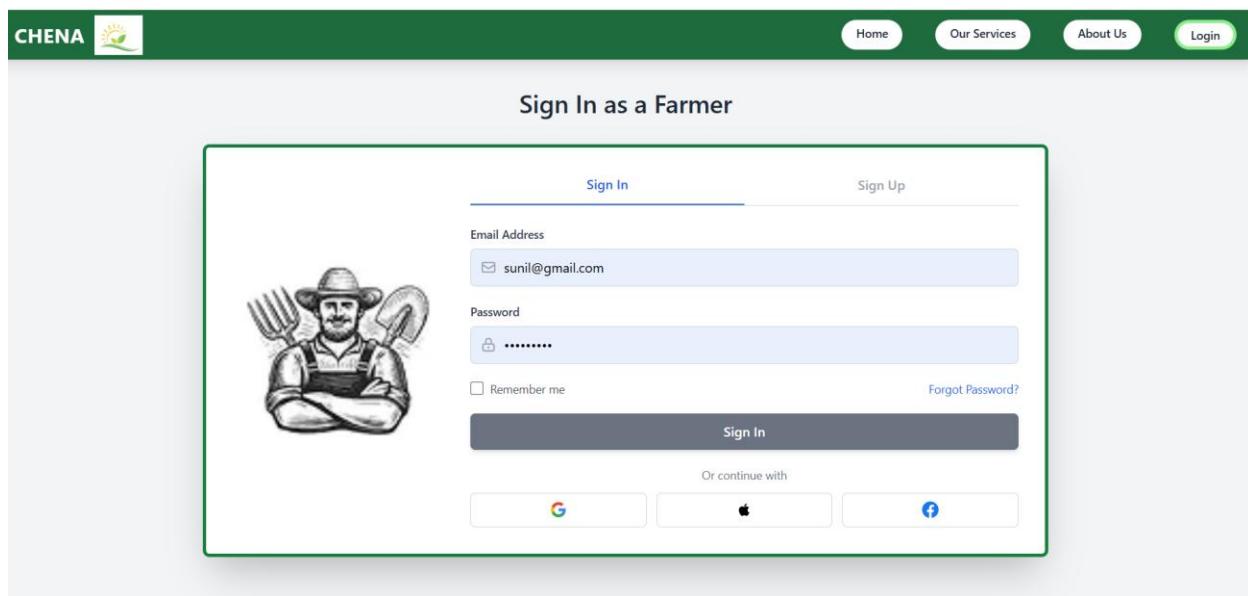
"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

Figure 40 - Farmer login page

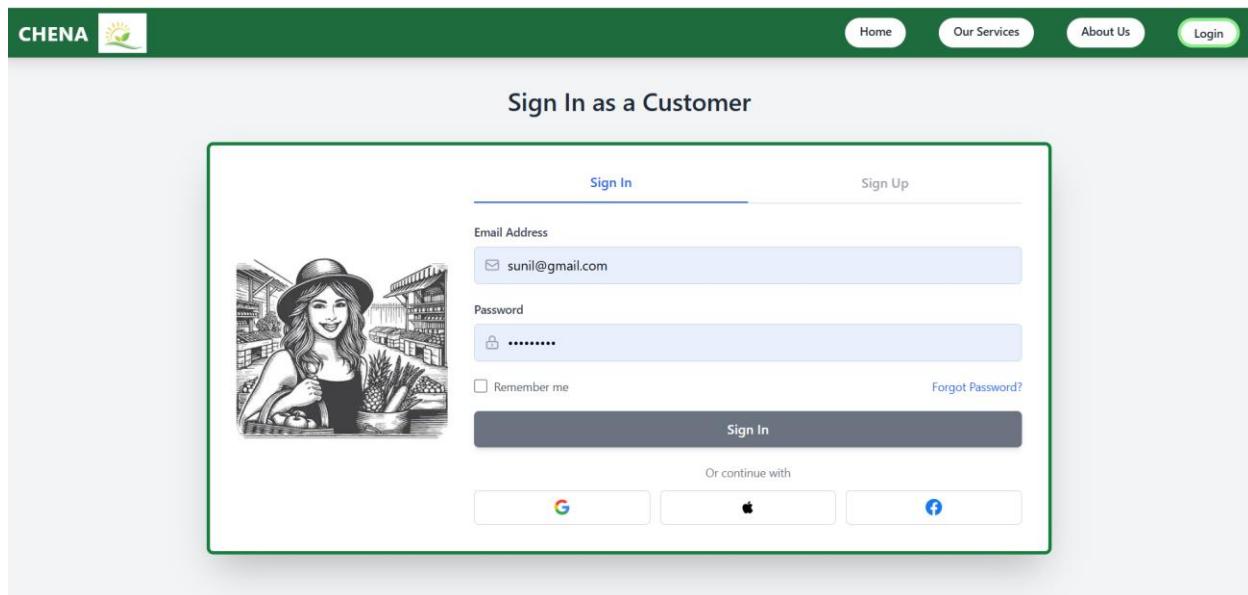


Figure 41 - Customer login page

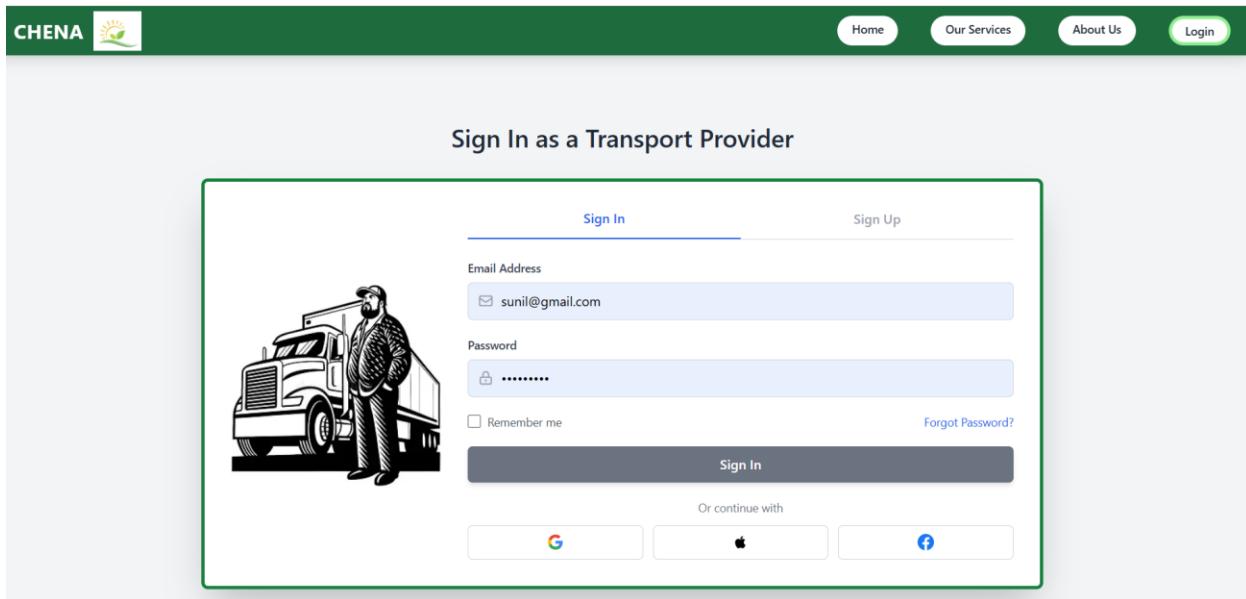
"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

Figure 42 - Transport provider login page

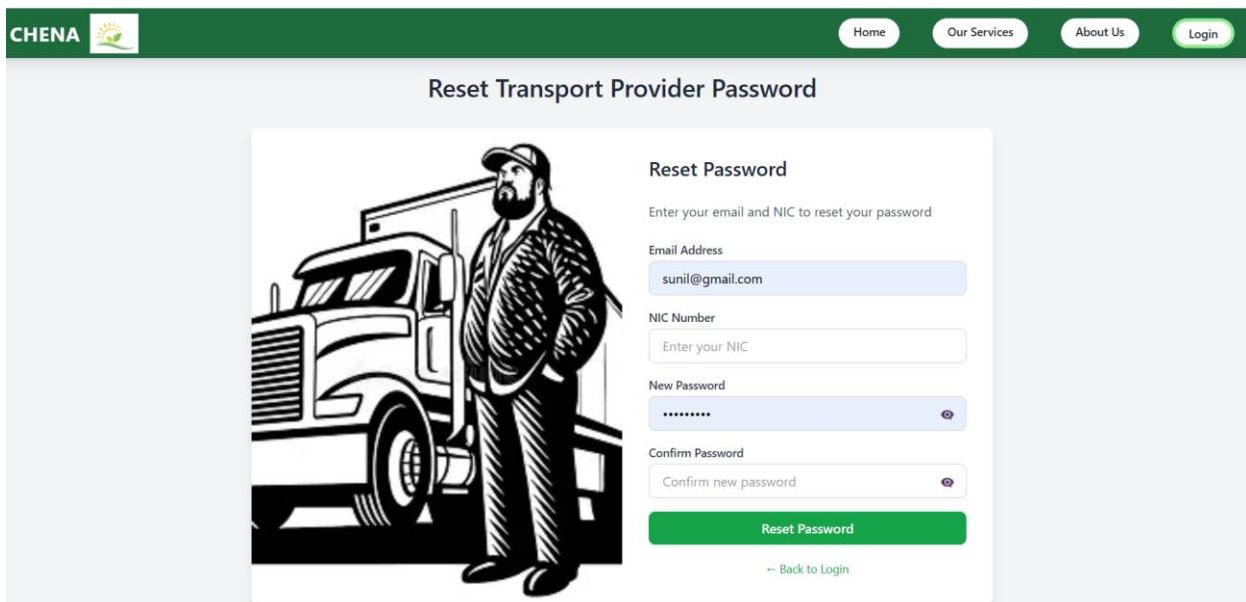


Figure 43 - Password reset page

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

Dashboards

Screenshots of farmer, buyer, transport provider, and administrator dashboards showing role-specific features and navigation.

The screenshot shows the CHENA Farmer Portal dashboard. At the top, there's a green header bar with the CHENA logo, a navigation menu with links to Home, Our Services, About Us, and Login, and a user profile indicator showing "Logged in as sunil@gmail.com". The main content area has a white background. On the left, a sidebar titled "Farmer Portal" lists Profile, Products, Orders, and Reports. The central area is titled "Profile" with the sub-tittle "Welcome to your farmer dashboard". It displays a circular profile picture with a large letter "S", the name "Sunil Perera", and the farm name "Sunil Organic Farm". Below this, there are two buttons: "✓ Verified Farmer" and "Organic Vegetables". A green "Edit Profile" button is located on the right. Underneath, a section titled "Personal Information" contains fields for Full Name (Sunil Perera), Email Address (sunil@gmail.com), Phone Number (+94 77 123 4567), and NIC Number (197512345678).

Figure 44 - Farmer dashboard

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

The screenshot shows the Chena platform interface for a farmer named Sunil Perera. The top navigation bar includes links for Home, Our Services, About Us, and Login. On the left, a sidebar menu offers options for Products, Orders, and Reports. The main content area displays personal information for Sunil Perera, including his name, farm name, verification status (Verified Farmer), and category (Organic Vegetables). Below this, a section titled "Personal Information" contains fields for Full Name (Sunil Perera), Email Address (sunil@gmail.com), Phone Number (+94 77 123 4567), NIC Number (197512345678), and Address (No. 123, Main Street, Anuradhapura).

Figure 45 - Farmer edit profile page

The screenshot shows the Chena platform interface for a farmer dashboard. The top navigation bar includes links for Home, Our Services, About Us, and Login. On the left, a sidebar menu offers options for Profile, Products (which is selected and highlighted in green), Orders, and Reports. The main content area displays a "Products" section with a welcome message and a "Farmer Portal" header. A green button labeled "+ Add Product" is prominently displayed. Below it, a form titled "Add Product to Your Inventory" asks the user to select a product from a catalog and set price and quantity. A dropdown menu shows the placeholder "-- Choose a product --". At the bottom right of the form are "Clear Form" and "Add to Inventory" buttons. In the top right corner, there is a notification indicating the user is logged in as sunil@gmail.com.

Figure 46 - Farmer add product page

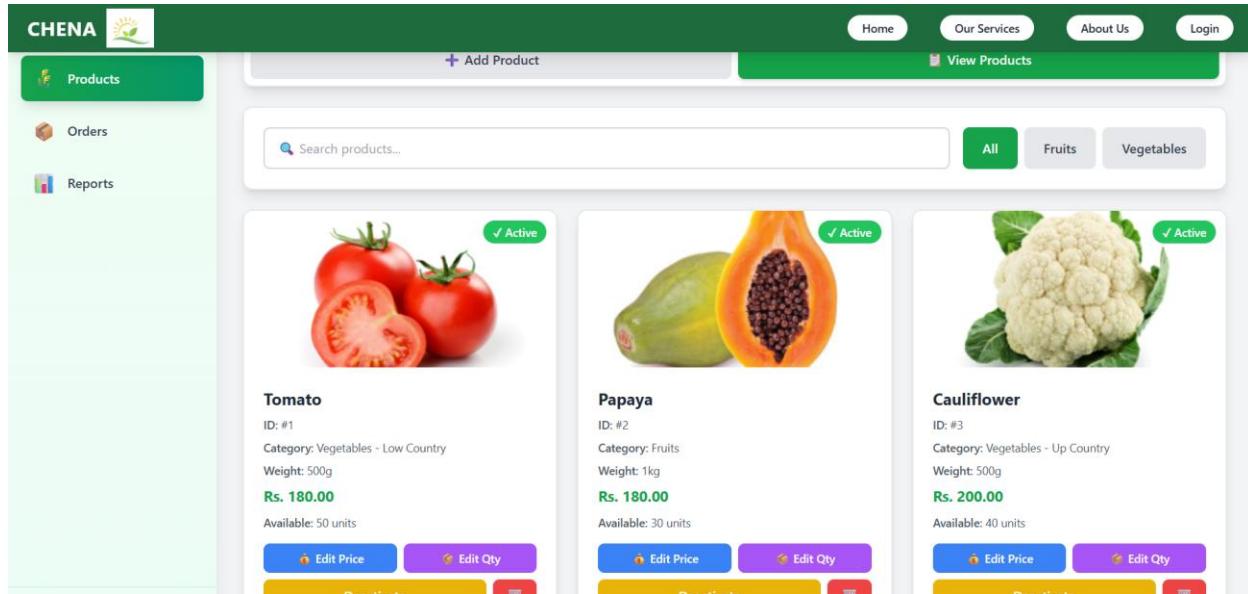
“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Figure 47 - Farmer view products page

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

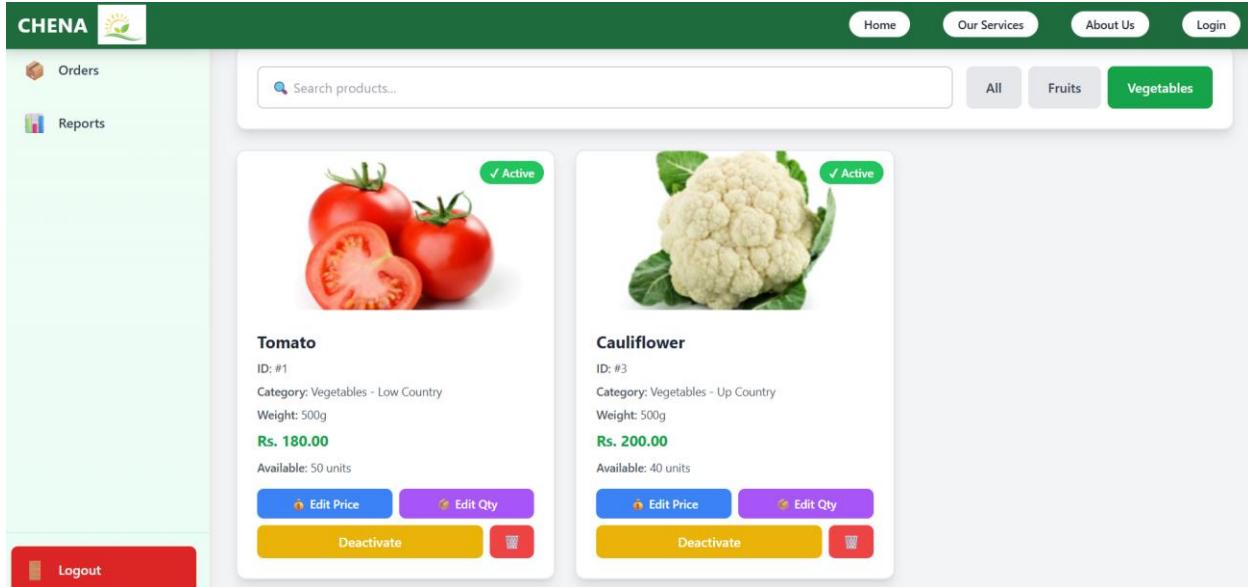


Figure 48 - Farmer view product filtered page

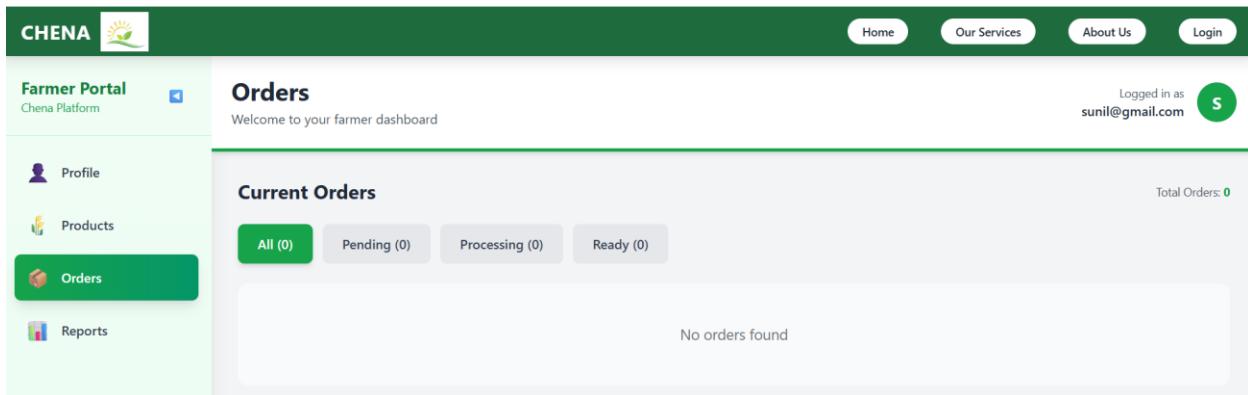


Figure 49 - Farmer order balances page

Product Listing Pages

Screens illustrating how farmers add products and how buyers browse available products.

Fresh Fruits & Vegetables

Discover our wide selection of farm-fresh produce delivered straight to your door

Showing 8 of 45 Products



Avocado
250g
Rs. 150.00

- 1 +

[View Farmers](#)



Grapes Red
500g
Rs. 350.00

- 1 +

[View Farmers](#)



Mandarin
1kg
Rs. 280.00

- 1 +

[View Farmers](#)

Categories

- Vegetables
- Fruits

Sub Categories

- Up Country Vegetables
- Low Country Vegetables

Filter By Price

Price: Rs. 0 — Rs. 500

Filter

Figure 50 - Product Listing page without filter

Showing 8 of 45 Products



Avocado
250g
Rs. 150.00

- 1 +

[View Farmers](#)



Grapes Red
500g
Rs. 350.00

- 1 +

[View Farmers](#)



Mandarin
1kg
Rs. 280.00

- 1 +

[View Farmers](#)



Narang
1kg



Papaya
1kg



Passion Fruit
500g

Categories

- Vegetables
- Fruits

Sub Categories

- Up Country Vegetables
- Low Country Vegetables

Filter By Price

Price: Rs. 0 — Rs. 500

Filter

localhost:3000

Figure 51- Product Listing page with filters

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

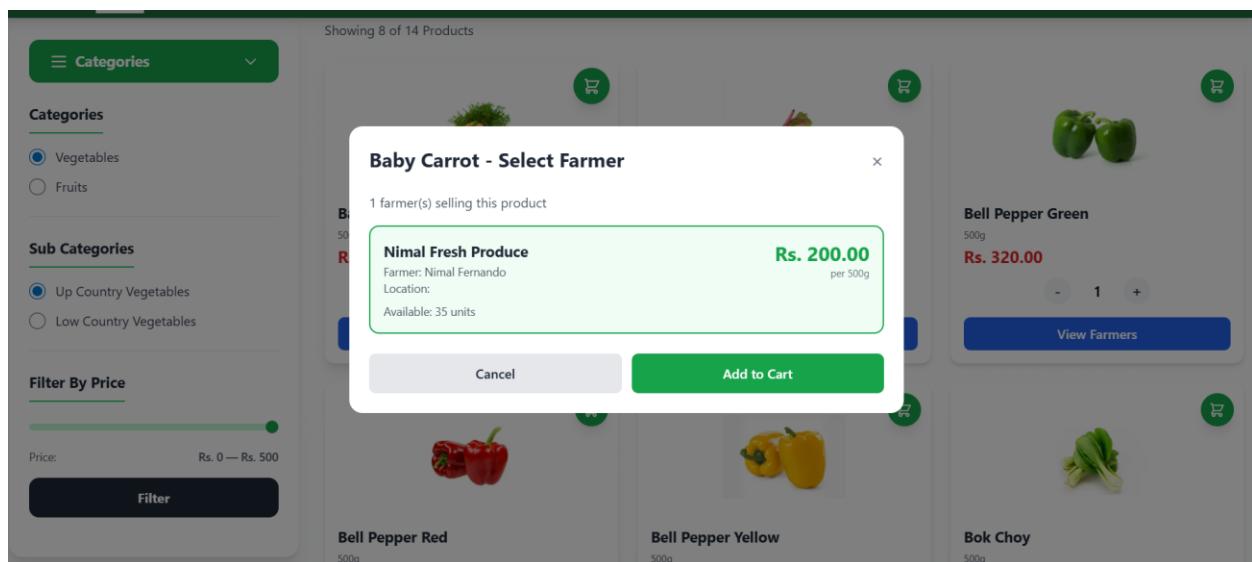


Figure 52 - View product detail preview page

The screenshot shows the Chena Customer Portal dashboard. The top navigation bar includes links for Home, Our Services, About Us, and Login. The user is logged in as surani@gmail.com. The left sidebar has a "Customer Portal" header and links for Profile, View Products, Cart, and Orders. The main content area is titled "Profile" and welcomes the user to their customer dashboard. It displays the user's profile picture (blue circle with white letter 'S'), name (Surani Alas), email (surani@gmail.com), and status (✓ Verified Customer, Active Account). There is a blue "Edit Profile" button. Below this, a "Personal Information" section shows the user's details: Full Name (Surani Alas), Email Address (surani@gmail.com), Phone Number (0245689369), and NIC Number (997937861v).

Figure 53 - Customer Dashboard

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

The screenshot shows the Customer Portal's Profile section. On the left sidebar, there are links for Profile, View Products, Cart, and Orders. The main area displays a profile card for "Surani Alas" with the email "surani@gmail.com". The card indicates she is a "Verified Customer" and has an "Active Account". There are "Save" and "Cancel" buttons at the bottom right of the card. Below the card, a "Personal Information" section contains fields for Full Name (Surani Alas), Email Address (surani@gmail.com), Phone Number (0245689369), and NIC Number (997937861v).

Figure 54 - Edit customer profile page

The screenshot shows the Customer Portal's View Products section. The sidebar includes links for Profile, View Products (which is highlighted in blue), Cart, and Orders. The main content area features a "Browse Fresh Products" banner with the subtext "Discover fresh fruits and vegetables from local farmers". It shows 12 products out of 45. The first product is Avocado (250g, Rs. 150.00). The second is Grapes Red (500g, Rs. 350.00). The third is Mandarin (1kg, Rs. 280.00). Each product card includes a shopping cart icon and quantity controls (-, 1, +).

Figure 55- Customer view product page

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

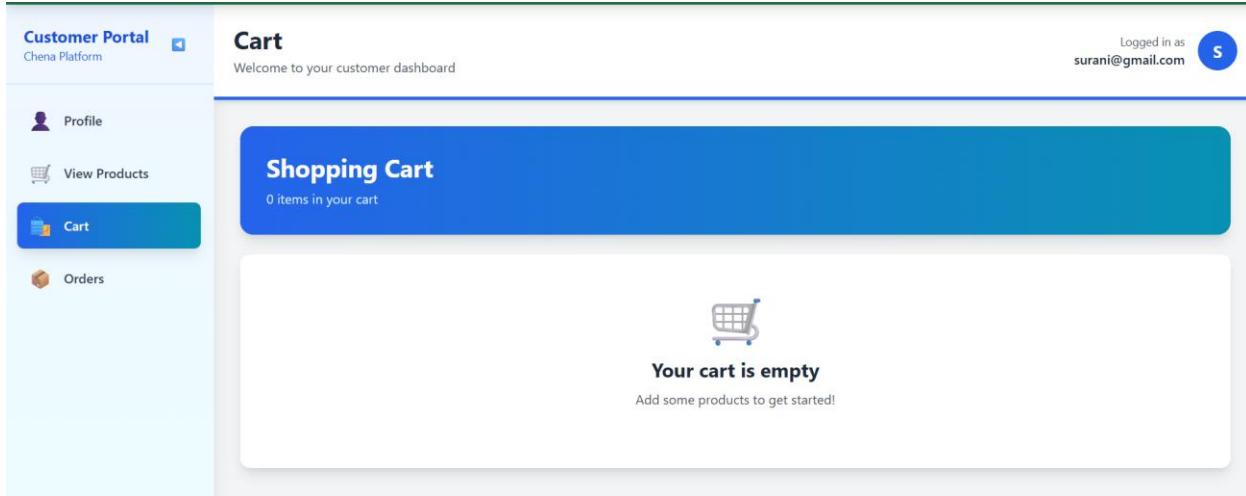


Figure 56 - Add to cart for customer

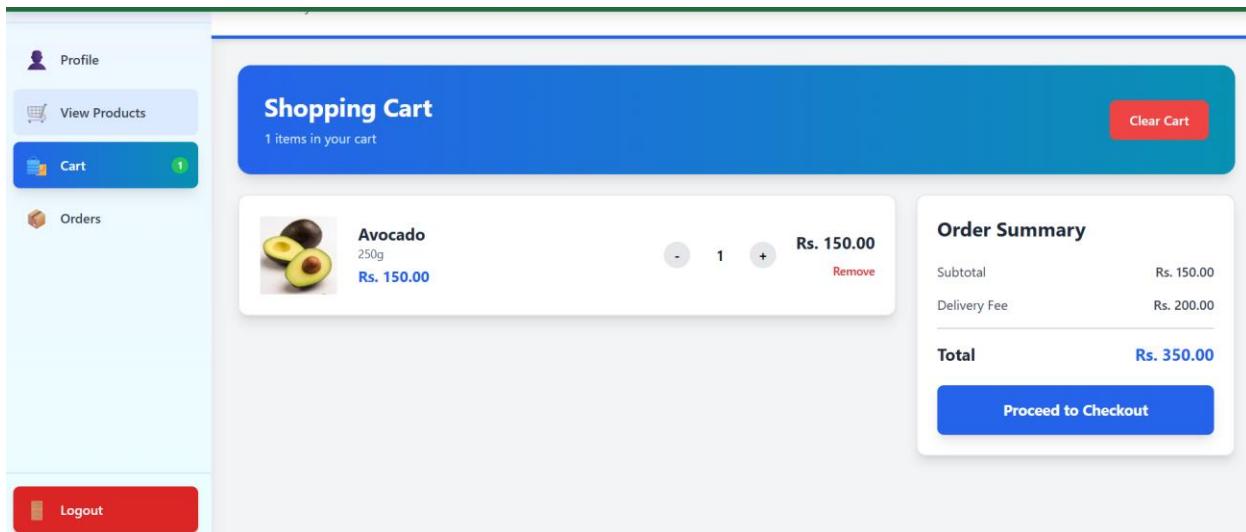


Figure 57 - Customer shopping cart

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

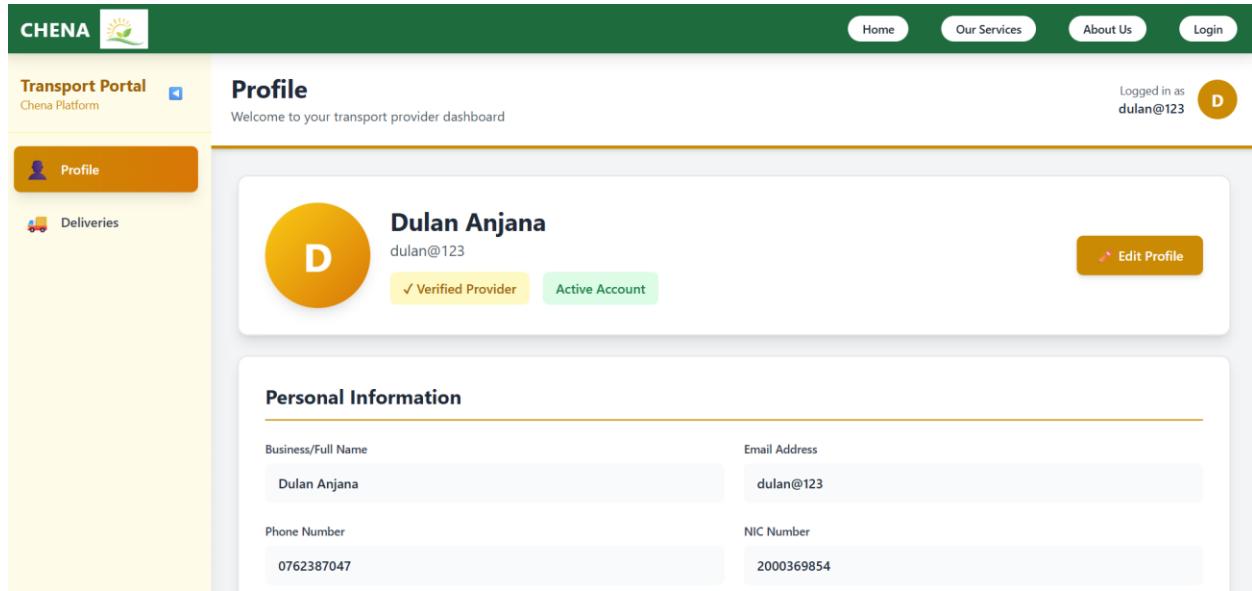


Figure 58 - Transport provider dashboard

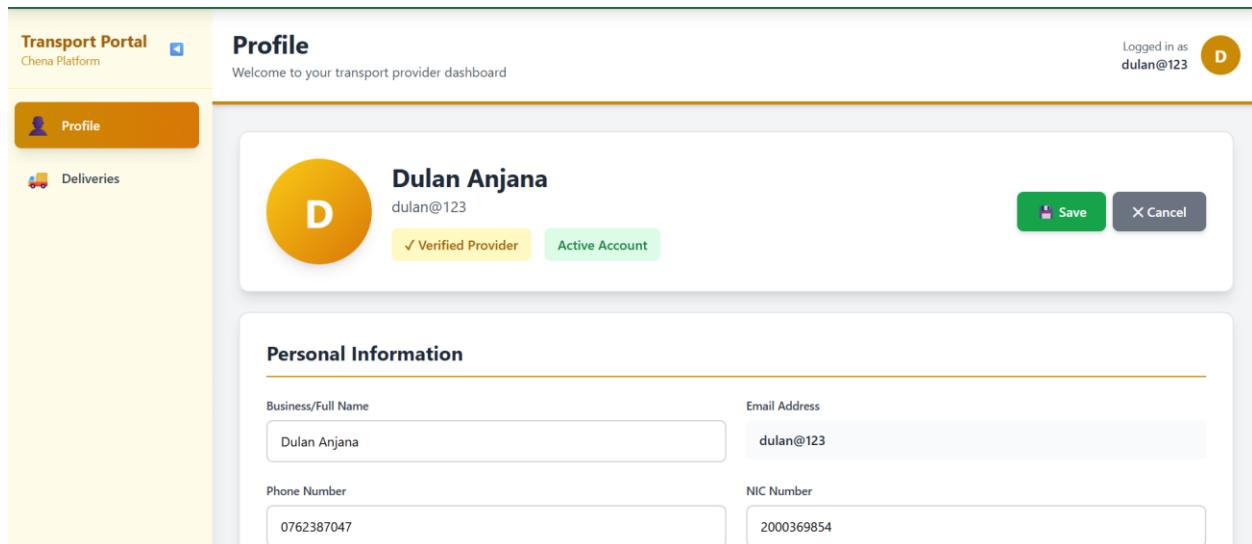


Figure 59 - Transport provider edit profile page

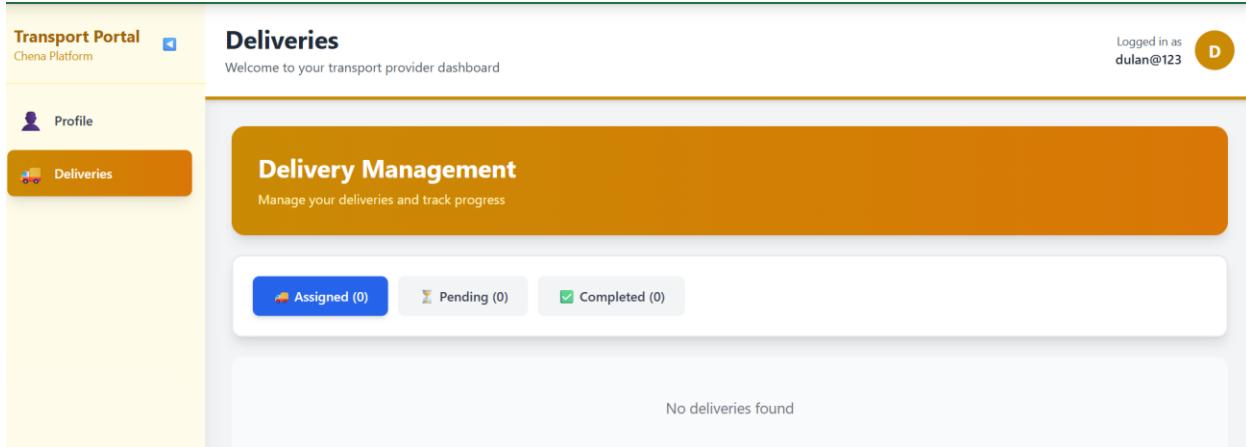
“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Figure 60 - Delivery management page

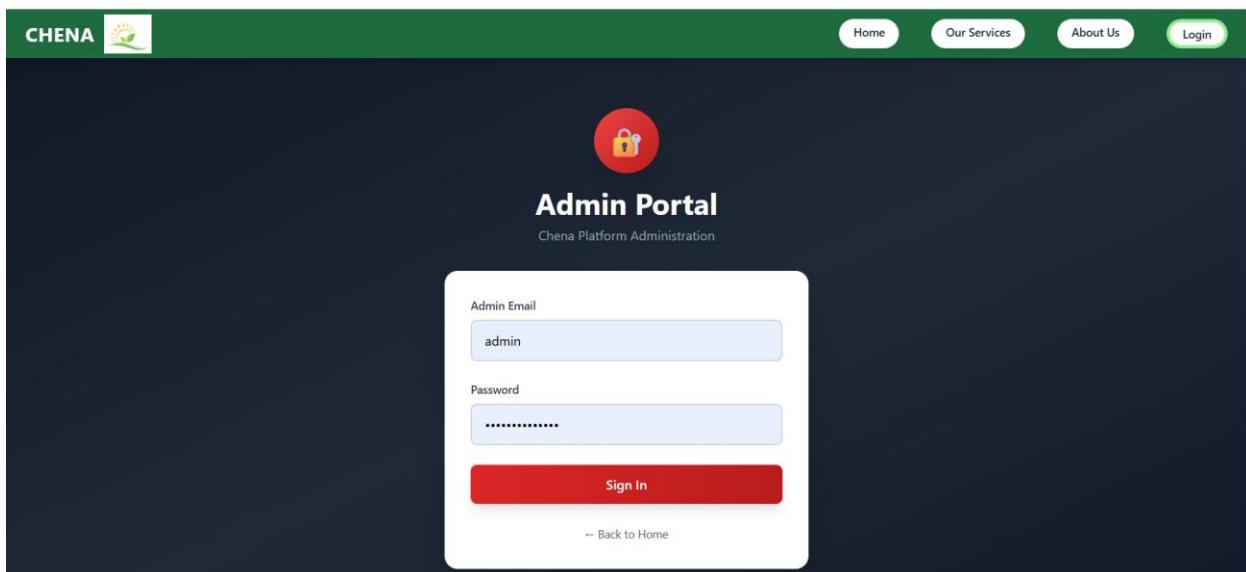


Figure 61 - Admin login

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

The screenshot shows the Admin Portal of the Chena Platform. The left sidebar has a purple header "Admin Portal" and "Chena Platform". Below it are three buttons: "Overview" (selected), "Users", "Products", and "Orders". The main content area has a green header "Overview" and a sub-header "Welcome to the admin dashboard". It displays various statistics in cards:

- Total Users: 18 (Farmers: 7)
- Total Products: 7
- Total Orders: 6 (Pending Orders: 5)
- Customers: 6
- Transport Providers: 4
- Total Revenue: Rs. 4,405

Below these cards is a section titled "Recent Orders" with a table:

Order #	Customer	Amount	Status	Date
ORD1769310092171	Rasini Perera	Rs. 1,100	pending	1/25/2026
ORD1769306459736	Rasini Perera	Rs. 1,095	pending	1/25/2026

Figure 62 – Admin dashboard

The screenshot shows the "Users" tab of the Admin Portal. The left sidebar has a purple header "Admin Portal" and "Chena Platform". Below it are three buttons: "Overview" (selected), "Users" (selected), "Products", and "Orders". The main content area has a green header "Users" and a sub-header "Welcome to the admin dashboard". It shows user filtering options:

User Type	Status	Search
All Users	All Status	Search by name, email, phone...

Below these filters is a table of users:

User	Type	Contact	Status	Joined	Actions
Lakma Rajapaksha lakma@gmail.com	Farmer	0775623140	Active	1/25/2026	Edit Deactivate Delete
Lakmal Gamage lakmal@gmail.com	Transport	0415263987	Active	1/25/2026	Edit Deactivate Delete
Medha Munasinghe medha@gmail.com	Customer	0254689637	Active	1/24/2026	Edit Deactivate Delete
Sithira Rajakaruna sithira@gmail.com	Farmer	0114556238	Active	1/23/2026	Edit Deactivate Delete

Figure 63 – Admin dashboard users tab

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

Order Management Pages

Screens showing order placement, order details, and order tracking interfaces.

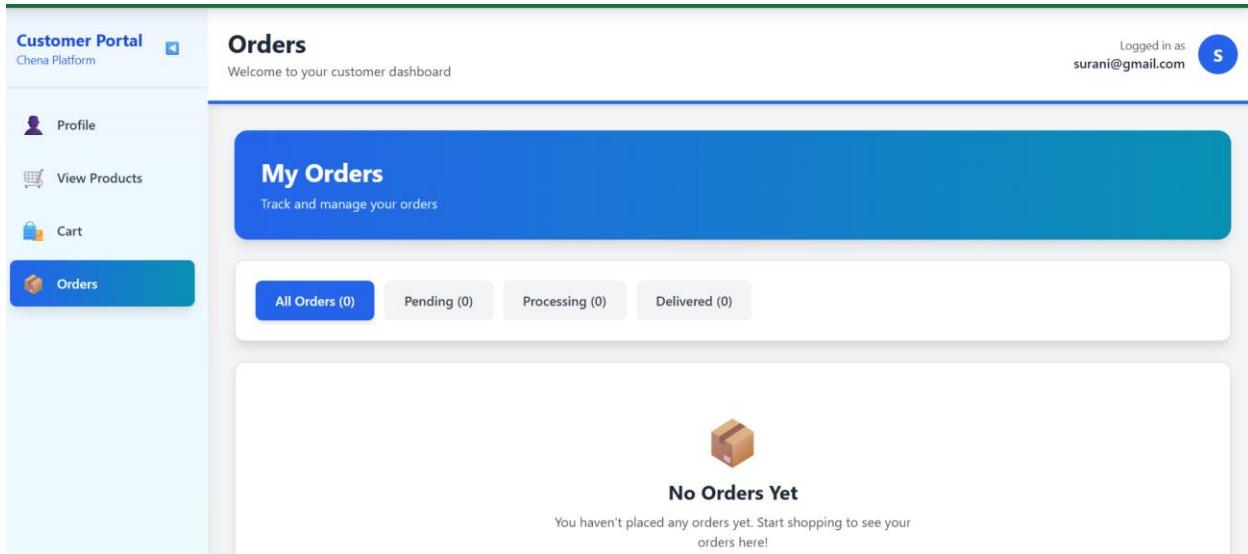


Figure 64 - Customer order management page

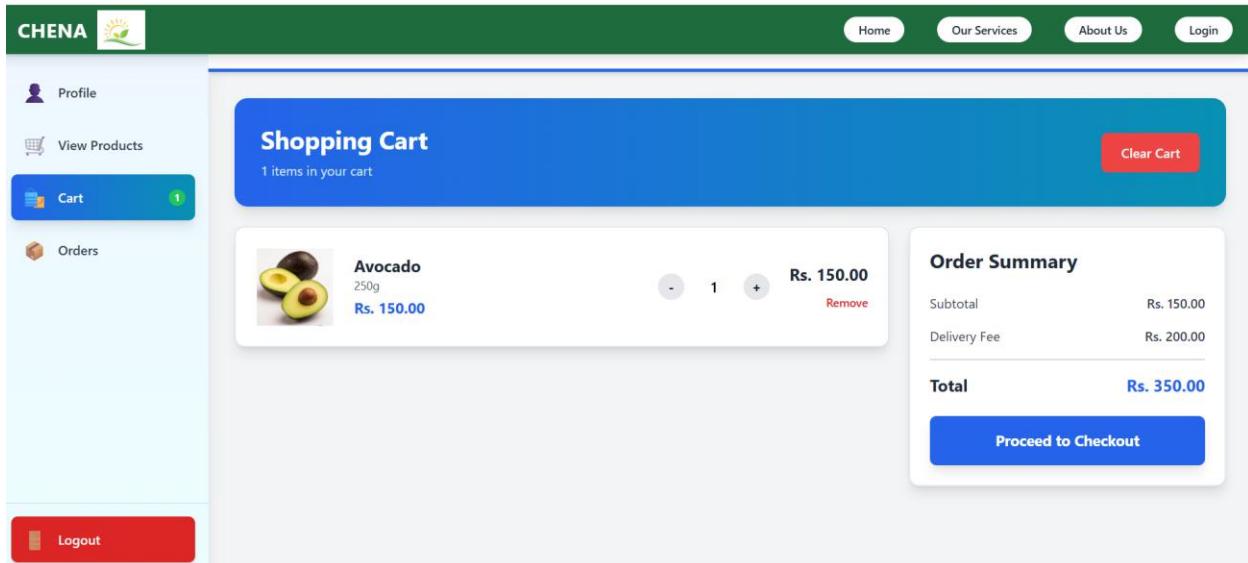


Figure 65 – Customer order cart tab

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

Payment Gateway

The screenshot displays the CHENA web-based agricultural supply chain management system's payment gateway interface. At the top, there is a navigation bar with links for Home, Our Services, About Us, and Login. The main content area is divided into several sections:

- Checkout:** A section titled "Checkout" with the sub-instruction "Complete your order".
- Delivery Information:** A form for entering delivery address, city, and postal code.
- Order Summary:** A table showing the items ordered:

Item	Description	Price
Avocado	Nimal Fernando Rs. 150 × 1	Rs. 150.00
Subtotal		Rs. 150.00
Delivery Fee		Rs. 200.00
Total		Rs. 350.00
- Select Transport Provider:** A section listing three transport providers:
 - Dulan Anjana:** Contact +94 762387047, Available Vehicles: Van (Rs. 100.00/km), Van (AE-4568) (Rs. 100.00/km).
 - Kamal Transport Services:** Contact +94 77 345 6789, Available Vehicles: Van (Rs. 50.00/km), Van (CAB-1234).
 - Kulan Bandara:** Contact +94 0778596G24, Available Vehicles: None.
- Payment Method:** A section showing payment options:
 - Credit/Debit Card: Pay securely with Stripe.
 - Cash on Delivery: Pay when you receive your order.
- Message:** A yellow box at the bottom of the payment method section states: "⚠ Please fill in all delivery information before proceeding with payment".

Figure 66 - Payment Gateway

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

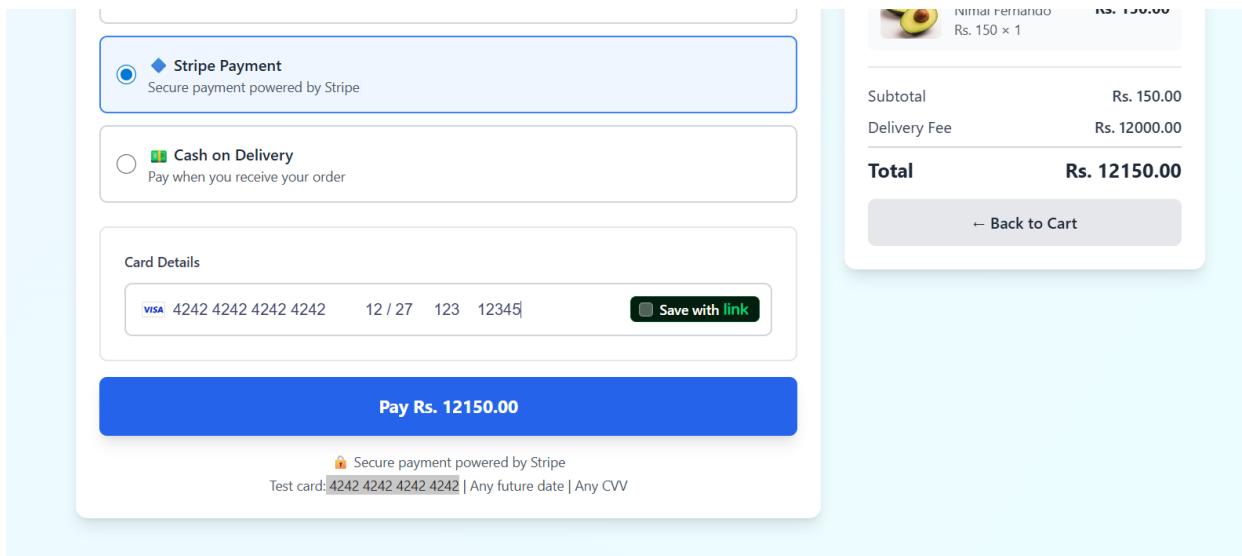


Figure 67 – Stripe Payment Gateway

Reporting Screens

Screens displaying sales reports, income analysis, and administrative analytics dashboards.

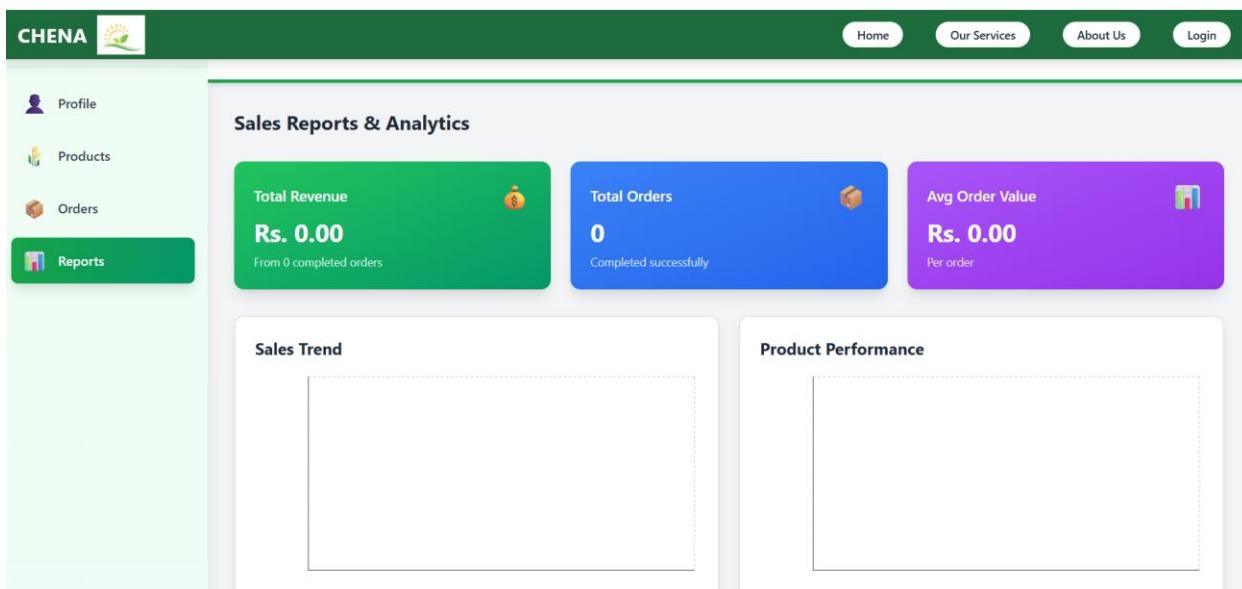


Figure 68 - Farmer reports page

These wireframes and screenshots visually confirm that the system design aligns with usability principles and functional requirements defined in Chapter 3. References to this appendix are made throughout the system design section.

Appendix L : Database Design

This appendix presents screenshots of the database tables used in the system, illustrating the structure, attributes, and relationships defined during the database design phase. These tables ensure efficient data storage, integrity, and reliable data retrieval to support the system's core functionalities.

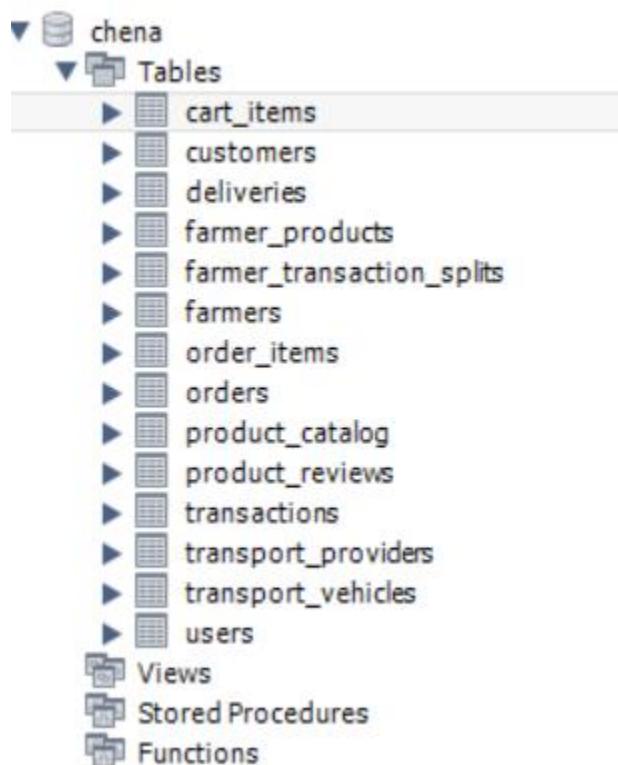


Figure 69 – Database table structure

"Chena" Web-Based Agricultural Supply Chain Management System for Farmers.

The screenshot shows a database grid titled "Result Grid" with the following columns: user_id, email, password_hash, user_type, full_name, phone, nic, address, is_verified, and is_active. There are 9 rows of data, each representing a user account. The data includes various names, email addresses, and contact details.

	user_id	email	password_hash	user_type	full_name	phone	nic	address	is_verified	is_active
▶	1	admin@chena.com	\$2y\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	admin	System Administrator	+94 11 234 5678	197012345678	Chena Head Office, Colombo 07	1	1
	2	sunil@gmail.com	\$2b\$10\$60/4kFVShZ0cgFRN1ccmlPw0nPxDn...	farmer	Sunil Perera	+94 77 123 4567	197512345678	No. 123, Main Street, Anuradhapura	1	1
	3	nimal@gmail.com	\$2y\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	farmer	Nimal Fernando	+94 77 987 6543	198012345679	No. 456, Farm Road, Nuwara Eliya	1	1
	4	rasin@gmail.com	\$2y\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	customer	Rasin Perera	+94 77 234 5678	199512345678	No. 45, Main Street, Colombo 07	1	1
	5	kamal@transport.com	\$2y\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	transport	Kamal Transport Services	+94 77 345 6789	198512345678	No. 78, Galle Road, Colombo 03	1	1
	6	thaara123@gmail.com	\$2b\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	farmer	Thaara Nagasinghe	0112356145	9632581243v	abc	0	1
	7	tmpunyawardhana@gmail.com	\$2b\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	customer	Thamindu Madhusan	0112356145	2000563245	No.80 , Gahitiyawa , Ganemulla	0	1
	8	isu123@gmail.com	\$2b\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	customer	Isumundi Rathnayake	0472563987	1999563245	No.23, Aghanadi , Walsamulla	0	1
	9	mattheesha123@gmail.com	\$2h\$10\$92IXUNpkjO0rQSBvMl.Ye4oKoEa3Ro...	farmer	Mattheesha Herath	0762387047	2007563941	Nr. 123, Hettiva Rd, Gammla	0	1

Figure 70 -User table

The screenshot shows a database grid titled "Result Grid" with the following columns: farmer_id, user_id, farm_name, farm_size, farm_type, bank_account, bank_name, branch, created_at, and updated_at. There are 9 rows of data, each representing a farm entry. The data includes farm names, sizes, types, and associated bank information.

	farmer_id	user_id	farm_name	farm_size	farm_type	bank_account	bank_name	branch	created_at	updated_at
▶	1	2	Sunil Organic Farm	5 Acres	Organic Vegetables	1234567890	Bank of Ceylon	Anuradhapura	2025-12-04 23:19:32	2025-12-04 23:19:32
	2	3	Nimal Fresh Produce	3 Acres	Mixed Farming	9876543210	Commercial Bank	Nuwara Eliya	2025-12-04 23:19:32	2025-12-04 23:19:32
	3	6		NULL	NULL	NULL	NULL	NULL	2025-12-05 06:43:08	2025-12-05 06:43:08
	4	9		NULL	NULL	NULL	NULL	NULL	2025-12-15 04:55:43	2025-12-15 04:55:43
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 71 - Farmers table

The screenshot shows a database grid titled "Result Grid" with the following columns: customer_id, user_id, city, postal_code, created_at, and updated_at. There are 9 rows of data, each representing a customer entry. The data includes city names and postal codes.

	customer_id	user_id	city	postal_code	created_at	updated_at
▶	1	4	Colombo	00700	2025-12-04 23:19:32	2025-12-04 23:19:32
	2	7	NULL	NULL	2025-12-06 18:07:00	2025-12-06 18:07:00
	3	8	NULL	NULL	2025-12-06 18:24:09	2025-12-06 18:24:09
	4	10	NULL	NULL	2025-12-15 08:39:25	2025-12-15 08:39:25
	5	14	NULL	NULL	2025-12-15 09:04:19	2025-12-15 09:04:19
*	NULL	NULL	NULL	NULL	NULL	NULL

Figure 72 - Customers table

The screenshot shows a database grid titled "Result Grid" with the following columns: transport_id, user_id, city, postal_code, created_at, and updated_at. There are 9 rows of data, each representing a transport provider entry. The data includes city names and postal codes.

	transport_id	user_id	city	postal_code	created_at	updated_at
▶	1	5	Colombo	00300	2025-12-04 23:19:32	2025-12-04 23:19:32
	2	11	NULL	NULL	2025-12-15 08:45:51	2025-12-15 08:45:51
	3	15	NULL	NULL	2025-12-15 09:09:29	2025-12-15 09:09:29
*	NULL	NULL	NULL	NULL	NULL	NULL

Figure 73 - Transport providers table

“Chena” Web-Based Agricultural Supply Chain Management System for Farmers.

Result Grid													
	order_id	order_number	customer_id	delivery_address	delivery_city	delivery_postal_code	subtotal	delivery_fee	total_amount	payment_method	payment_status	order_status	order_date
▶	1	ORD001	1	No. 45, Main Street, Colombo 07	Colombo	00700	1010.00	200.00	1210.00	Online Payment	paid	processing	2025-12-04 2
2	ORD1765089148318	2	NULL	University of Kelaniya	Matara	81000	150.00	200.00	350.00	Cash on Delivery	pending	pending	2025-12-07 1
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 74 - Order table

Result Grid													
	catalog_id	product_name	category	standard_weight	suggested_price	description	is_active	created_at	updated_at				
▶	1	Avocado	fruits	250g	150.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
2	Grapes Red	fruits		500g	350.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
3	Mandarin	fruits		1kg	280.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
4	Narang	fruits		1kg	200.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
5	Papaya	fruits		1kg	180.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
6	Pineapple	fruits		1kg	220.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
7	Pomegranate	fruits		500g	400.00	NULL	1	2025-12-04 23:19:32	2025-12-04 23:19:32				
8	Watermelon	fruits		1kg	120.00	NULL	1	2025-12-04 23:19:32	2025-12-06 12:00:50				
...	NULL	-

Figure 75 - Product Catalog

Appendix M : Timeline – Gantt Chart

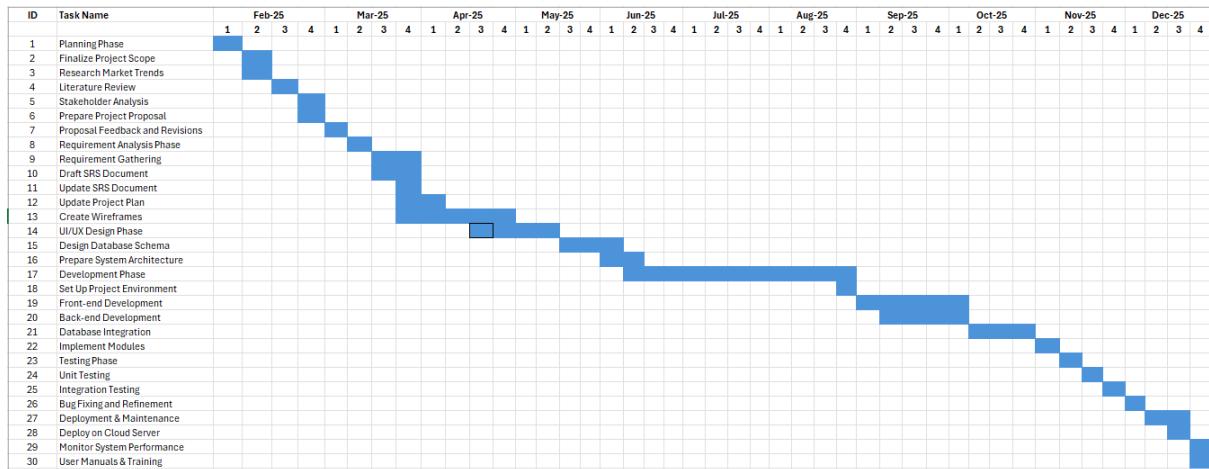


Figure 76 - Gantt Chart

Appendix N : SRS Document

Refer to:

https://drive.google.com/file/d/1ove_8BS7lROSfW11CqUyFiZbvblIB_ou/view?usp=sharing

Appendix O : Source Code Reference

The complete source code for the “Chena” Web-Based Agricultural Supply Chain Management System is maintained in a public GitHub repository for transparency and future enhancement purposes.

Repository Name: Chena

Repository URL: <https://github.com/lakma1019/Chena.git>

Branch Used for Final Submission: Main

Technology Stack: React.js, Node.js, MySQL

The version of the source code available in the repository corresponds to the system described in this dissertation. All major functionalities, database schemas, and system modules discussed in the report are implemented within this codebase.

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- End -
