

Dairy Farm Management System Project Report



Sri Lanka Institute of Information Technology
IT2080 Information Technology Project

Group ITP_WD_B4_05









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Appendix 2 – Declaration

Declaration

This project report is our original work and the content is not plagiarized from any other resource. References for all the content taken from external resources are correctly cited. To the best of our knowledge, this report does not contain any material published or written by third parties, except as acknowledged in the text.

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Abstract

Traditionally, dairy farming operations in Sri Lanka have been burdened by manual processes, including recordkeeping and data management. This reliance on paperwork and manual documentation hinders efficiency and productivity within dairy farms. The aim of this project is to develop a comprehensive Dairy Farm Management System that revolutionizes the way dairy farms operate. By leveraging modern web-based technology, the system streamlines tasks such as milking management, product tracking, cattle monitoring, breeding management, inventory control, financial management, and human resource management. Through automation and real-time data insights, the system aims to improve operational efficiency, ensure product quality, and facilitate informed decision-making. Drawing upon insights from research on dairy farming practices, this system is designed to meet the specific needs of Sri Lankan dairy farms, promoting sustainability and growth within the industry. Implemented using the latest MERN stack technology, this represents a significant step towards modernizing dairy farming practices in Sri Lanka.

Acknowledgment

We extend our heartfelt gratitude to all those who contributed to the realization of this project. Special thanks to Mr. Harshanath, the lecturer in charge of the Information Technology Project (ITP), for his invaluable guidance and support throughout the project duration. We also express our gratitude to our instructors for their unwavering assistance and mentorship. Additionally, we would like to thank our friends, family, batch mates, and senior students for their encouragement and valuable insights. Finally, we acknowledge the dedicated efforts of all members of our ITP team, whose commitment and collaboration were essential in successfully completing this project.

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Chapter 1: Introduction

Background

Nevil Nutri Feeds Pvt Ltd is a dairy farm with a focus on livestock farming and dairy product production. The company has a total of 400 cows and heifers, indicating a significant scale of operations in the dairy industry. The range of products includes curd, yogurt, ice cream, and milk, suggesting a diversified product portfolio catering to various consumer preferences.

Despite the substantial monthly sales volume of around 5000 units, it is notable that the company has not adopted computerized systems for managing their operations. This implies that the business relies on manual processes for tasks such as recordkeeping, sales tracking, and inventory management.

Given the current industry trends and the scale of their operations, there is a potential for significant improvement and efficiency gains through the implementation of computerized systems.

Transitioning to digital solutions could enhance data accuracy, streamline processes, and contribute to better decision-making, ultimately benefiting the overall productivity and competitiveness of Nevil Nutri Feeds Pvt Ltd in the market.



Nevil Nutri Feeds (Pvt) Ltd

Figure 1- Nevil Nutri Logo



Figure 2- Nevil Nutri Farm

Problem and Motivations

Problem Statement:

The dairy industry in Sri Lanka is facing significant challenges that obstruct its growth and sustainability. Despite a high demand for dairy products, local farmers struggle to meet the market demand, resulting in a significant supply demand gap. Currently, Sri Lanka currently produces 40% of its milk demand domestically and is therefore heavily dependent on imports to meet demand. This reliance on imports not only places a strain on the country's economy but also poses challenges for local farmers who are unable to capitalize on the growing demand for dairy products. Moreover, the lack of technological integration in dairy farming practices further worsens the problem. Many farmers still rely on outdated manual recordkeeping methods, which limit their ability to optimize milk production, manage herd health efficiently, and to explore market access. Without access to real-time data insights and analysis tools, farmers struggle to make informed decisions, leading to inefficiencies in their operations and missed opportunities for growth.

Motivation:

The potential for significant improvement in the Sri Lankan dairy industry is a compelling opportunity. By addressing the challenges faced by local farmers and enhancing their capacity to meet market demand, we can not only boost the country's self-sufficiency in dairy production but also create new opportunities for economic growth and development.

Furthermore, bridging the gap between supply and demand in the dairy sector aligns with broader national objectives, such as promoting food security, reducing dependency on imports, and helping rural development. By letting local dairy farmers use the tools and resources they need to thrive, we can contribute to the overall well-being of rural communities and the sustainable development of the agricultural sector.

Considering these challenges and opportunities, our team decided on this project to develop a web-based Dairy Farm Management System that addresses all specific needs of Sri Lankan dairy farmers. Our system aims to help farmers optimize milk production, manage herd health efficiently, and enhance market connectivity. Through this initiative, we aspire to revolutionize traditional dairy farming practices, promote economic prosperity, and contribute to the sustainable development of Sri Lanka's dairy industry.

Literature Review

The dairy industry is essential for providing dairy products to meet global nutritional needs. However, with increasing demands and market changes, dairy farmers face pressure to optimize operations sustainably. Dairy farm management systems are crucial tools for streamlining operations, improving decision-making, and maximizing resource use. Despite their potential benefits, adoption varies due to factors like cost and complexity. This literature review aims to provide an overview of dairy farm management systems, identifying trends, challenges, and opportunities, and informing stakeholders about advancements in the field.

Existing Dairy Farm Management Systems

The dairy industry has witnessed significant advancements in farm management systems, with various options available to farmers depending on their specific needs and resources. Some of the notable systems include:

1. DairyComp: This comprehensive dairy management software offers features such as milk production tracking, health monitoring, reproductive management, and financial analysis. DairyComp is widely adopted by dairy farmers for its user-friendly interface and robust data management capabilities [1].
2. DeLaval DelPro: DelPro is an integrated farm management system that provides real-time monitoring of cow health, milk production, and reproductive status. It also offers automated data collection and analysis tools to optimize farm operations [2].
3. Afimilk: Afimilk focuses on precision livestock farming and offers features such as automated milking systems, rumination monitoring, and heat detection. Known for its advanced technology, Afimilk has high adoption rates in large-scale dairy operations [3].
4. Lely T4C: Lely T4C is designed for robotic milking systems and offers features such as cow traffic control, milk quality monitoring, and feed management. It is popular among dairy farmers using robotic milking technology [4].

These systems vary in adoption rates depending on farm size, technological infrastructure, and budget constraints. Larger dairy operations tend to adopt more advanced systems like Afimilk and DeLaval DelPro, while smaller farms may opt for simpler solutions like DairyComp. Overall, the adoption of dairy farm management systems is increasing as farmers recognize the benefits of data-driven decision-making and automation in improving farm efficiency and productivity.

Real-world implementations of dairy farm management systems have demonstrated their effectiveness in optimizing farm operations and promoting sustainability. For example, Fair Oaks Farms in Indiana, USA, has successfully integrated advanced technologies such as robotic milking systems and data analytics to increase milk production and enhance animal welfare [5]. Similarly, the Afimilk system implemented in large dairy farms in Israel has led to higher yields, reduced labor costs, and improved overall farm performance [6].

These case studies underscore the importance of technology integration in modern dairy farming practices and highlight the tangible benefits of adopting dairy farm management systems in real-world settings.

Challenges and Limitations

Challenges and limitations associated with existing dairy farm management systems include:

1. **Cost:** Implementing and maintaining advanced dairy farm management systems can be costly, especially for small-scale farmers with limited financial resources [1]
2. **Complexity:** Some systems may be complex to set up and operate, requiring training and technical expertise that not all farmers may possess [2].
3. **Interoperability issues:** Compatibility issues between different systems and technologies can hinder seamless data sharing and integration, leading to inefficiencies in farm management [3].
4. **Data privacy concerns:** Collecting and storing sensitive farm data raises privacy and security concerns, especially with the increasing use of digital technologies in agriculture [4].

Addressing these challenges is crucial to ensure the widespread adoption and effective utilization of dairy farm management systems in the industry.

Research Gaps and Opportunities

Research gaps and opportunities for further investigation in dairy farm management systems are crucial for advancing the field and addressing key challenges. Some notable areas for future research include:

1. **Cost Effective Solutions:** There is a need for the development of cost effective dairy farm management systems accessible to small scale farmers with limited financial resources. Research in this area can focus on streamlining processes, reducing hardware costs, and optimizing software solutions to make them more affordable and practical for smaller operations [5].
2. **Simplified User Interfaces:** Investigating the development of user friendly interfaces for dairy farm management systems can help address the complexity barrier and ensure ease of adoption by farmers. Research efforts may focus on intuitive design principles, customization options, and interactive features to enhance user experience and usability [6].
3. **Interoperability Standards:** Establishing interoperability standards for different dairy farm management systems is essential for enabling seamless data sharing and integration across platforms. Research in this area can explore common data formats, communication protocols, and integration frameworks to facilitate interoperability and data exchange between systems [7].
4. **Data Privacy and Security:** Exploring strategies to enhance data privacy and security measures in dairy farm management systems is critical to address concerns related to the collection and storage of sensitive farm data. Research efforts may include encryption techniques, access controls, and compliance frameworks to ensure data protection and regulatory compliance [8].

Addressing these research gaps can contribute to the advancement of dairy farm management systems, leading to more efficient, sustainable, and technologically advanced practices in the dairy industry.

The proposed dairy farm management system aims to revolutionize the dairy industry by integrating innovative technologies, empowering farmers, and ensuring sustainable practices. Drawing inspiration from successful models like Amul, the system prioritizes farmer empowerment, fair trade practices, and product quality to drive growth and market dominance. Through collaborative partnerships, continuous innovation, and a focus on consumer satisfaction, the system seeks to enhance operational efficiency, promote environmental stewardship, and meet evolving market demands. By addressing key research gaps and leveraging emerging technologies, the proposed system has the potential to transform dairy farming practices, foster economic development, and ensure a sustainable future for the industry.

Table 1: Challenges and Limitations

System	Management Type	Strengths	Weaknesses
Amul Anand Milk Union Limited	Production Management	Provides integrated production management solutions for various products like cheese yoghurt.	May lack advanced features compared to specialized solutions like Granular. Scalability limitations for larger operations
DairyComp	Milking Management	Robust data analysis capabilities Scalability for larger operations	Complexity may be overwhelming for smaller farms. Limited customization options
PastureMap	Grazing Management	Focuses on pasture mapping and rotational grazing planning. Realtime data tracking	Limited integration with other farm management modules May lack features for diversified operations
FarmLogs	Sales and Inventory Management	Focuses on crop management and yield monitoring Realtime insights	Limited sales and inventory features compared to more comprehensive solutions
FarmBooks	Finance Management	Simple and easy-to-use interface Suitable for smaller farms	Limited features compared to more comprehensive solutions. Scalability limitations for larger operations
VetFM	Veterinary Management	Provides integrated veterinary management solutions with real-time data analysis	Complexity may be overwhelming for smaller farms. Scalability limitations for larger operations

Aims and Objectives

Aim

The aim of our project is to develop and implement a technologically advanced Dairy Farm Management System tailored specifically to the needs and challenges faced by dairy farms in Sri Lanka. This system will serve as an all-in-one solution to simplify farm operations, optimize resource management, and increase overall productivity and profitability, thereby addressing the identified problem of inefficiency and limited data insights seen in traditional dairy farming practices.

Objectives

- Systematic milking management by coordinating milking session scheduling, data recording, real-time monitoring, and quality assurance to enhance operational efficiency and ensure high-quality milk production within the dairy farm.
- Efficient Product management to manage resources efficiently and improve productivity, ensure product safety by real-time temperature monitoring and help to time with process tracking.
- Effectively monitor cattle batches, maximize milking yields, maintain detailed pasture records for easier cattle management and simplify grazing rotations, and enhance operational efficiency for proper waste management.
- Improve breeding management efficiency, simplify animal registration processes, and enhance cow healthcare by maintaining detailed medical records and providing prompt treatments.
- Efficient inventory management through optimized stock control and simplified procurement processes, improved supplier management with comprehensive databases, and transparent communication channels.
- Improve financial management processes by using a system for tracking transactions, budgeting, reporting, and profitability analysis within the dairy farm management framework.
- Integrate employee registration, work hours tracking, and task management to streamline operations and improve communication within the dairy farm, optimizing organizational efficiency.
- Utilize data for informed decision-making with analytics, enhancing operational efficiency and customer satisfaction in conjunction with optimizing order processing and driving revenue growth through sales.

Solution Overview

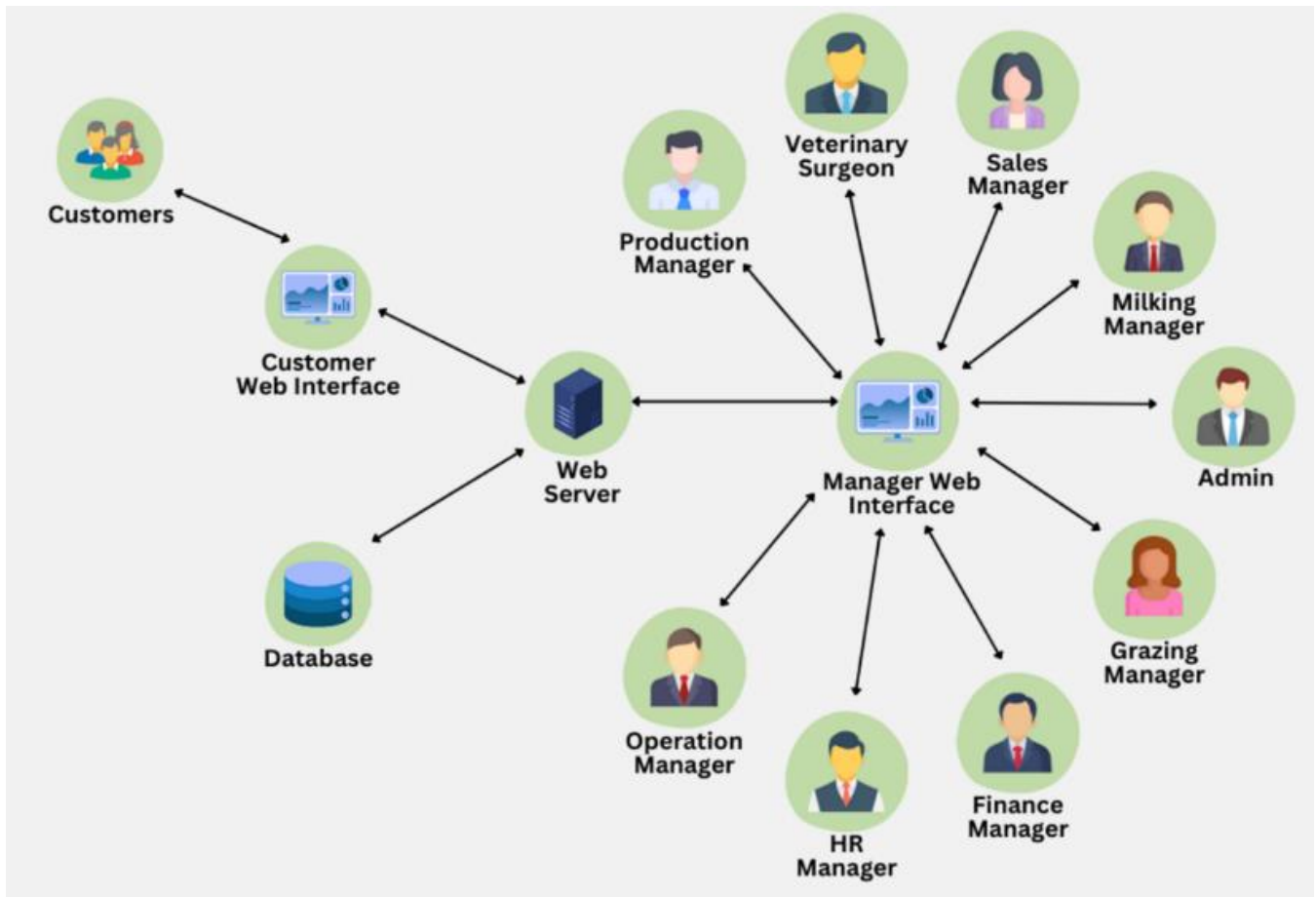


Figure 3- System Overview Diagram

Methodology

Agile is chosen for a collaborative and iterative approach to software development that emphasizes flexibility, customer collaboration, and continuous improvement. It involves breaking down projects into smaller increments, delivering value in short cycles, and adapting to changing requirements throughout the development process. Agile teams prioritize customer satisfaction, embrace feedback, and focus on delivering high-quality software efficiently. Alternatives to Software Engineering methods are the waterfall Model, Spiral Model, V-model, and Increment Model including Agile Engineering Methods.

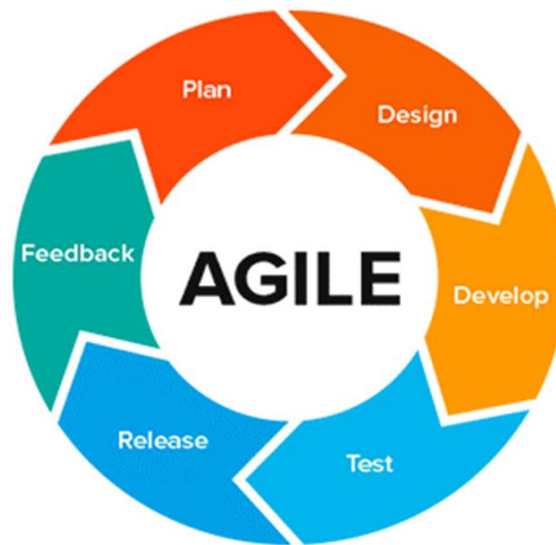


Figure 4: Agile Methodology Chart

Plan

Identify project goals, prioritize tasks, and create a roadmap for development.

Design

Outline the architecture and user experience, translating requirements into a blueprint.

Develop

Implement features iteratively, following Agile principles such as continuous integration.

Test

Verify functionality and quality through automated and manual testing, ensuring the product meets acceptance criteria.

Release

Deploy the product incrementally, delivering value to users in manageable increments.

Feedback

Gather input from stakeholders and users, incorporating insights to guide future iterations and improvements.

Structure of the report

- o Chapter 1. Introduction- Overview of the project's background, objectives, and significance.
- o Chapter 2. Requirements- Specific functionalities and features desired in the Dairy Farm Management System.
- o Chapter 3. Design and Development- Details on system architecture, technology stack, and user interface design.
- o Chapter 4. Testing- Testing methods employed to ensure system functionality and reliability.
- o Chapter 5. Evaluation and Conclusion- Assessment of system effectiveness and conclusions drawn from the project outcomes.

Repo Link

<https://github.com/SAwandya/Dairy-farm-management-system>

Chapter 2: Requirements

Stakeholder Analysis

Farm owners aim to optimize operations and increase profitability. For this reason, they are keen on implementing a comprehensive dairy farm management system that leverages technology to streamline farm activities and maximize returns.

Farm staff is entrusted with executing daily tasks and ensuring herd welfare. They seek a user friendly and efficient dairy farm management system that can simplify tasks, enhance productivity, and contribute to the overall wellbeing of the livestock.

Suppliers play a critical role in maintaining smooth supply chain operations for the dairy farm. They are interested in the system's capabilities for order tracking, inventory management, and ensuring timely procurement of supplies to meet farm requirements efficiently.

Investors are focused on achieving profitable returns on their investment in the dairy farm. They are keen to assess the system's impact on enhancing farm efficiency, productivity, and overall profitability, as it directly influences their financial interests.

Customers, as dairy product consumers, prioritize obtaining high quality dairy products. Their interest in the dairy farm management system revolves around its role in ensuring product quality, traceability, and compliance with health and safety standards, thereby fostering trust and satisfaction among consumers.

Requirement Analysis

1. Finance Management

- Track milk sales and purchase transactions (date, quantity, price).
- Generate financial reports (income statements, balance sheets) summarizing sales and expenses.
- Reconcile financial records with inventory data for accuracy.
- Provide budgeting and forecasting tools for future revenue and expenses.

2. Veterinary Management

- Manage breeding information for individual cows (breeding dates, sire details).
- Create and maintain detailed animal registration records.
- Facilitate health record-keeping for each cow (illnesses, treatments, vaccinations, deworming).

3. Employee Management

- Manage employee details (add, edit, delete).
- Assign and track employee tasks.
- Allocate work hours and schedule updates.

4. Grazing Management

- Manage cattle batch information (registration numbers, milking yield).
- Plan and schedule grazing and feeding sessions.
- Update and modify grazing rotation schedules.
- Track and maintain pasture health (plant types, grass height, weed control, nutrient levels).

5. Milking Management

- Schedule milking sessions.
- Record milking data during sessions (milk yield, cow group ID, quality check status).
- Monitor milk tank levels.
- Generate milking reports for analysis.

6. Supply Chain Management

- Provide real-time inventory visibility.
- Facilitate efficient supply ordering.
- Generate detailed inventory reports for analysis.
- Automate sending invoices for supplies to the finance department.

7. Sales Management

- Approve or reject customer orders.
- Access real-time sales data and analytics dashboards.
- Generate comprehensive monthly sales reports.
- Manage product inventory, track stock movements, and receive low inventory alerts.

8. Production Management

- Monitor and control storeroom temperature using IoT sensors.
- Track production progress for specific products in real-time.
- Conduct and store quality control reports.
- Create and manage product recipes.

Requirements Modeling

1. Grazing Management:

1.1 Scheduling and Monitoring:

- Allow scheduling, editing, and cancellation of grazing sessions.
- Record session details like duration, livestock involved, and pasture utilized.
- Display session details and ongoing activities in real time for monitoring.

1.2 Quality Inspection:

- Enable inspectors to log pasture quality inspection results associated with specific grazing sessions.

1.3 Pasture Condition Monitoring:

- Record and monitor post grazing pasture conditions, including grass height, forage availability, and signs of degradation.

2. Effluent Control Management:

2.1 Compliance Reporting:

- Generate compliance reports for effluent management activities, including regulatory status, monitoring results, and corrective actions.

2.2 Stock Assessment:

- Enable assessment of manure stock levels, accumulation rates, nutrient content, and associated environmental risks.

3. Milking Management:

3.1 Session Scheduling and Recording:

- Allow scheduling, editing, and cancellation of milking sessions.
- Record session details like duration, milk quantity, and any irregularities.

3.2 Data Display:

- Display milking session schedules and recorded data during sessions for users.

3.3 Quality Check:

- Enable quality check inspectors to log status and relevant data for milk batches.

3.4 Inventory Management:

- Record details of refrigerated tanks storing milk batches.

3.5 Reporting:

- Generate comprehensive reports summarizing milking session data.

4. Production Management:

4.1 Resource Planning:

- Provide a real time dashboard for planning and allocating resources.

4.2 Schedule Management:

- Create and manage production line schedules for dairy-based products.

4.3 Realtime Monitoring:

- View current production stages with estimated completion times.

4.4 Quality Control:

- Conduct 3-phase quality checks, store, view, and analyze Quality Control reports.

4.5 Alerting:

- Automatically notify relevant personnel in case of quality control failure.

4.6 Inventory and Recipe Management:

- Maintain inventory status, automate reorder requests, and manage recipes for dairy-based products.

4.7 Analysis and Reporting:

- Analyze quality parameters, nutritional content, and generate reports on production and quality metrics.

5. Supplier Relationship Management (SRM):

5.1 Database Maintenance:

- Maintain a centralized database of supplier information, including contact details and transaction history.

5.2 Performance Tracking:

- Track supplier performance metrics such as delivery timeliness and product quality.

5.3 Order Management:

- Allow creation, management, and processing of purchase orders within the system.

5.4 Invoice Processing:

- Facilitate verification, approval, and payment processing for supplier invoices.

6. Inventory Management:

6.1 Realtime Tracking:

- Provide real time tracking of inventory levels and movements.

6.2 Adjustment and Reporting:

- Allow manual adjustments and generate detailed reports on inventory management aspects.

6.3 Threshold Notification:

- Notify users when inventory levels fall below predefined thresholds.

7. Veterinary Management:

7.1 Identification and Tracking:

- Allow easy identification and tracking of cows for breeding purposes.

7.2 Cycle Tracking:

- Enable input and tracking of estrus cycles for female cows.

7.3 Record Maintenance:

- Track artificial inseminations, maintain comprehensive cow records, and manage breeding plans.

7.4 Healthcare Management:

- Record and manage health records, categorize sick cows, and automate healthcare reminders.

7.5 Reporting:

- Generate PDF reports containing comprehensive health and vaccination records.

8. Employee Management:

8.1 Information Management:

- Input, store, update, and delete employee information.

8.2 Task Assignment:

- Add, allocate, and manage tasks within the system.

8.3 Performance Tracking:

- Display employee information, work hours, tasks, and track workforce performance.

8.4 Leave Management:

- Allow approval/rejection of leaves and facilitate deletion of employee information.

8.5 Reporting:

- Generate customizable reports for performance assessments and decision making.

9. Financial Management:

9.1 Transaction Tracking:

- Track all financial transactions related to farm operations, including incomes and expenses.

9.2 Automated Recording:

- Automatically record payments from milk sales, supplier purchases, and additional expenses.

9.3 Reporting and Forecasting:

- Generate financial reports, provide insights into revenue trends, and offer forecasting tools for future financial performance.

9.4 Compliance:

- Maintain compliance with regulatory requirements by documenting all financial transactions.

Chapter 3: Design and Development

ER Diagram

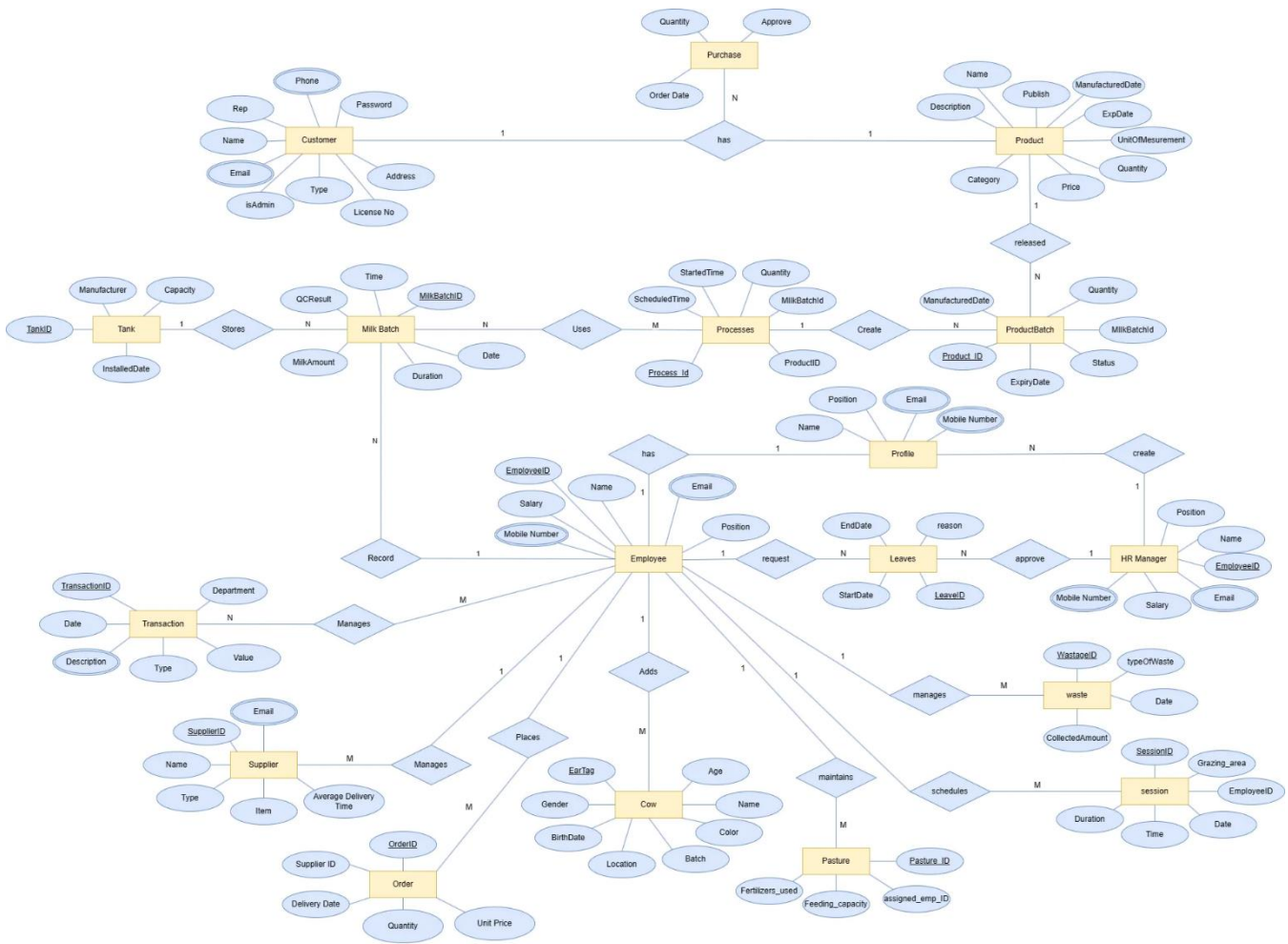


Figure 5- ER Diagram

Class Diagram

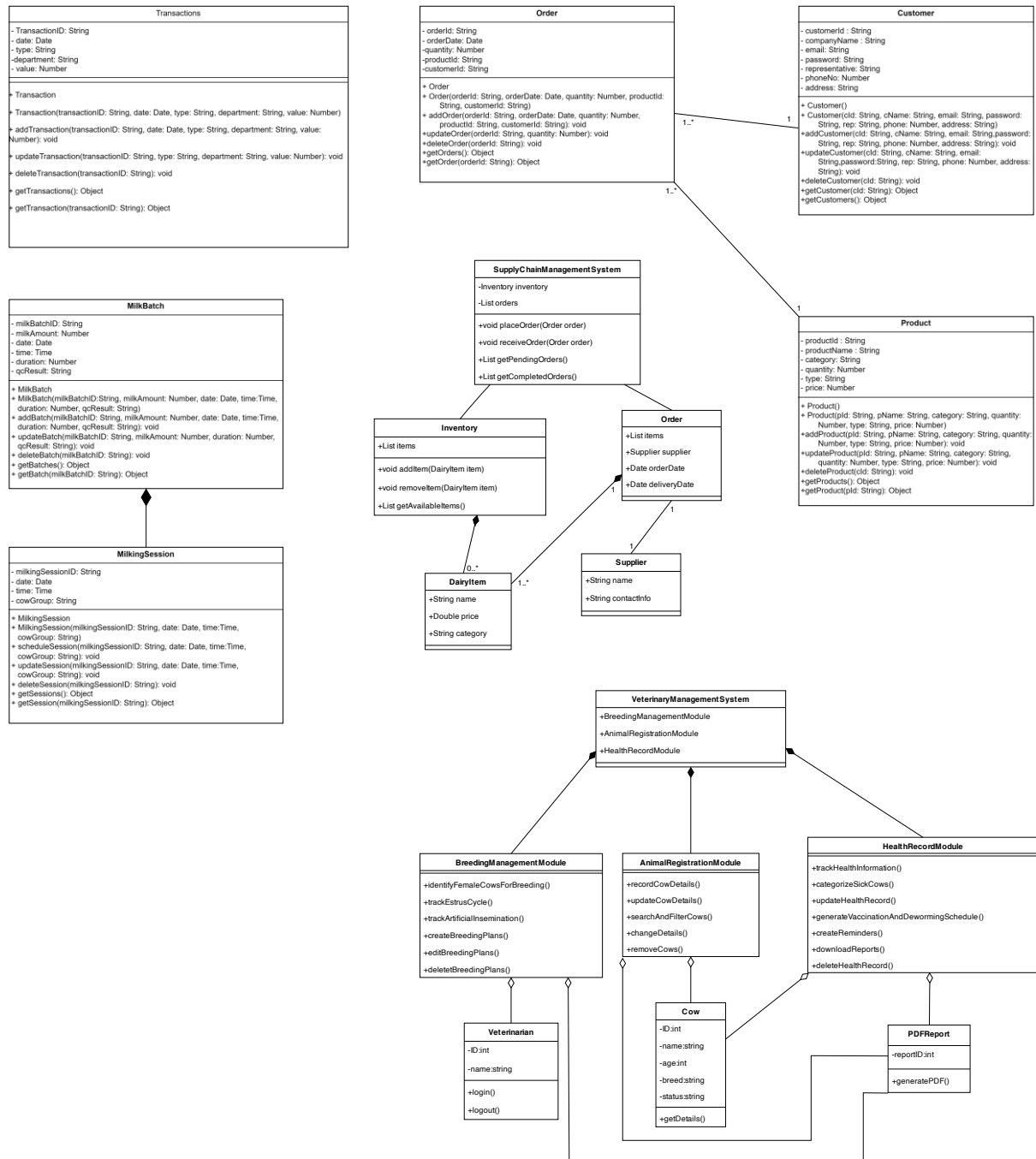


Figure 6- Class Diagram

Database Schema

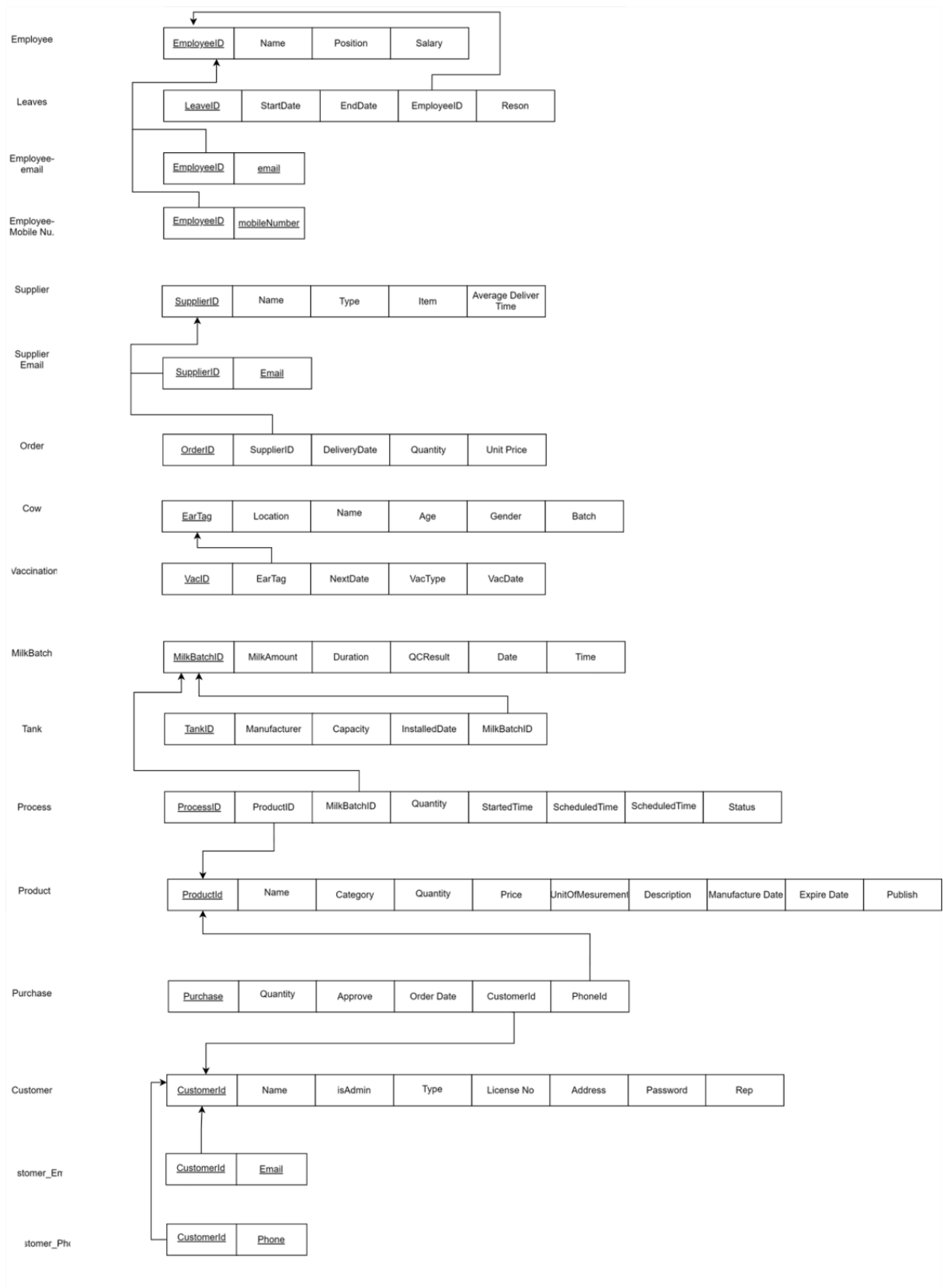


Figure 7-Database Diagram

Activity Diagrams

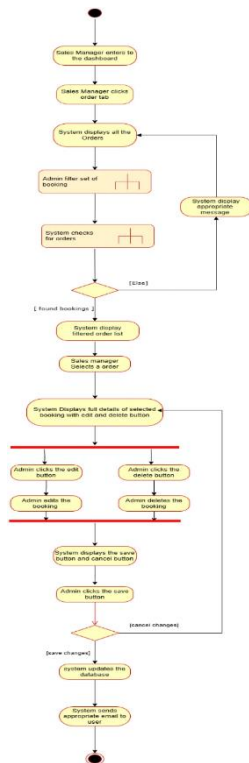


Figure 8 - Activity Diagram Sales

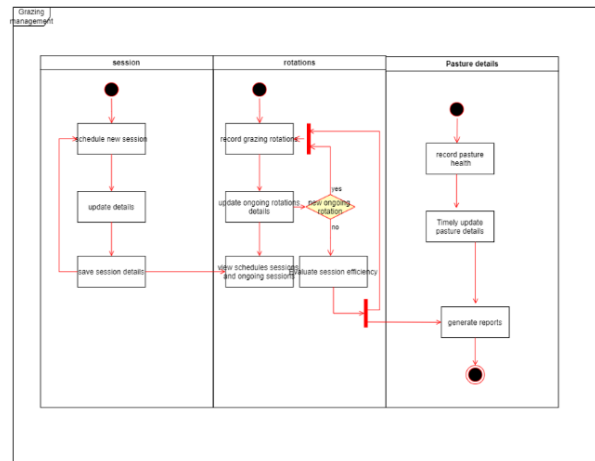


Figure 10 - Activity Diagram Grazing

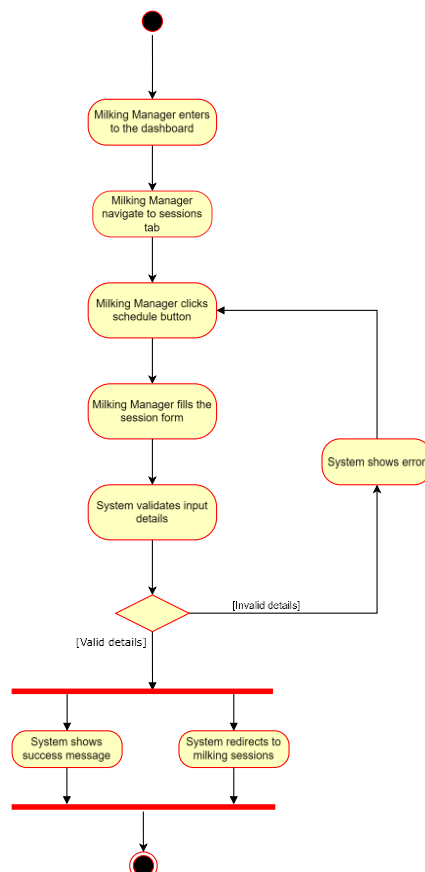


Figure 9 - Activity Diagram Milking

Sequence Diagrams

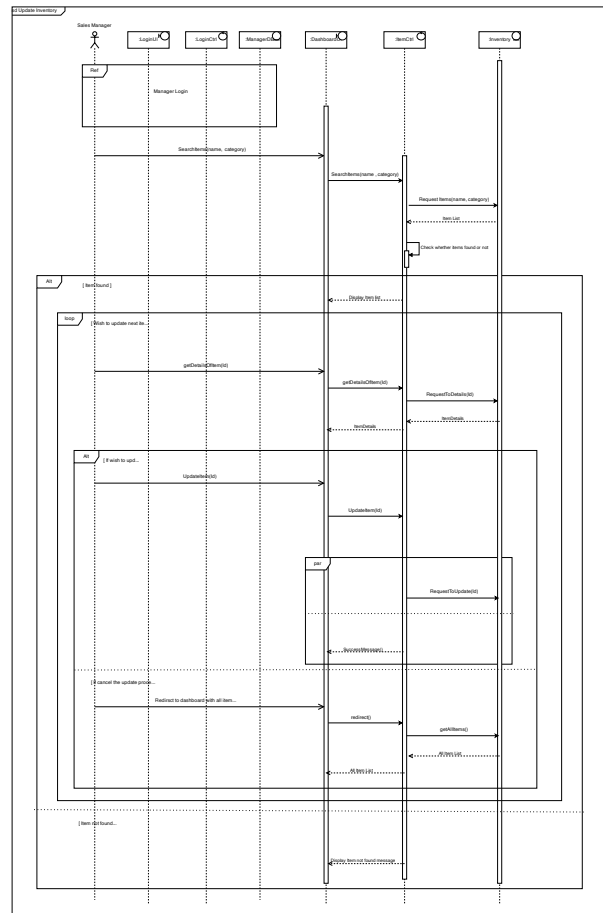


Figure 11 - Sequence Diagram Sales

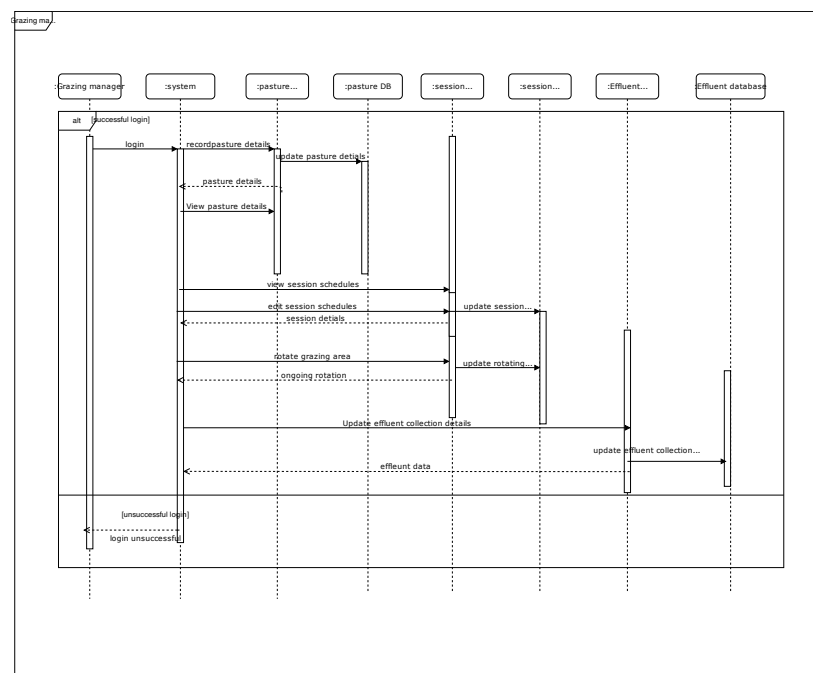


Figure 12 - Sequence Diagram Graizing

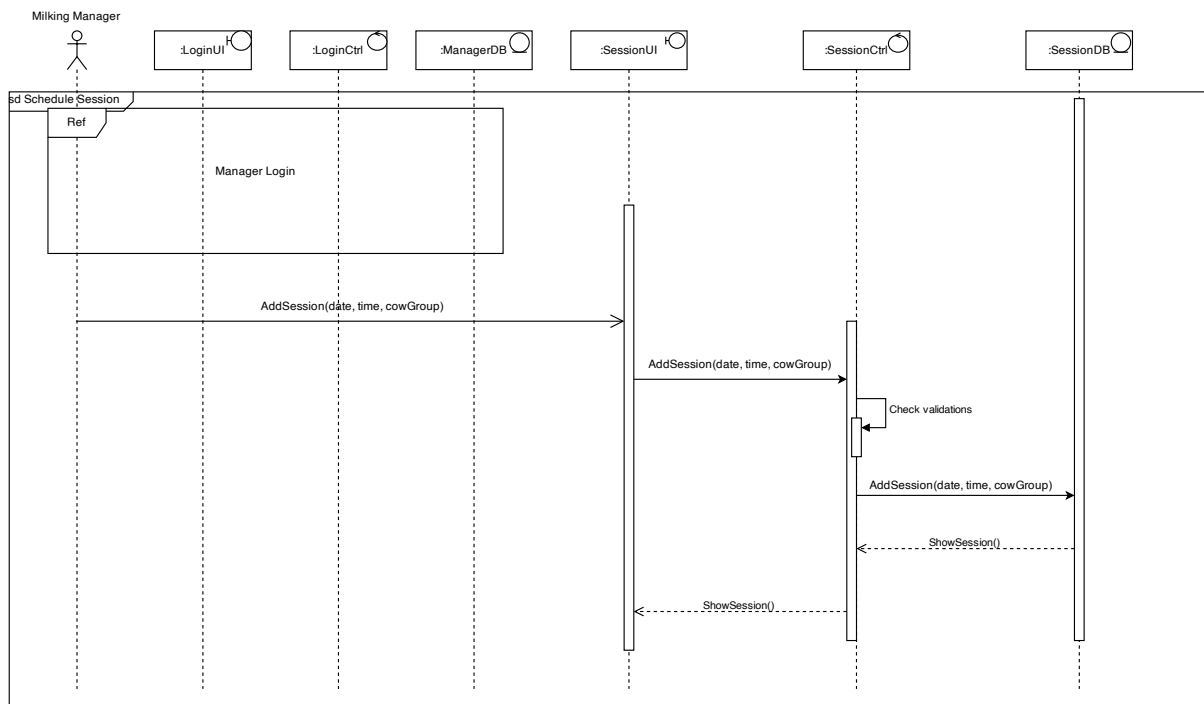


Figure 13 - Sequence Diagram Milking

Use case Diagrams.

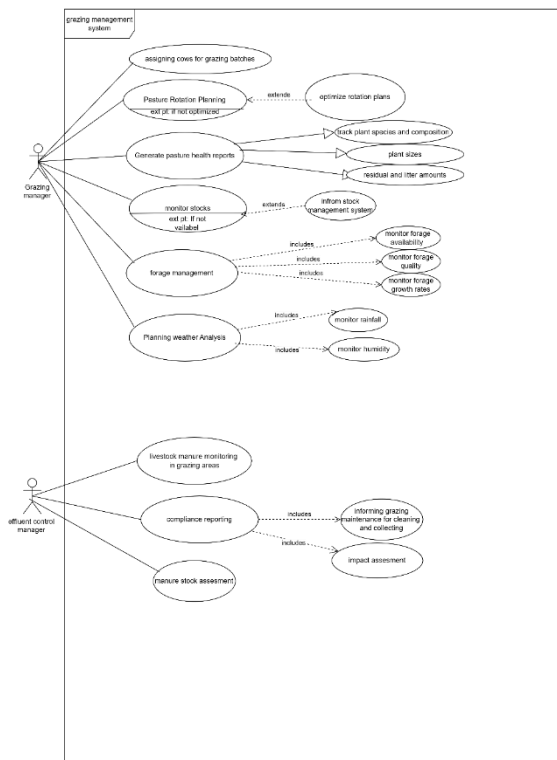


Figure 14 – Use case Grazing

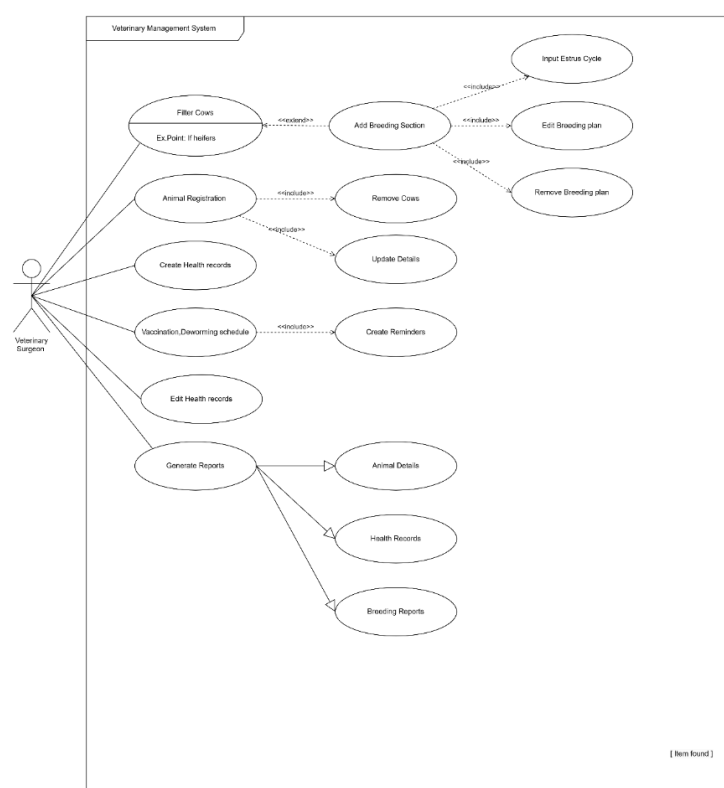


Figure 15 - Use case Veterinary

Chapter 4: Testing

Test Case Design Diagram

Table 2 Table of Test Cases

Test case ID	Test Case Description	Test Steps	Expected Results	Actual Result	Result	Test Data
FM TC 001	Verify that a new financial transaction can be successfully recorded in the system.	Navigate to the financial transaction recording page. Enter valid transaction details (type, amount, category). Submit the transaction form.	The system should successfully record the new financial transaction and display a confirmation message.	New financial transaction recorded successfully, and a confirmation message is displayed.	Pass	Transaction Type: Sale Amount: 50000 LKR Category: Milk Sales
EM TC 001	Verify that a new employee can be successfully registered in the system.	Navigate to the employee registration page. Enter valid employee details (name, email, department). Submit the registration form.	The system should successfully register the new employee and display a confirmation message.	New employee registration is successful, and a confirmation message is displayed.	Pass	Name: Disara Methmali Email: Disaramethmali2001@gmail.com Position: HR Basic Salary: 75000
V01	Add new Cow to the Registry	Navigate to the registration page. Enter Cow details Submit the form	System should successfully register new now and display the success message	New cow added successfully	Pass	EarTag: ET001 Name: Duvini Age: 2 Years Color: White Birth Date: 2022/05/06 Batch: F001 Gender: Female Location: Barn02
ORDT C 001	Verify the ability to place a new order	Navigate to the Order Management module.	System should successfully place the new order with the order status	Order placed successfully with order status set to "Pending"	Pass	Order Type: Bottle Supplier: Nimal Supplies PVT Quantity: 50

		Enter required details in order place form. Submit the form	set to "Pending".			Advance Fee: 10000 Delivery Date: 4/25/2024
PM TC 001	Get the new Process entry and take relevant action according to the status.	Navigate to process management page and input details via "Add new Process" form.	The system should store the details in the process table. If the status is scheduled, it should display the process in the scheduled process list.	Process scheduled successfully.	Pass	Product: Yoghurt Quantity: 550 L Scheduled_date: 25/04/2024 Scheduled_time: 10.30 A.M. Special_notes:
SM TC 001	Order products by the customers.	Select product through the customer interface. Enter required details in forms and submit the form.	System should successfully place the new order and show the order through order page with "Processing" status.	Place order successfully with order status set to "Processing"	Pass	Product Type: Icecream Customer: Avishka Shehan Quantity: 10 Packs Fee: 40000 LKR Order Date: 06/04/2024
MM 001	Verify that a new milking session can be successfully scheduled	Navigate to the milking session scheduling page. Enter valid scheduling details. Submit the scheduling form.	The milking session is successfully scheduled, and a confirmation message is displayed.	Milking Session is successfully recorded.	Pass	Date: 20240501, Time: 06:00 AM, Cow Group: F001
GR Z001	Schedule a grazing session	Navigate to the grazing session planning page. Select a grazing area. Enter valid session details (date, start time, duration). Submit the session scheduling form.	A new session for grazing cows is successfully scheduled by the system.	A new session is scheduled for grazing.	Pass	Grazing Area: 1 Date: 20240715 Start Time: 09:00 AM Duration: 3 hours

Chapter 5: Evaluation

The journey towards operational excellence within the dairy farm management ecosystem began with the meticulous development and integration of various management subsystems: Grazing, Production, Milking, Employee, Finance, Sales, Veterinary, and Supplier, where each played a crucial role in optimizing different aspects of farm operations.

The production management subsystem laid the foundation for efficiency by automating processes, monitoring progress in real-time, and managing inventory seamlessly. Leveraging IoT technology, it ensured optimal conditions for product storage and cultivation, driving profitability for the dairy farm.

Simultaneously, the grazing management subsystem revolutionized grazing operations by offering comprehensive tools for scheduling sessions, recording data, and monitoring pasture conditions. Through continuous improvements based on user feedback, such as reinforcing user validation and enhancing security measures, the system bolstered farm performance and supported animal welfare.

Meanwhile, the milking management subsystem streamlined milking operations, providing accurate data recording and effective storage monitoring. Enhancements focused on user validation and interface refinement further solidified its reliability, enabling better decision-making and enhancing overall dairy farm productivity.

The employee management subsystem optimized workforce management, ensuring efficient allocation of resources and smooth coordination of tasks. Similarly, the finance subsystem simplified financial processes, tracking sales, purchases, and inventory efficiently. Through user feedback-driven enhancements, including strengthened security measures and refined dashboards, these subsystems provided robust support for farm operations and financial management.

Moreover, the sales and supplier management subsystems facilitated seamless transactions and logistics integration, ensuring compliance and data security throughout the supply chain.

The veterinary management subsystem offered comprehensive capabilities for animal health management, breeding, and pregnancy monitoring, bolstering animal welfare and supporting veterinary care initiatives.

As each subsystem evolved and improved in response to user feedback and technological advancements, the dairy farm management system emerged as a holistic solution, empowering farmers with the tools and insights needed to thrive in a dynamic agricultural landscape.

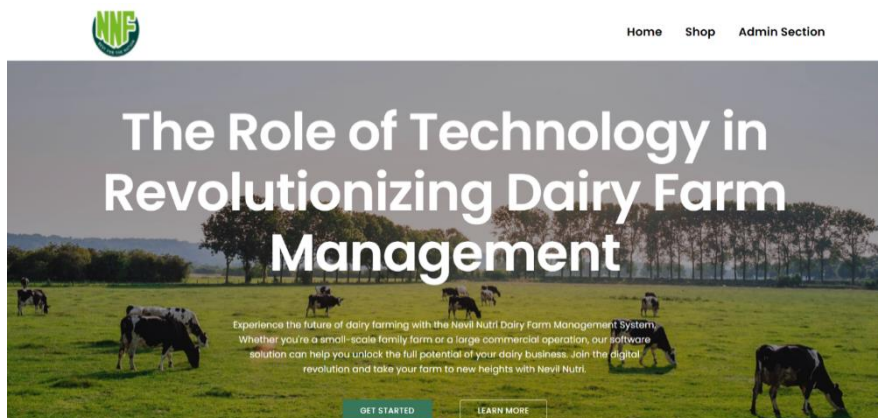


Figure 16 - Landing Page

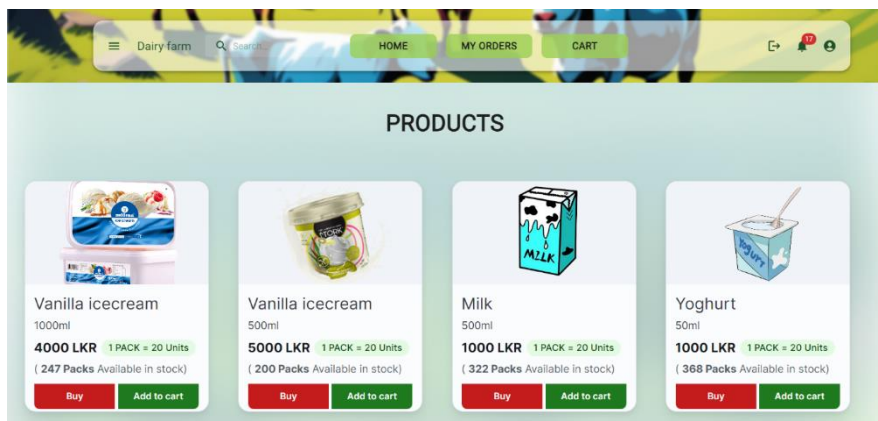


Figure 17 – Sales Customer Page

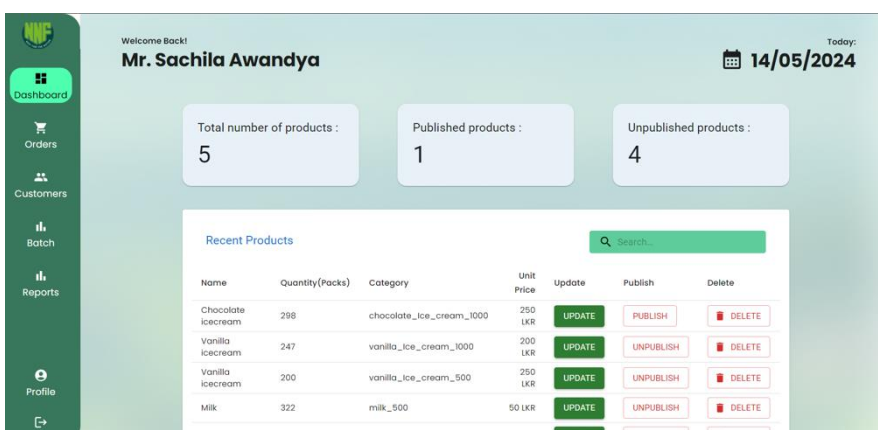


Figure 18 - Sales Dashboard

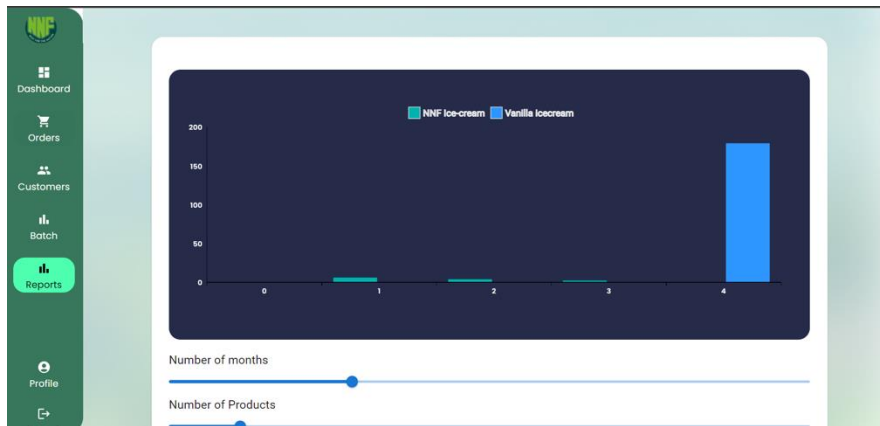


Figure 19 - Sales Report Page

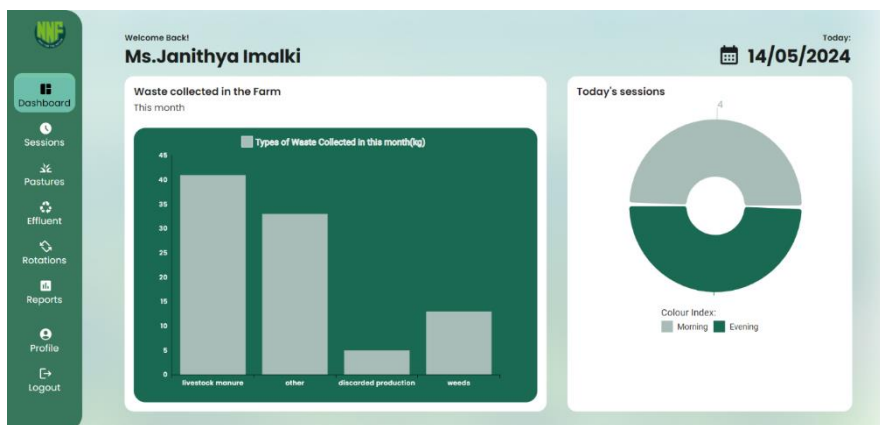


Figure 20 - Grazing Dashboard

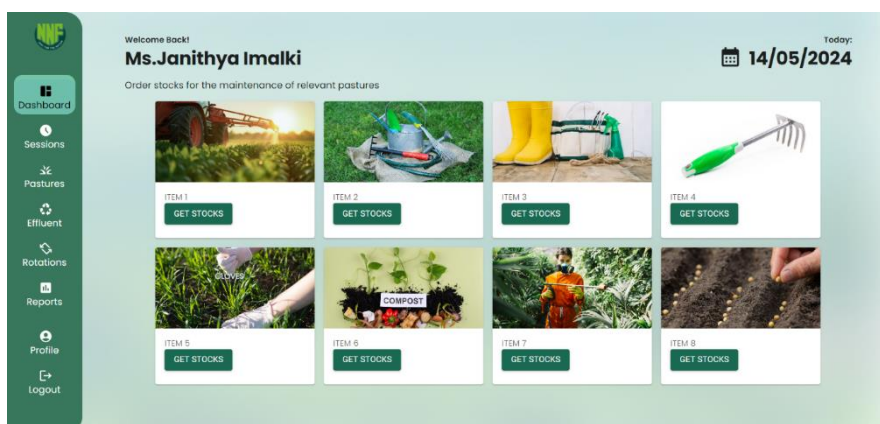


Figure 21 - Grazing supply request

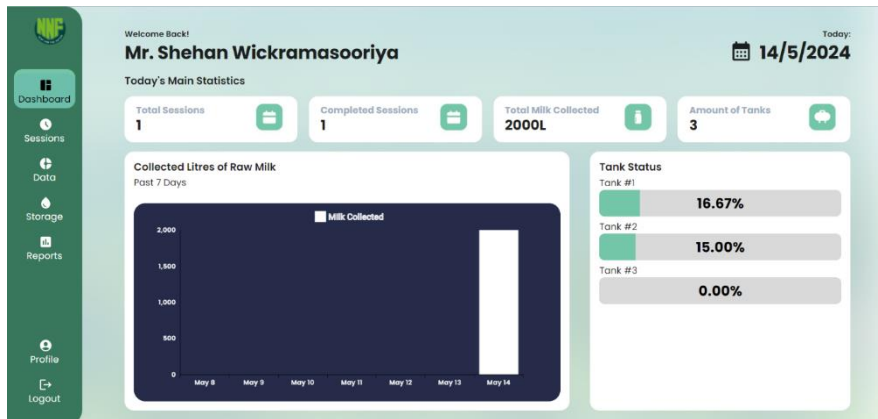


Figure 22 - Milking Dashboard

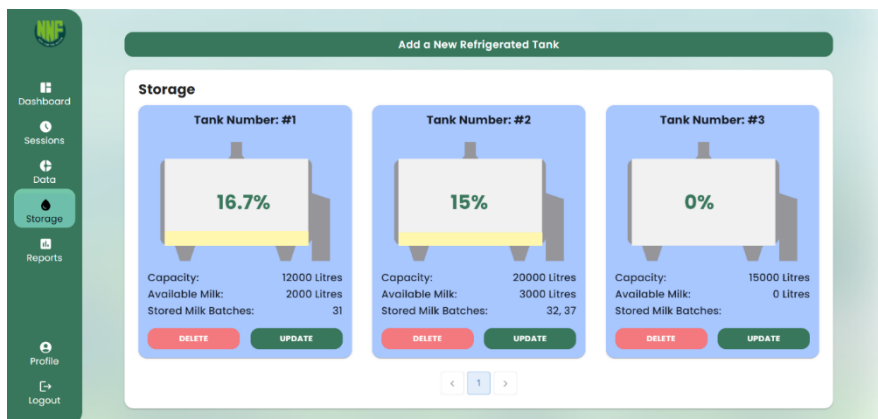


Figure 23 - Milking Tanks Dashboard

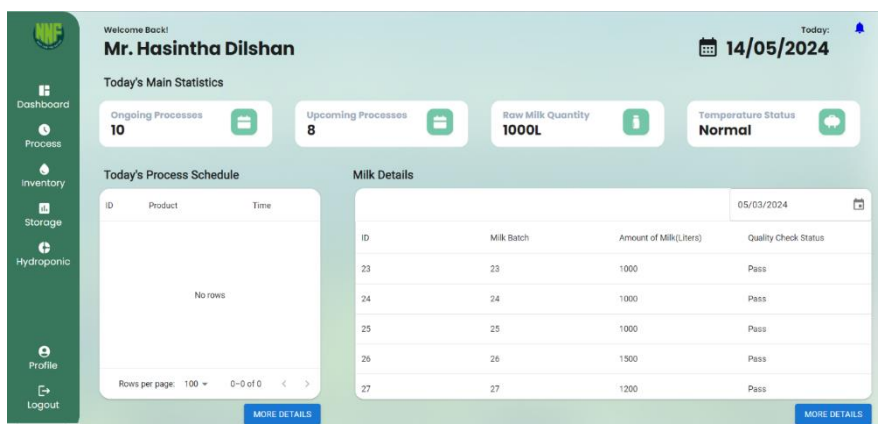


Figure 24 - Production Dashboard

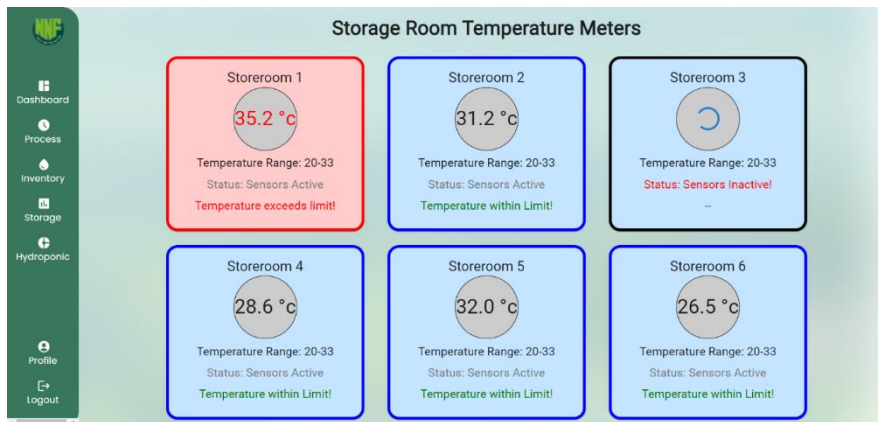


Figure 25 - Production Sensors Page

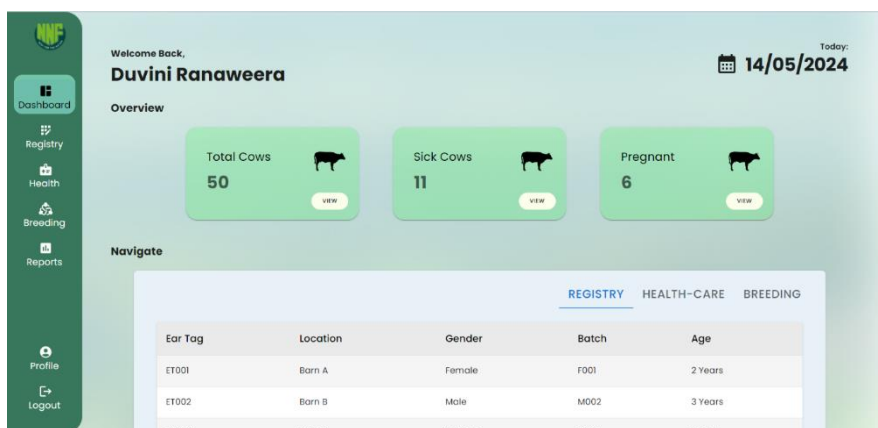


Figure 26 - Veterinary Dashboard

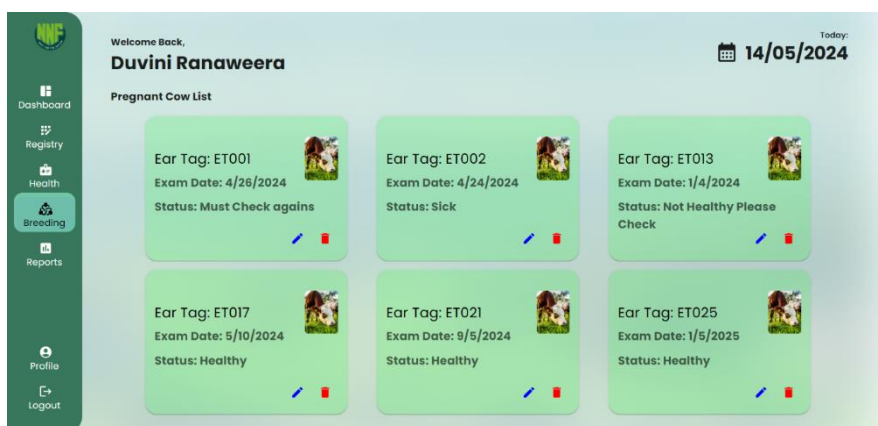


Figure 27-Veterinary Breeding Management System

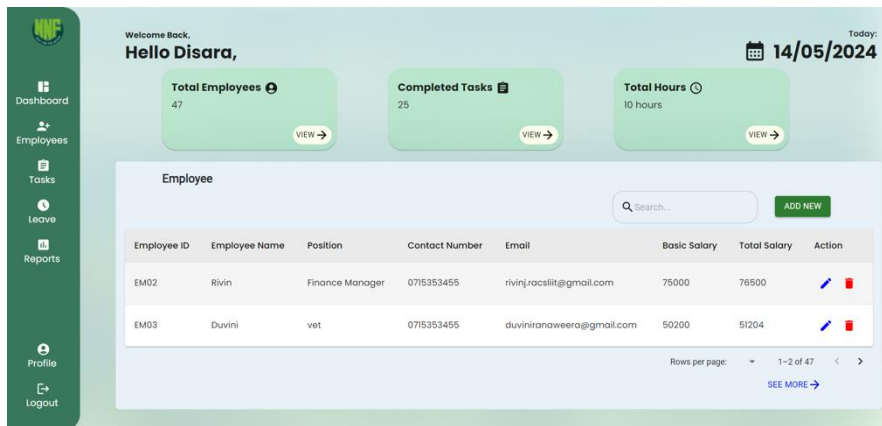


Figure 28-Employee Dashboard

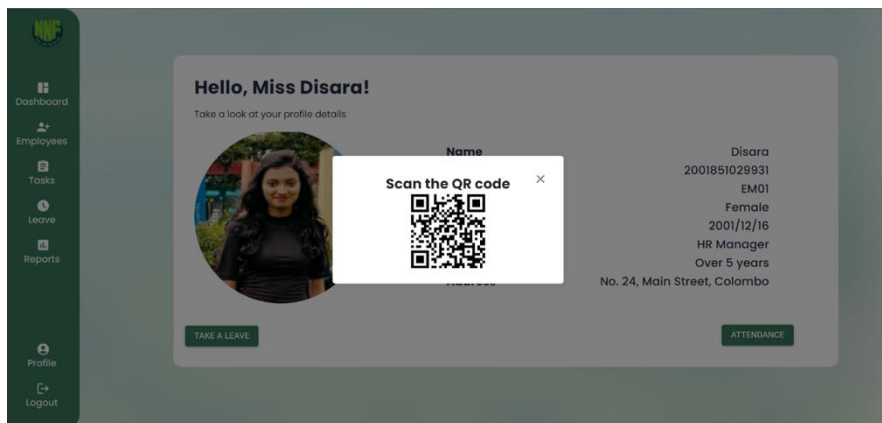


Figure 29 - Employee Attendance Page

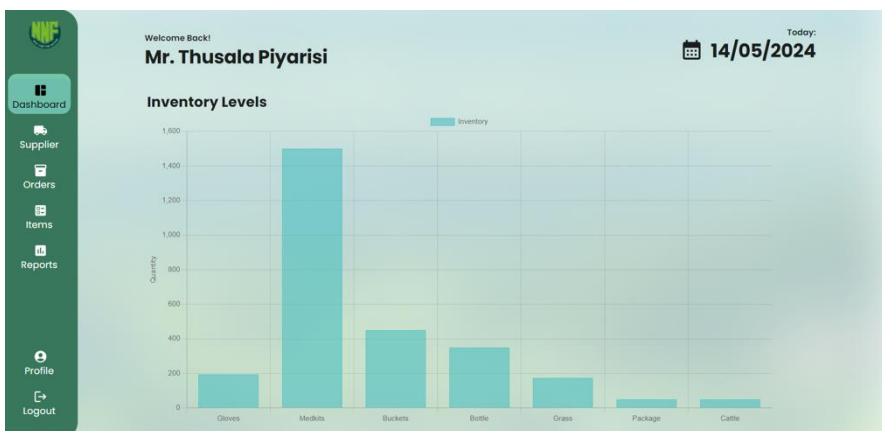


Figure 30 - Inventory Dashboard

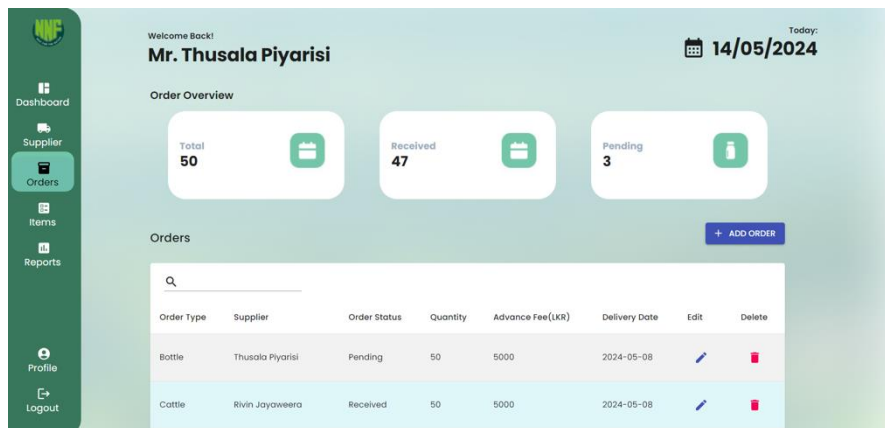


Figure 31 - Order Management Dashboard

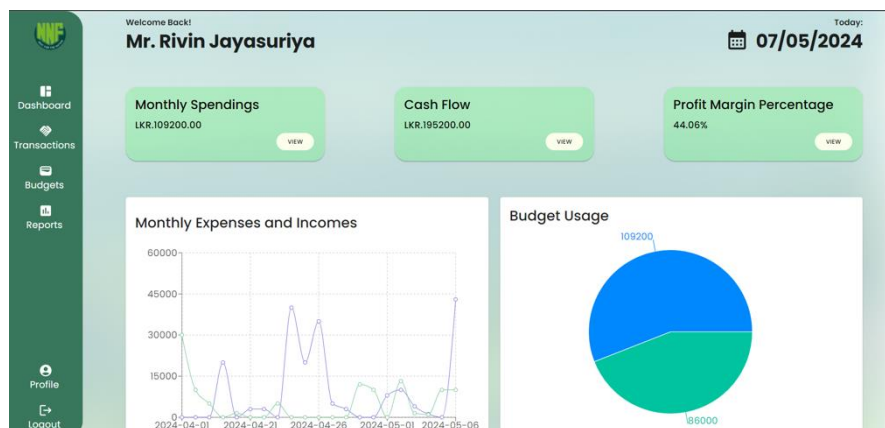


Figure 32 - Finance Dashboard

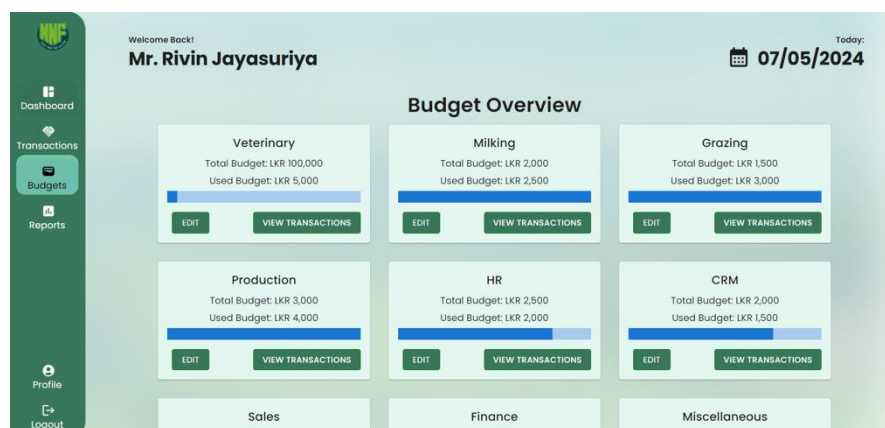


Figure 33 - Finance Budget Dashboard

Chapter 6: Conclusion

In conclusion, the integration of diverse management subsystems within the dairy farm management system has revolutionized traditional farming practices, ushering in an era of efficiency, productivity, and sustainability. From production and grazing to milking, employee management, finance, sales, supplier, and veterinary care, each subsystem plays a pivotal role in optimizing farm operations and enhancing overall farm performance. Through continuous improvement initiatives driven by user feedback and technological advancements, these subsystems have evolved into robust, adaptable solutions that empower farmers with real-time insights and streamlined processes. As a result, dairy farmers are better equipped to navigate the complexities of modern farming, maximize resource utilization, and ensure the well-being of their livestock while driving profitability and long-term sustainability. The success of the dairy farm management system underscores the transformative power of technology in shaping the future of farming, paving the way for a more efficient, resilient, and prosperous agricultural sector.

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Appendix- A

IT Number	Name	Contribution
IT22891518	JAYASURIYA L K R S	Developed Finance Management System
IT22884510	RANAWEERA R A D S	Developed Veterinary Management System
IT22326690	PIYARISI T D	Developed Supply Chain Management System
IT22149558	PINTO M J I	Developed Grazing Management System
IT22347244	WICKRAMASOORIYA J D A S	Developed Milking Management System
IT22080394	KAHATAPITIYA K R D M	Developed Employee Management System
IT22004772	MANAMPERI S A	Developed Sales Management System
IT22266828	DILSHAN J M H	Developed Production Management System

Appendix- B

IT Number	Name	Contribution
IT22891518	JAYASURIYA L K R S	Introduction
IT22884510	RANAWEERA R A D S	Introduction
IT22326690	PIYARISI T D	Testing
IT22149558	PINTO M J I	Design and Development
IT22347244	WICKRAMASOORIYA J D A S	Requirement Analysis
IT22080394	KAHATAPITIYA K R D M	Requirement Analysis
IT22004772	MANAMPERI S A	Design and Development
IT22266828	DILSHAN J M H	Evaluation and Conclusion