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AgriConnect: A Tech-driven Approach from Farm to Market

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Abstract: *Transportation of farm products remains a major concern for farmers in rural areas, as they deal with problems like delayed deliveries, post-harvest loss and financial stress due to the lack of coordinated logistics.* ***AgriConnect*** *is a Java-based digital platform dedicated specifically on connecting farmers and truck drivers in real time to facilitate smooth transportation of crops from farm to marketplace. By offering crop registration, creation of transport request, delivery tracking and admin monitoring, AgriConnect eliminates dependency on middlemen and improves the transparency and efficiency in agricultural logistics. The platform enables farmers to deliver their farm products to market on time while optimizing transport utility for truck drivers. This report gives the detailed design, development and working of the AgriConnect platform, highlighting how it overcomes one of the most critical bottlenecks in the farm-to-market supply chain*

Keywords: AgriConnect, Java, Agricultural Logistics, Farmer-Driver Coordination, Rural Supply Chain, Real- Time Transport System, Crop Delivery Management

I. INTRODUCTION

In India, where agriculture supports nearly 58% of the population, inefficiencies in the transportation of crops significantly impact agricultural profitability. Farmers in rural areas often lack direct access to transport, resulting in delays in transporting goods to markets, which in turn causes price drops and vegetable spoilage. While urban sectors have organized and structured logistics, rural agri-transport remains unorganized, depending on word-of-mouth or lack of structured agreements.

AgriConnect has main objective to fill this logistical gap by creating a single integrated platform that allows farmers to interact directly with truck drivers. Built on Java with MySQL backend technology , the system automates crop registration, transport request creation and delivery tracking. Truck drivers gain a structured interface to accept delivery jobs, while farmers can monitor the delivery process in real time. Admins verify users, ensure fair usage and manage reports.

The system creates a win-win situation: farmers get timely transport and fair logistics, while truck drivers get more consistent work opportunities. This report describes on the system architecture, characteristics and real-world benefits of the AgriConnect platform.

II. LITERATURE REVIEW

The [1] paper, titled "Optimization of Agricultural Supply Chains and Market Distribution" was published in 2024 by Liren Shangguan. This research describes about the strategies to improves the efficiency and reliability of agricultural products transportation. It elaborates the implementation of major technologies like real-time inventory management systems, demand forecasting algorithms, vehicle dispatch optimization, route optimization algorithms and agricultural e-commerce platforms. By implementing these technologies, the paper focuses to optimize market transportation, reduce wastage and enhancing service quality for both farmers and consumers. This article emphasizes the importance of utilizing innovative solutions to reduce challenges in agricultural logistics, aiming to enhance market efficiency and ensure delivery of agricultural products on time. The integration of demand forecasting algorithms allows for better

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alignment between supply and market needs, reducing the risk of overproduction or underproduction. Vehicle dispatch optimization and route planning algorithms help in making cost-effective and timely deliveries, which are most important for perishable agricultural goods.

The [2] paper, entitled "IoT-based Supply Chain Management: A Systematic Literature Review" was published in 2023 by Soonh Taj, Ali Shariq Imran, Zenun Kastrati, Sher Muhammad Daudpota, Raheel Ahmed Memon and Javed Ahmed. This research offers a systematic literature review (SLR) of Internet of Things (IoT) solutions in supply chain management (SCM) from 2018 to 2022, working on a notable gap in existing literature by providing an in-depth analysis of IoT-based SCM. The research presents different dimensions including application areas, technologies, sensors and devices used for the deployment of IoT-based SCM systems. Additionally, it elaborates the challenges, advantages and economic and business implications associated with IoT integration in SCM. The authors point out that IoT- enabling technologies such as artificial intelligence, blockchain and cloud computing are emerging in this area and proposes that future research could further investigate these technologies further to enhance the robustness of IoT-based SCM systems.

The [3] paper, titled "Supply Chain Management in Agriculture using Blockchain," was published in 2022 by Mr. Anuj Mali, Mr. Bharath Shinde, Mr. Sahil Sharma, Mr. Saurabh Khatal and Ms. Vidya Vasekar. This research presents a blockchain-based solution to enhance transparency, traceability and security in agricultural supply chains. By utilizing blockchain's decentralized ledger as well as cryptographic features, the authors points out a feature that records transactions performed immutable blocks, which leads to data integrity and minimizing the need for intermediaries. The research elaborates the importance of smart contracts to automate transactions, especially for high-value crops, thus simplifying processes and establishing trust among stakeholders. The implementation of Advanced Encryption Standard (AES) in secure data within the blockchain system is also addressed in this paper. Future plans includes developing a web application using Java- based technologies to allow user interaction with the system and utilizing the integration of distributed databases to further improves scalability and resilience.

The [4] paper, titled "The Application of Agricultural Resource Management Information System Based on Internet of Things and Data Mining," was published in 2021 by S. Gao. This research proposes an integrated framework where Internet of Things (IoT) technologies and data mining techniques used to enhance agricultural resource management. With the use of IoT sensors, the system captures real-time data on various agricultural parameters, which are then processed with the help of data mining algorithms to extract meaningful insights. The study highlights the system's capability to enhance decision-making processes, optimize utilization of resources and increase overall productivity in agriculture. Future work describes about expanding the system's functionalities to incorporate advanced predictive analytics and machine learning techniques for more accurate, robust and automated agricultural management.

The [5] paper titled "Secure identification, traceability and Real-Time tracking of agricultural food supply during transportation using Internet of Things," published in 2021 by Bhutta and Ahmad, gives a robust IoT-based model aimed at improving the efficiency and transparency of agricultural transportation systems. The study highlights a multi-layer architecture that provides real- time monitoring, tracking and identification of food items as they move through the supply chain. A key contribution of the paper is the application of RFID sensors and communication modules for secure identification, enabling detailed traceability of agricultural products. The model maintains data security and integrity through the integration of cloud computing and edge analytics, which enables real-time decision-making even in areas with periodic connectivity. Future directions identified include the addition of blockchain technologies for immutable record-keeping, extension to cold chain logistics and combining predictive analytics for supply-demand prediction. This research provides a strong foundation for smart, transparent and sustainable agri-food logistics systems based on IoT technologies.

III. PROBLEM STATEMENT

Agriculture in India is one of the most important sectors, contributing a significant percentage to GDP and offering employment to a large portion of the rural population. Though it is the backbone of the Indian economy, one of the key pain points exists in the post-harvest supply chain, especially in transportation. A major percentage of fruits and vegetables never reaches the market on time due to poor logistics. Farmers, specifically those in rural or undeveloped

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villages, have serious problems in getting timely and reliable transportation. The lack of structured interaction between farmers and local truck drivers is one of these complications. Farmers are not informed about truck availability, price or the expected delivery duration, which compels them to either delay in transportation or high costs. These delays result into post-harvest losses, crop spoilage and reduced income for the farmer. Additionally, due to unpredictable logistics, most farmers prefer selling crops at lower prices locally rather than transporting them to larger and more profitable markets. The root cause of this issue lies in the unavailability of a centralized digital system which is easy to use and that facilitates seamless interaction between crop producers and transport providers.

Truck drivers who drive in agricultural belts also have their own set of challenges. Most of them do not have a fixed schedule and operate on a daily availability basis. This leads to inefficient planning and inconsistent earnings. Truck drivers usually spend hours or even days waiting for transport calls or roaming around nearby villages looking for transport opportunities. Most often, trips are cancelled or reassigned through verbal communication, which results in confusion and leads to time wastage and fuel wastage. Drivers do not have an efficient interface where they can see active transport requests and confirm bookings in advance. Without proper planning and route optimization, their efforts, time and fuel is wasted. The absence of an organized platform for checking, selecting and confirming transport jobs also increases the probability of double bookings or mismatched expectations. Most importantly, there is no system in place for them to provide real-time delivery updates to farmers or administrators. This absence of interaction leads to trust issues and inefficient transport cycles, discouraging both parties from using digital methods to manage logistics.

The reliance on middlemen or intermediaries is another major challenge that adversely affects both farmers and truck drivers. In most instances, middlemen take advantage of lack of direct communication between these two parties to fix prices or control transport schedules. Farmers are charged extra fees for transport and truck drivers are underpaid for their services. Also the intermediaries tend to prioritize larger clients or more orders, neglecting small farmers who might need urgent transportation for smaller quantities. These monopolistic practices leads to logistical discrimination and delays that could be prevented if there were a direct, transparent system in place. Furthermore, intermediaries usually do not provide tracking or feedback mechanisms, leaving farmers in the dark once their produce is in underway. The whole process is opaque and reliant on informal networks.

Another key challenge is the lack of crop-specific logistics handling. Different types of crops require different transport conditions. Perishable fruits and vegetables, for example, must be transported within specific time slots to preserve freshness and market value. Lacking an effective system to equate urgent crop demands with available transport, farmers are forced to utilize slow or inappropriate means, compromising quality and income. There is no system that assists truck drivers or logistics providers to know the types of the goods they are carrying. In few cases, crop spoilage during transportation is because of lack of awareness or preparedness on side of the driver. Without classification or notification about crop sensitivity, planning becomes guesswork. Also, drivers are not notified of any special instructions which are related to packaging or delivery deadlines, leading to dissatisfaction and conflict upon delivery. This misalignment can be addressed by a system that enables farmers to define crop type, following the instructions and urgency at the time of request for transportation. It also guarantees that drivers who accepting the request are informed and prepared.

Technologically, rural areas still suffer from a lack of digital solutions specifically built for their needs. The requirements of small to medium-sized farmers as well as independent truck drivers are largely ignored in the design of modern transport systems. The interfaces are often too complicated, that require technical understanding, or are only represented in English. These entry barriers avoids adoption by local users. Farmers, especially older or less-educated struggle to use platforms that do not utilize regional languages or simplified workflows. Similarly, truck drivers having limited literacy or smartphone experience also struggle with complex mobile applications. Because of that, even if digital platforms exist, they are unable to address the ground- level problems faced by rural transporters and farmers. What is needed is a simple, lightweight, mobile-friendly web platform that supports multilingual functionality and appropriate design tailored for rural users.

Security and trust remain significant concerns when it comes to digital coordination between two previously unknown parties. Farmers are concerned about leaving their harvested products to unknown drivers with no assurance of safety or delivery. Truck drivers, however do not want to accept delivery requests from unverified users due to payment

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uncertainty. Without verification, validating credentials and maintains a transaction log, both parties remain unsure to transact digitally. Additionally,There are also risks of conflicts over delivery status, price and damage to the goods during transport. A well-designed system should have verified registration for all users, admin control to approve accounts and automated logs for ensuring transparency. It should support both parties to rate or report the other, establishing a feedback loop to build trust over time.

Finally, all the problems mentioned above lead to one broader challenge: lack of transparency, efficiency and trust in rural agricultural transport. In the absence of a centralized, role-based platform, the transportation of crops from farms to markets remains inefficient. Manual coordination, paper-based records, and verbal communication dominate the current process AgriConnect aims to solve all these problems by providing a platform that connects farmers and truck drivers directly, enables real-time communication, authenticate users and tracks deliveries.

IV. METHODOLOGY

The AgriConnect system is designed with a modular, role- based architecture that isolates the roles of farmers, truck drivers and the admin. The project adheres to the Model- View-Controller (MVC) architecture to ensure scalability, maintainability and proper separation of concerns. The backend is implemented using Java Spring Boot that offers RESTful APIs and processes business logic effectively. The frontend is implemented using JSP (JavaServer Pages), HTML, CSS and JavaScript enabling the users to engage with the system through easy-to-use web interfaces. The database layer is implemented using MySQL, where structured tables store farmer and truck driver details, crop information, transport requests and delivery status.

For farmers, the system offers facilities like registration, login and a dashboard to register crops with appropriate information such as crop name, quantity, harvest date, location and expected delivery period. After registering, the farmer can raise a transport request, which becomes visible to all verified truck drivers on the system. Farmers can also view the status of each transport request whether it is pending, accepted, just picked or delivered. This status tracking characteristics lowers anxiety and enhances transparency during the delivery process. Additionally, farmers can receive notifications or alerts if a driver accepts a request or updates the delivery status.

On the driver's side, the system allows for account creation, profile verification and checking active transport requests based on their location or crop type. Drivers have options choose to accept or decline any available job. After accepting, the system reserves that transport request to prevent double booking. Drivers update their delivery status through the stages from "Picked", "In Transit" and "Delivered", each of which is timestamped and recorded in the database. This provides accountability and allows for audit trails. Drivers also able to view their transport history and earnings, so the platform is useful for long- term logistics planning.

The admin module plays a important role in ensuring the integrity of the platform. Admins authenticate newly registered users to prevent fraudulent activity, monitor transactions in progress and produce reports summarizing system usage, delivery and user feedback. The admin interface is designed to provide an overview of the system's operations, with authority for deactivation, issue resolution and backups. All these three modules work in synchronization to provide a reliable, secure and real-time communication system between farmers and truck drivers, transforming the outdated manual coordination process into a organized digital workflow. Admins can also manage system logs, monitor login activities and track incomplete or cancelled transport requests to ensure smooth operations.

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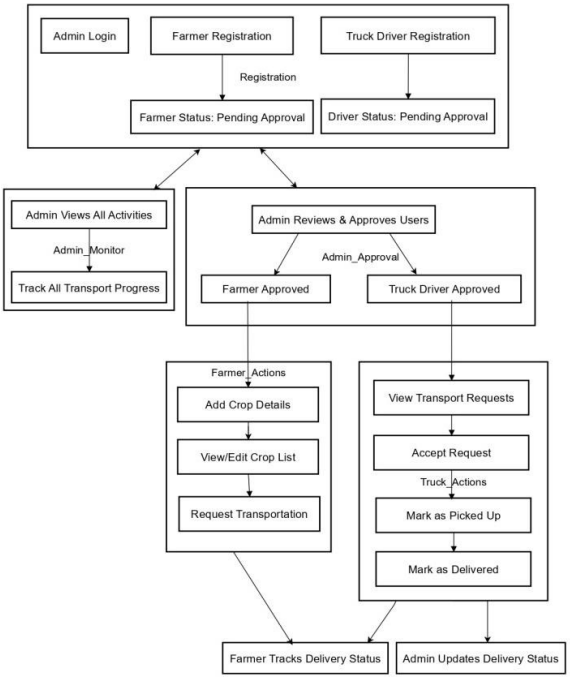

Figure 1: Flowchart

V. PROPOSED SYSTEM

The proposed system, AgriConnect, is a web-based Java application designed to establish real-time communication between farmers and truck drivers for transporting agricultural goods from farm to market. It enables farmers to register crops and raise transport requests, which are visible to nearby truck drivers. Drivers can accept these requests and update the delivery status at each stage. The system includes an admin module for verifying users, monitoring transport activities and generating system- wide reports. This streamlined platform reduces delays, enhances transparency and reduces dependency on intermediaries.

AgriConnect provides an efficient and scalable solution for rural agricultural transport inefficiencies by enabling direct communication between farmers and truck drivers. Farmers can register their harvested crops with necessary details and raise transport requests through a simple dashboard. Authenticate truck drivers have access to these requests and can accept tasks based on location and availability. Once a delivery has been initiated, drivers can update the status in real-time, ensuring that farmers remain noticed about their produce. Admin users play a key role in verifying new users, monitoring delivery logs, and managing overall functionalities. The platform is developed using Java Spring Boot, JSP, MySQL and REST APIs, making it suitable for future scalability and integration with GPS and mobile applications.

The proposed system AgriConnect bridges the gap between crop producers and transport providers by creating a centralized, digital platform where both parties can communicate in real time. The system has of three major modules: the Farmer module, the Truck Driver module and the Admin panel. Farmers can log in, register their crops and raise transport requests by specifying crop type, quantity and delivery location. These requests are made available to all verified truck drivers, who can able to view, accept or decline jobs based on their current location and capacity. Once a transport job is accepted, the driver must update the delivery progress through a sequence of status changes such as "Picked", "In Transit" and "Delivered" all of which are timestamped for accountability. This helps to ensure transparency and real-time tracking. The admin has control over the system, including user verification, report generation, issue resolution and performance monitoring. Implemented using Java Spring Boot, JSP, MySQL and REST architecture, the platform is simple, secure and customizable. It provides the foundation for adding advanced

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features in future releases, like live GPS tracking, automated notifications, payment gateways and offline access for rural areas with poor internet.

VI. EXISTING WORK

In recent years, numerous digital platforms have been introduced to support agriculture including crop price monitoring systems, e-Mandis and supply chain platforms. Government initiatives like the eNAM (National Agriculture Market) have facilitated increased access to fair prices for crops and minimizes middlemen involvement. Yet, a majority of these platforms are market-facing and do not bridge the transportation gap between farms and markets. They assists farmers to find buyers but fail to assist in the physical transportation of goods, particularly in rural areas where farmers lack access to timely and affordable transport. Likewise, platforms like Kisan Rath and Mandi Express provides truck booking functionalities but lack real-time delivery tracking or integration with a backend system which connects drivers and farmers directly. These applications are basically region-bound and not customizable based on crop urgency, transportation capacity or location. Most relevantly, they do not offer role-based admin control for managing operations at scale.

In addition, several logistics startups have attempted to bridge the rural transport gap by providing third-party networks for transportation to farming communities. Although these applications aim to address the transportation issue, they are either urban-based, expensive for small-scale farmers, or too technologically complicated for rural users. Most of these systems require constant internet access, GPS permissions or mobile app usage factors that limit adoption in areas with less connectivity or low smartphone penetration. Moreover, in most cases, the farmers and truck drivers interaction is either indirect or handled through automated matching with no manual negotiation or status-based communication possible. Additionally, existing systems often lack transparency with regard to pricing, delivery timelines and quality. Without proper communication tools or monitoring it may arise that could have been avoided through a direct, verified and trackable model of interaction. In contrast, AgriConnect stands out by offering a specialized platform dedicated on farmer and truck driver interaction, with a robust backend architecture that enables real-time coordination, delivery tracking and admin-managed verification.

VII. RESULT AND WORKFLOW

The AgriConnect platform was successfully designed and implemented as a operational prototype that streamlines the interaction and operation between farmers and truck drivers. The results shows that the system operates efficiently in all modules allowing seamless handling of transport request, real-time tracking of delivery status and admin monitoring. The integration of farmer, truck driver and admin features ensures end-to-end coverage of the agricultural logistics process, starting from crop registration to successful market delivery.

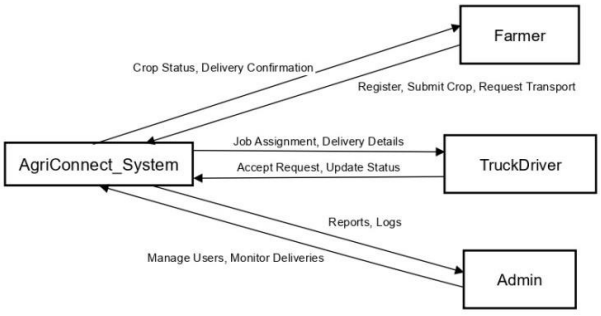

Figure 2: Data Flow Diagram Level 0

System Workflow:

1. Farmer Registration and Crop Entry: Farmers register and login to the system using a simple and intuitive interface. Once logged in, they are allowed to register their crops with necessary details such as crop type, quantity, harvest date, and market location. This creates a new entry in the system's database.

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2. Transport Request Creation: Once crop details are entered, the farmer initiates a transport request by specifying the pickup location and desired delivery time. The request is marked "Pending" until it is accepted by a truck driver.
3. Truck Driver Login and Job Acceptance: Verified truck drivers log into their own dashboard after registration, that shows a list of all available and unassigned transport requests in their area. The driver can see crop details, pickup points and delivery locations mentioned by farmer before accepting a job. Once accepted, the request status is changes to "Accepted" and is removed from the list of available jobs for other drivers.
4. Real-Time Delivery Updates: The transport request status is updated by the truck driver through specified stages:
o Picked Up –After collecting the crops from the farmer's location.
o In Transit – While the goods are being transported.
o Delivered – After successful delivery at the market.
Each update is made visible on the farmer's dashboard, enhancing transparency and reducing uncertainty.
5. Admin Monitoring and Report Generation: The admin module is the backbone of the system, which is responsible for user authentication, transport request management and issue resolution. Admins can view the status of every transport request, mark suspicious activity and create summary reports which include user activity logs, transport history and overall platform usage.

VIII. CONCLUSIONS

The AgriConnect platform efficiently addresses one of the most essentials challenges in the agriculture - efficient and reliable crops transportation from farms to market. The system establishes a digital communication channel between farmers and truck drivers, thereby eliminating the long-standing dependency on intermediaries and manual coordination that tended to results in delays, losses and inefficiency. With its modular design and role- specific dashboards, AgriConnect facilitates real-time management of transport request, crop delivery tracking and administrative management, providing transparency and accountability at each step of the supply chain.
The implementation of Java Spring Boot, JSP and MySQL ensured a robust and scalable backend, while user-friendly frontend interfaces made the system accessible even for those with limited technical knowledge. The integration of the Admin Module played a critical role in maintaining system security, performance and creating detailed logs and reports for continuous improvement. During development and testing, the platform consistently met its functional requirements and demonstrated its potential to be scaled and adapted to be used in various agricultural regions.
AgriConnect not only enhances the efficiency of crop transportation but also enables small and marginal farmers by providing them direct access to transport services, facilitating delivery on time and better market prices. For truck drivers, it guarantees consistent work availability and organized job tracking. In the long run, platforms like AgriConnect can transform rural logistics, promote digital integration and provides more agricultural profitability through smarter, technology-driven coordination. The project provides a strong foundation for future enhancements like GPS-based tracking, mobile application integration and multilingual support paving the way for broader adoption in India's agricultural ecosystem.

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