

AgroLink: Smart Agro Network

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Abstract - Agriculture remains the primary livelihood for millions of farmers, yet the existing supply chain is dominated by intermediaries who control pricing and buyer access. Due to a lack of real-time market demand information, farmers often harvest crops blindly and transport them to mandis, where they are frequently forced to sell at lower prices. Additionally, vegetables are highly perishable commodities, and without immediate buyers or storage availability, a significant portion of harvested produce gets wasted. This research proposes a web-based Agro Demand Platform, a digital marketplace that connects three stakeholders—farmers (sellers), buyers (consumers, wholesalers, supermarket chains, vegetable vendors), and cold storage managers. Farmers update the available crop inventory, buyers place demand requests based on their requirements, and cold storage managers update storage space availability. This platform enables demand-driven harvesting, reduces wastage through storage visibility, and promotes direct transactions without middlemen. The system is developed using Spring Boot (backend), Angular (frontend), and MySQL (database). Experimental results show that the proposed solution increases farmer profit margin by reducing post-harvest loss and improves transparency between all stakeholders.

I. INTRODUCTION

India is one of the largest producers of vegetables, yet approximately 30–40% of the harvested crop gets wasted every year due to inefficient supply chains, poor demand prediction, and limited storage infrastructure. The traditional agriculture marketing process involves multiple intermediaries, where farmers do not receive fair compensation, and buyers lack traceability and quality assurance.

When farmers do not know the demand, they harvest crops based on assumptions. If demand is low, crops

remain unsold and eventually spoil, resulting in financial losses.

On the buyer side, supermarkets and vegetable sellers face challenges in sourcing fresh produce directly from farmers and their requirement data rarely reaches the farmer in time.

Another significant issue is the lack of digital visibility of cold storages. Cold storage managers maintain availability records manually, and farmers are unaware of nearby storage facilities when they urgently need to preserve harvested crops.

Thus, there is an urgent need for a system that brings transparency, bridges the gap between stakeholders, and reduces produce wastage.

The proposed platform solves this problem by:

1. Allowing farmers to update real-time availability of vegetables.
2. Allowing buyers to post vegetable demand and negotiate order quantity.
3. Presenting cold storage availability and allowing farmers to store crops when demand drops.

II. PROBLEM STATEMENT

Farmers lack market awareness and digital connectivity with buyers and storage facilities. This causes:

1. Unplanned harvesting – farmers harvest large quantities without knowing demand.
2. Post-harvest losses – vegetables remain unsold and get spoiled due to lack of storage.
3. Middlemen dominance – farmers are forced to accept low prices.
4. No direct communication – buyers cannot access farmers directly.

5. Cold storage mismanagement – farmers cannot know which cold storage has available space. Therefore, a digital platform is needed to connect farmers, buyers, and cold storage managers for real-time demand–supply visibility and wastage reduction.

III. OBJECTIVES

- To provide farmers a digital platform to update vegetable stock availability.
- To allow buyers (supermarkets, vendors, consumers) to place real-time demand requests.
- To integrate cold storage managers so they can update storage capacity.
- To achieve demand-based harvesting and reduce wastage.
- To eliminate intermediaries and enable direct farmer-to-buyer transactions.
- To use a secure and scalable architecture using Spring Boot, Angular, and MySQL.

IV. LITERATURE REVIEW

Five Relevant Research Papers

1. Xinghua Zhang, Yongjie Sun, Yongxin Sun (2022)
Title: Research on Cold Chain Logistics Traceability System of Fresh Agricultural Products Based on Blockchain

Journal: Computational Intelligence and Neuroscience
Summary: This paper identifies problems in traditional cold-chain logistics — such as centralized data, data tampering, and low transparency among stakeholders (farmers, logistics, wholesalers, retailers). The authors design a blockchain-based traceability system using a hybrid architecture (both alliance chain and private chain). The private chain stores enterprise-specific data securely, while the alliance chain enables open queries. They simulate and validate the system, showing it improves query efficiency and data reliability.

2. Yang Si(2022)

Title: Agricultural Cold Chain Logistics Mode Based on Multi-Mode Blockchain Data Model

Journal: Computational Intelligence and Neuroscience
Summary: This paper proposes a multi-layer blockchain architecture (consortium chain + private chain) to facilitate high-volume data sharing in cold

chain logistics. To prevent large on-chain data storage costs, they use IPFS for off-chain storage, keeping only hashes on-chain. They also implement access control via identity authentication, so different stakeholders (farmers, transporters, storage) have controlled permissions. The study shows that this architecture improves data privacy and system scalability and that the post-harvest losses. Instead of cultivating or harvesting in bulk, farmers who harvest according to market demand achieve better financial returns and reduce wastage. However, existing systems do not provide structured mechanisms for cold chain logistics efficiency is high in empirical tests.

3. Zhenghao Gao, Dan Li (2022)

Title: Blockchain-Based Neural Network Model for Agricultural Product Cold Chain Coordination

Journal: Computational Intelligence and Neuroscience
Summary: The authors combine blockchain technology with a neural-network-based coordination model to improve the agricultural cold chain. They propose a system that organizes many small files (from sensors, logistics, storage) using Hadoop HDFS, and they optimize file management with a balanced merging & index caching strategy. This ensures efficient storage and retrieval of data like temperature logs. The neural network model helps to coordinate operations (like scheduling storage / transport) based on data stored on the blockchain.

4. Yanhu Bai, Hansheng Wu, Minmin Huang, Jianli Luo, Zhuodong Yang (2023)

Title: How to Build a Cold Chain Supply Chain System for Fresh Agricultural Products Through Blockchain Technology — A Study of Tripartite Evolutionary Game Theory Based on Prospect Theory
Journal: PLoS ONE

Summary: This paper models the behavior of three stakeholder types — cold chain logistics participants, government, and consumers — using evolutionary game theory and prospect theory. They simulate how factors like blockchain adoption cost, government incentives, and scale of the cold chain affect adoption decisions. Their findings show that: (1) government incentives and lower blockchain costs significantly boost adoption; (2) larger cold chain networks reduce default risk; (3) incentives and penalties are important to maintain cooperation. This is useful for designing

economic models and policy frameworks for a blockchain-based cold chain network.

5.Xifeng Xu, Choon Wah Yuen, Suhana Binti Koting, Siti Nurmaya Binti Musa (2024)

Title: Construction of a Blockchain Based Cold Chain Logistics Information Platform for Gannan Navel Oranges to Enhance Transparency and Efficiency
Journal: Frontiers in Sustainable Food Systems

Summary: This work builds a blockchain-based platform specifically for the cold-chain logistics of Gannan navel oranges, a high-value agricultural product. Using an alliance-chain model (SMART-PBFT), they integrate IoT data (temperature, location) to improve traceability, reduce data tampering, and enhance coordination across the supply chain (farmers → storage → transport → market). The system increases data transparency, reduces cost, and strengthens trust across stakeholders.

• Research Gap:

Although several previous studies proposes a digital platforms for agriculture, most solutions focus on either marketplace trading or cold-chain logistics, or transportation individually. There is no unified ecosystem that connects farmers, buyers, cold storage providers, and transport services on a single integrated platform. Existing research lacks real-time multi-party coordination, end-to-end traceability, and a dynamic price + logistics optimisation system. Therefore, a gap exists for a holistic, connected Agri-supply chain platform like AgroLink that provides all services seamlessly in one system.

V. PROPOSED SYSTEM

This system contains 3 modules as follows:

Module 1: Farmer (Seller)

- Registers using phone/OTP.
- Updates stock details (crop name, quantity, expected harvest date).
- Receives notifications when buyers place demand.
- Decides whether to harvest based on demand shown on dashboard.
- Option to store crops in cold storage.

Module 2: Buyer

- Buyers include: *supermarkets, hotels, restaurants, vegetable vendors, households.*
- Search agriculture produce using filters (vegetable type, location, quantity).
- Send demand request specifying quantity and delivery/pickup date.
- Direct chat/negotiation can be enabled via messaging or call option.

Module 3: Cold Storage Manager

- Adds new cold storage details (name, location, capacity).
- Updates available storage space in real time.
- Accepts or rejects farmer storage request.

VI. SYSTEM ARCHITECTURE

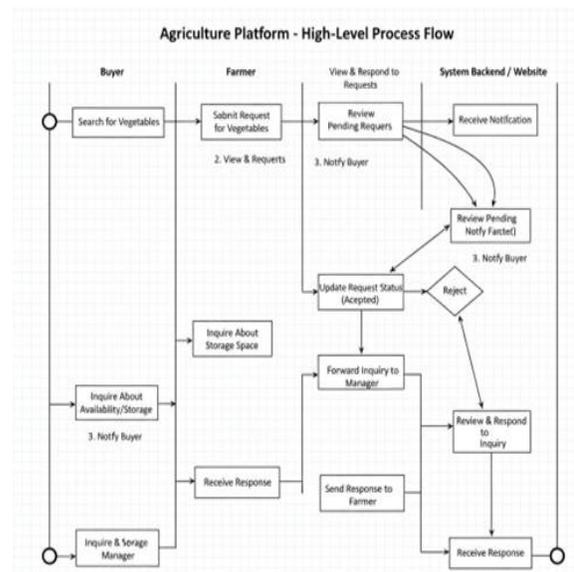


Fig no.1 : system architecture of AgroLink

VII. METHODOLOGY

Phase	Description
Requirement Analysis	Interviews with farmers to understand real issues
System Design	Architecture diagram, ER diagram, DFD, sequence diagram
Development	Spring Boot REST APIs + Angular frontend
Testing	Unit testing, Integration testing, User acceptance testing
Deployment	Host on cloud platform (AWS, Azure, or on-premise server)

VIII. EXPECTED OUTCOME

Profit farmer	to Low margin	profit Direct improves earnings	income
Transparency	No transparency	Real-time updates on demand & storage	

Parameter	Before System	After Proposed System
Wastage	30–40% wastage due to lack of storage info	Predicted wastage loss by 30%
Middlemen	High involvement	No middlemen

IX. CONCLUSION

The system successfully creates a digital connection between farmers, buyers, and cold storage managers — enabling demand-based harvesting. As a result, farmers do not harvest unnecessarily, buyers receive fresh produce, and crops are preserved in cold storage when demand reduces.

The platform improves:

- income levels,
- transparency,
- decision-making,
- reduces wastage.

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