LAB-2 AGILE MODEL

Agri Supply Chain – Blockchain Enabled Supply Chain Platform

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Project Overview

The **Agri Supply Chain – Blockchain Platform** is a decentralized web application designed to bring transparency, traceability, and fair trade practices into agricultural supply chains. The system integrates **blockchain smart contracts**, **backend APIs**, and a **React-based frontend** to enable decentralized crop auctions, real-time shipment tracking, and QR-based product provenance.

Because the project involves rapidly evolving technologies like blockchain and smart contracts, an **Agile development model** was chosen to allow continuous refinement, testing, and integration of components throughout development.

Why Agile for This Project

Traditional development models are not flexible enough for blockchain-based systems where smart contracts, APIs, and user interfaces must evolve together.
Agile enables:

• Incremental smart contract development
• Continuous integration between blockchain and web services
• Early user feedback on UI and workflows
• Progressive security and performance optimization

Agile Sprint Planning

The entire development process is divided into **three iterative sprints**, each delivering a working and testable system increment.

Sprint 1 – Core Infrastructure & Decentralized Auctions

Objectives

• Define overall system architecture
• Set up local blockchain network using Hardhat
• Design database for user management
• Implement user registration and login
• Develop Auction smart contract for crop trading
• Deploy smart contract on local blockchain
• Create backend APIs to interact with auction contract
• Build frontend pages for creating and bidding on auctions
• Integrate MetaMask wallet connection

Deliverable

A functional decentralized auction module where farmers can create auctions and buyers can place bids through a web interface connected to blockchain.

Sprint 2 – Supply Chain Tracking & Product Provenance

Objectives

• Develop smart contract for GPS-based shipment tracking
• Develop smart contract for storing product lifecycle records
• Write and execute unit tests for both contracts
• Implement backend APIs for updating and fetching tracking data
• Generate and validate QR codes linked to blockchain records
• Build frontend interface to display real-time shipment locations
• Create QR scanner to retrieve product history

Deliverable

A transparent supply chain tracking system where each product's journey from farm to retailer is recorded on blockchain and accessible through QR scanning.

Sprint 3 – System Integration, Testing & Deployment

Objectives

• Integrate auction, tracking, and provenance modules
• Perform end-to-end blockchain to UI data flow testing
• Optimize smart contracts for gas efficiency
• Conduct backend validation and API testing
• Test frontend usability and responsiveness

• Implement security checks and access controls
• Configure environment variables for production
• Deploy smart contracts and host web application

Deliverable

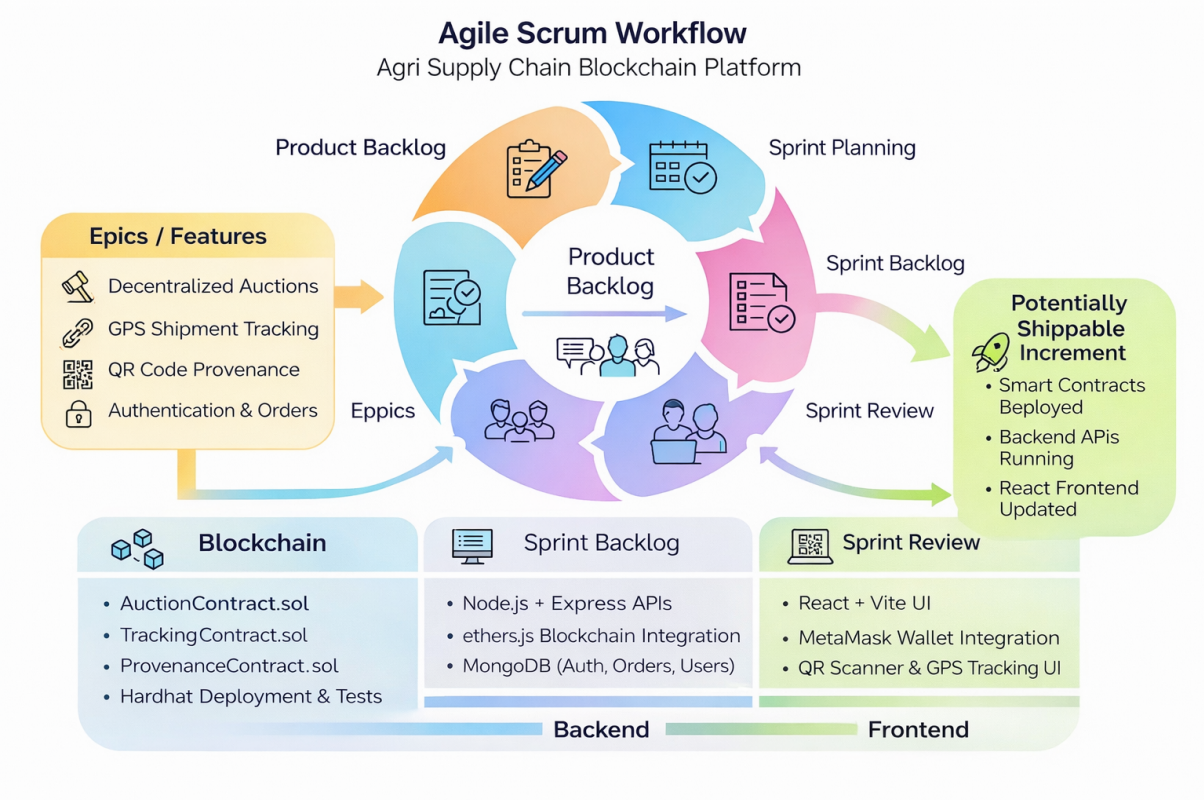
A fully integrated, secure, and deployable blockchain-based agricultural supply chain platform.

Agile Development Flow

The Agile workflow follows a continuous loop:

Product Backlog → Sprint Planning → Sprint Backlog → Sprint Execution → Daily Stand-up → Sprint Review → Sprint Retrospective → Back to Product Backlog

Each sprint produces a working increment that is reviewed, tested, and refined based on feedback.



Agile Team Structure

• **Product Owner:** Defines features and priorities
• **Scrum Master:** Manages sprint activities and removes blockers
• **Blockchain Developer:** Builds and tests smart contracts
• **Backend Developer:** Develops APIs and database logic
• **Frontend Developer:** Builds user interfaces and wallet integration

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Continuous Feedback and Improvement

After every sprint review:

• Smart contract logic is refined
• User interface improvements are added
• Backend performance is optimized
• Security vulnerabilities are addressed
• New features from the roadmap are added to backlog

This ensures continuous enhancement of functionality, security, and user experience.

Benefits of Agile in This Project

• Supports rapid blockchain prototyping
• Allows parallel development of contracts, APIs, and UI
• Encourages continuous testing and integration
• Reduces risk of late-stage failures
• Adapts quickly to new requirements
• Ensures a stable and scalable final product