# Smart Dairy Management System

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***Abstract*—The Agro Dairy Portal is a Smart Dairy Management System that was developed to address the key challenges in dairy product delivery and management. The current dairy product management system involves paper-based records leading to calculation errors in the monthly bill. Furthermore, customers face the inability to cancel or change day-to-day order and challenge when the delivery persons take unplanned alternate routes while reaching their location, which leads to the waste of time and resources. There are also challenges such as lack of timely information about delivery status and confirmation of receipt of products by the customer. The proposed solution intends to provide an online portal to automate monthly billing and subscription management, manage next-day dispatch, plan GPS-based routes and deliver a reliable dairy management portal. The portal will have separate Vendor Portal and Customer Portal components to address the needs of dairy vendors and customers involved. The application will be created in Java, JavaFX, and MySQL to digitize dairy management operations and organize the delivery process towards effective farm-to-customer dairy management.**

***Index Terms*—component, formatting, style, styling, insert.**

## I. INTRODUCTION

The dairy industry encompasses diverse tasks ranging from record-keeping and order processing to invoicing, delivery scheduling, and notifying customers about the delivery details. At the same time, local dairy operations may utilize manual processes for these tasks, which create opportunities for calculation errors during monthly billing or make it hard to keep track of day-to-day operations. Additionally, customers may want to have more flexibility when it comes to their regular dairy orders, whereas drivers should be able to have a clear overview of all delivery addresses.

Agro Dairy Portal, or Smart Dairy Management System, is the proposed web application, which aims to address these concerns by digitizing the relevant procedures and offering a more organized approach to billing, subscription management, delivery scheduling, and other aspects of the dairy operation. The project is expected to involve two main portals – one for vendors and another for customers, which will offer different features and capabilities in accordance with the users' needs.

Among the anticipated features of the application are automated monthly invoicing, digital tracking of day-to-day deliveries, customer-driven cancellation or adjustment of daily orders, next-day planning of dispatches, and GPS-based delivery route optimization. The latter feature is particularly useful, as it is expected to visualize the available delivery addresses on a map and calculate the shortest possible route between them. Altogether, the proposed system will be used to address the concerns related to manual record-keeping, delivery flexibility, route planning, and delivery notification.

The application will be built using Java, JavaFX, and MySQL, as mentioned in the project description. The main objective of the Agro Dairy Portal is to streamline the dairy supply chain between the vendor and the customer while maintaining the highest quality of products. Therefore, the project will offer a digital solution to organize the selected aspects of the dairy operation with the help of an application that will be available via two portals, for vendors and customers.

## II. LITERATURE REVIEW

Recent studies on dairy management have focused on digital platforms for enhancing cattle management, milk collection, billing, inventory, customer services, and farm operations. The developed Smart Cattle Management Systems using technologies like the MERN stack demonstrate how digital record keeping can organize various dairy activities in a single application, but the focus is solely on cattle and farm management with limited attention to cooperative milk collection and direct farmer communication [1].

Web-based milk management systems have been an extension of this approach to include milk entry, records, billing, payments tracking, and complaint handling. One study utilizes HTML, CSS, JavaScript, Bootstrap, Tailwind CSS, PHP, MySQL, and Twilio API to provide digital support for milk collection and cooperative dairy operations. While such platforms help organize billing and communication, the study acknowledges limitations in enhanced analytics, predictions, and intelligent decision-making [2]. Inventory-oriented dairy

management systems have also been proposed using HTML, CSS, JavaScript, PHP, and MySQL, with features such as stock management, employee management, billing, and invoice generation. These studies demonstrate the importance of inventory information organization but with a scope limited to dairy product inventory [3].

Other studies have focused on dairy product sales and customer transactions. A developed Dairy Product Management System using MySQL, XAMPP, Visual Studio Code, and a Paytm payment gateway exemplifies product management, customer order handling, billing, transaction functions, and online payments. Such systems offer digital support to product sales and customer management but with more focus on commercial transactions than milk collection, customer records, or delivery planning [4]. Similarly, web-based dairy farm management systems, using PHP and MySQL, have been proposed for maintaining digital dairy records and farm management. These approaches reduce the need for manual documentation but with a need for more advanced automation, notifications, and integrated farmer-payment features [5].

Recent research has also explored intelligent and automated approaches for dairy management. An AI-powered milk vendor management system demonstrates the application of artificial intelligence to milk vendor-related operations and provides an example of how intelligent technologies can support the management of dairy activities [6]. An IoT-based automatic billing and milk quality management system further demonstrates the use of connected technologies for automating billing and monitoring milk quality, indicating the potential of automation in improving dairy management processes [7].

Delivery and transportation planning have also received attention in dairy supply chain research. A supply chain analytics approach has been proposed for optimizing milk collection routing in multi-depot networks, highlighting the importance of route optimization in reducing transportation-related inefficiencies [8]. Similarly, a vehicle routing model for dairy supply chain distribution demonstrates the importance of systematic route planning for improving the distribution process of dairy products [9].

Transportation optimization has also been investigated in earlier dairy supply chain studies. A two-stage solution method for the annual dairy transportation problem emphasizes the role of optimization techniques in improving transportation planning and decision-making [10]. A stochastic dairy transportation model considers both collection and delivery phases, demonstrating the complexity of transportation decisions in dairy supply chains [11]. More recent research combines advanced forecasting and vehicle routing techniques to improve business processes in dairy supply chains, showing the potential benefits of integrating demand forecasting with transportation optimization [12].

The reviewed studies demonstrate that existing dairy management solutions address different operational requirements, including cattle management, milk collection, inventory management, billing, customer transactions, milk quality management, and transportation optimization [1]-[12]. However, these approaches generally focus on specific operational areas rather than providing a unified platform connecting customer order management, billing, dispatch planning, and delivery activities.

The Agro Dairy Portal focuses on integrating selected dairy service and delivery activities through two main portals: the Vendor Portal and the Customer Portal. The proposed system includes customer order management, digital daily delivery records, monthly billing, next-day dispatch planning, delivery location management, and route planning. By combining these selected functions within a single application, the proposed system provides an organized digital approach for connecting dairy vendor operations with customer requirements and delivery activities.

The reviewed studies show that existing dairy management solutions focus on specific operational areas such as cattle management, milk collection, inventory, product sales, billing, or farm record management. The combination of customer order flexibility, automated billing, dispatch planning, and delivery route management is less emphasized in these individual approaches. The Agro Dairy Portal focuses on integrating selected dairy service and delivery activities through Vendor and Customer Portals. Proposed features include automated monthly billing, digital management of daily orders, next-day dispatch planning, and GPS-based route planning, offering a structured digital approach to dairy operations from the vendor to the customer.




Fig. 1. login page.

## III. METHODOLOGY

The Agro Dairy Portal is developed to make the daily dairy operations efficient and hassle-free. As most local dairies deal with manual record systems which may result in stressful and error-prone processes, the proposed system aims to provide a unified digital platform to address core dairy activities. The system consists of two main modules, namely, the Vendor Portal and the Customer Portal. The application is designed using Java, JavaFX, and MySQL database.

The Customer Portal is intended for managing the daily customer orders. In this module, the customers can update or cancel their orders as per their requirements. This feature

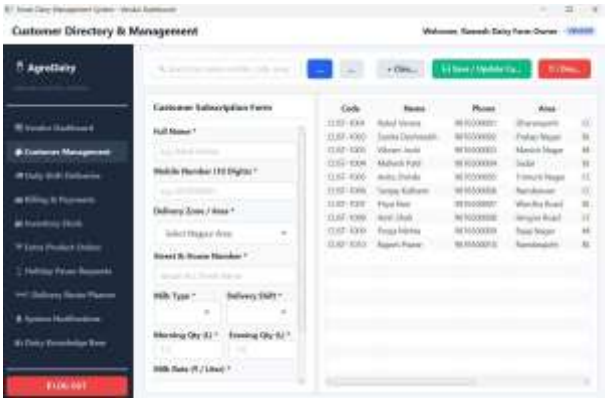



Fig. 2. Customer Directory and Management Module.

allows the customers to regulate their periodic expenses based on their needs without any discrepancies.

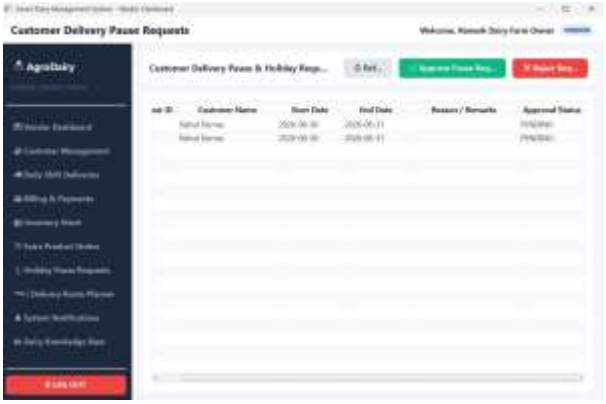



Fig. 3. Customer Delivery Pause Request Management.

On the other hand, the Vendor Portal is designed for recording the daily sales and dispatch data. The sales data is stored in a digital calendar to generate the customer's monthly bill and the corresponding invoice. Besides, the portal allows the vendor to track the requirements for the following day through a printed inventory checklist. This feature assists the vendor in understanding the demand forecast and managing the stock levels accordingly. The application also enables route optimization for the delivery executive based on the pick-up and drop locations. In this regard, a digital map is used to mark the daily delivery sites and calculate the shortest path between them. This feature helps the delivery executive in minimizing the travel time and fuel consumption by avoiding random site visits.

Overall, this system serves as an integrated platform for both the customer and the vendor. While the former can update the daily requirements, the latter can utilize the information for generating invoices and managing the stock and delivery program. Thus, with its key functions automated and organized in a unified interface, the Agro Dairy Portal offers a user-friendly application to address the daily dairy operations conveniently and efficiently.

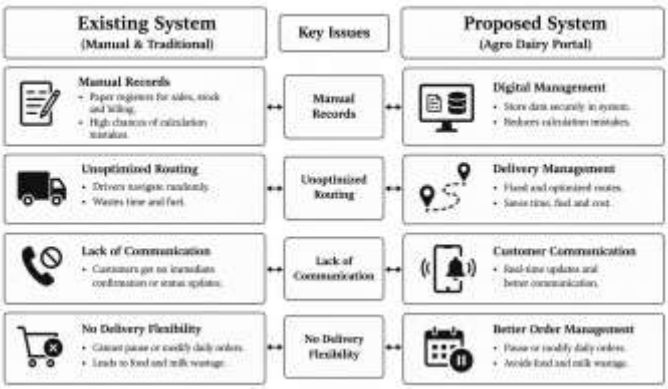



Fig. 4. Existing system and proposed system.

## IV. PROBLEM STATEMENT

In local dairies, the manual process of recording and managing daily registers and monthly bills remains a huge challenge. It is very hectic to manage all the bills by hand, and some errors can occur when calculating the monthly amount. In addition, customers usually provide daily orders that can be canceled at any time. However, it might be challenging to update or cancel the daily orders, resulting in huge losses of milk and foods.

Furthermore, the distribution process can be hectic if the drivers do not have a clear route of customers' location. They might waste a lot of time going back and forth to pick up and drop off the delivered items. Also, it is not always easy to inform customers about their delivery status, causing a communication gap between the dairies and the customers.

Therefore, a simple digital platform can solve all these challenges by providing easy management of daily and monthly billing, organizing the delivery process of foods and milk, and providing communication channels for effective delivery service. The Agro Dairy Portal is an innovative digital platform designed to manage vendors and customers' needs in the dairy industry.

## V. OBJECTIVE

The main purpose of Agro Dairy Portal is to optimize the daily operation of a dairy business. The objectives described below were prioritized in the project:

1. Monthly Billing: To store all the information about daily deliveries in a digital calendar and generate monthly bills on the basis of this data.

2. Order Management: To be able to easily cancel or amend the daily orders of the customers.

3. Next-Day Planning: To give the owner a comprehensive list of the resources necessary for the deliveries ahead and update it in the evening.

4. Route Planning: To indicate on a map the current locations of the dairy and the ones to be visited and find the shortest possible delivery route.

## VI. EXISTING SYSTEM AND PROPOSED SYSTEM

### A. Existing System

A lot of Local Dairy Activities are done manually in the existing system. The daily delivery records are maintained in paper registers. And the monthly bills are being generated from the maintained records manually. This may cause difficulty in billing and may lead to errors in calculation. There is no flexibility for the customer for stopping or altering the daily orders.

The planning of the delivery routes is also a problem when the company does not have a specific route for the delivery executive. This may lead to a lot of wastage of time and fuel for the delivery executives. There is a lack of a system by which the delivery person can confirm the delivery status or get an update on the processing of the order which makes the communication between the customer and the dairy challenging.

### B. Proposed System

The Agro Dairy Portal can be used for a digital version of all the manual tasks that are being handled in the existing system. The portals can be segregated into two types: the Vendor Portal and the Customer Portal. The Customer Portal helps in providing the customer with an option to stop or alter the daily order whereas the Vendor Portal helps in maintaining the daily delivery records, monthly billing, and next day's dispatch planning.

The GPS based location tracking system can be used to plan the routes according to the current active locations for the delivery executives. The shortest path can be calculated from the available locations for the dispatch of the products. Grouping the entire activity under one system, Agro Dairy Portal helps in making the entire process organized and more customer friendly than before.

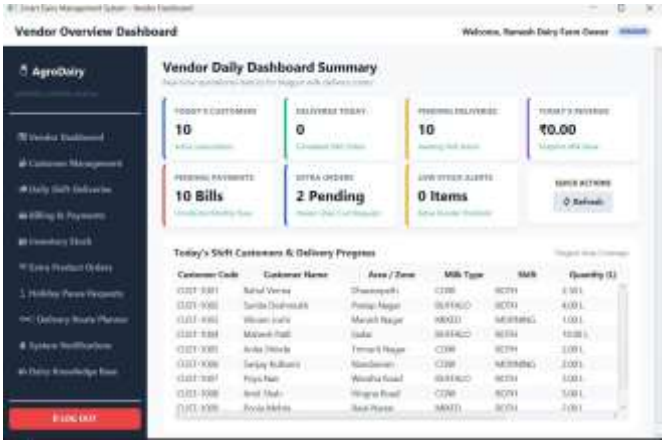



Fig. 5. Vendor Dashboard of the Agro Dairy Portal.

## VII. SYSTEM FLOW

The Agro Dairy Portal has a simple flow that connects the customer and the dairy vendor. The process begins with a customer managing their daily order through the Customer Portal. The customer can keep the order as it is, put it on hold or make some modifications whenever they want.

The steps of the system flow are described below:

1. Customer Order

This stage begins with the customer placing their regular order of dairy products through the Customer Portal.

2. Order Management

At this stage, the customer can choose to keep their daily order the same, put it on hold or make modifications to it.

3. Daily Delivery Record

A digital calendar is used to record the daily delivery information for easy management by the vendor.

4. Monthly Billing and Dispatch Planning

This stage involves generating the monthly bill for the customer based on the daily records. It also provides the vendor with a stock inventory list that will help them in preparing the following day's deliveries.

5. Delivery Locations

This stage helps in identifying delivery locations for all the active customers. This information is displayed on a map for easy navigation by the delivery driver.

6. Route Planning

This stage ensures that the shortest possible route is selected between the active delivery locations.

7. Delivery

The delivery driver then delivers the dairy products to the customer using the shortest route identified in the previous step.

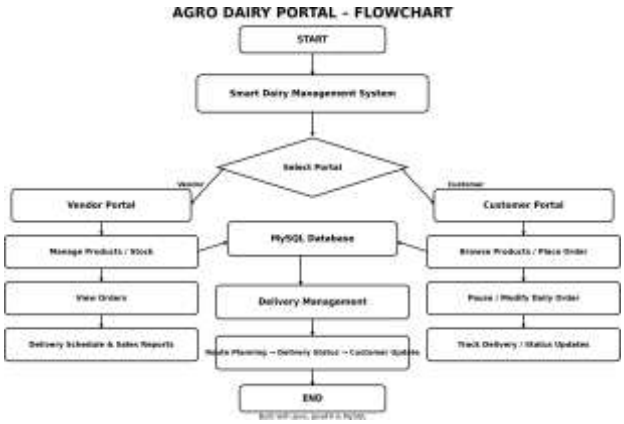



Fig. 6. System flow of the proposed Agro Dairy Portal.

## VIII. TECHNOLOGIES USED

The Agro Dairy Portal involves the use of three main technological components, which include Java, JavaFX, and MySQL. Each component serves a separate functionality, but together they make the system possible.

### A. Java

Java is used in the development process of the Agro Dairy Portal application that runs the operations of the system including the management of the company's customer base,

handling of vendors' activity, billing processes, and other operations.

B. JavaFX

JavaFX is used in the creation of the Graphical User Interface (GUI) of the system. It provides the basic layout that is visualized by the end-users including customers and vendors.

C. MySQL

MySQL is the database management system that is used in the storage of information used by the application. It enables the system to store customer records, order details, delivery information, and other aspects related to the operation of the business.

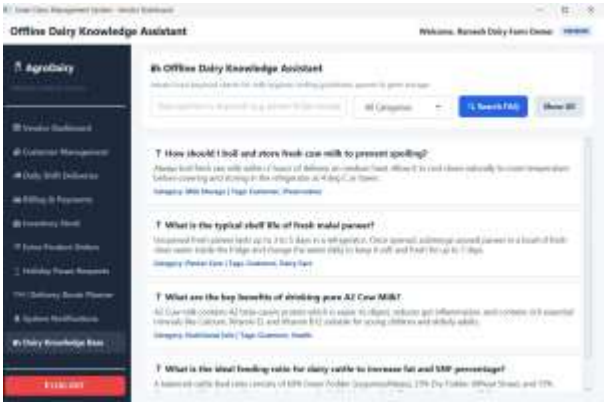



Fig. 7. Dairy Knowledge Assistant

## IX. CONCLUSION

The Agro Dairy Portal was designed to digitize the regular operations of a dairy. The software integrates the processes of managing the customer's order, delivering the products, recording the monthly bill, preparing the next day's order, and developing a route map for the delivery.

By using the Customer portal, the customers can cancel or modify their daily order. With the help of the Vendor portal, the dairy owner can manage the daily delivery, record the monthly payment, and monitor the requirements for the next-day delivery. In addition, the route planning feature assists the delivery person in choosing the shortest way between different customer's addresses.

The above-mentioned functions help dairy owners reduce manual work and ensure the accurate operation of the business. The software was designed with the use of Java and JavaFX programming languages and MySQL database. Overall, the Agro Dairy portal is a convenient platform that digitizes the main operation of an agriculture business dealing with dairy production.

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