Software Engineering Project Proposal

KisanSetu: Farmer-Centric Digital Agri-Ecosystem Platform

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1. Problem Statement

India's agricultural sector faces several systemic challenges that severely affect smallholder farmers, who constitute nearly 86% of total landholders. The major problems are as follows:

- **Information Asymmetry:** Farmers receive only 25–30% of the final consumer price due to exploitation by middlemen.
- **Post-Harvest Losses:** Nearly 40% of perishable agricultural produce is wasted because of inadequate cold chain and logistics infrastructure.
- **Resource Access Barriers:** Small farmers lack affordable access to modern equipment, high-quality agricultural inputs, and professional expert guidance.
- **Digital Divide:** Rural illiteracy (23.4%) and low awareness of agricultural applications (73%) hinder the adoption of digital solutions.
- **Fragmented Services:** There is no single unified platform that integrates marketplaces, equipment rentals, service hiring, and government schemes.

These challenges together create a market opportunity of over $650 billion, which can be addressed through a comprehensive digital platform.

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2. Proposed Solution: KisanSetu

KisanSetu is a unified, farmer-centric digital agri-ecosystem designed to address the above challenges by integrating technology with on-ground support.

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3. Target Users

The platform is designed for the following user groups:

- **Smallholder Farmers (Primary Users):**
- Own 1–5 acres of land
- Limited digital literacy

- Need direct market access, fair pricing, affordable equipment, and expert guidance

- **Buyers (B2B and B2C):**

- Retailers, wholesalers, and consumers

- Require quality produce, transparent pricing, and traceability

- **Service Providers:**

- Equipment owners and agricultural experts

- Seek a marketplace for rentals and professional services

- **Micro-Entrepreneurs:**

- Local hub operators
- Earn commission-based income and receive operational training

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4. Core Farmer-Centric Functionalities

4.1 Smart Marketplace

- Provides real-time pricing from more than 7,000 mandis across India
- Uses AI-based recommendations to help farmers achieve 20–35% higher returns
- Enables direct B2B and B2C sales
- Supports collective bargaining through Farmer Producer Organizations (FPOs)

4.2 Equipment and Expert Rentals

- Allows farmers to rent tractors, harvesters, and drones at ₹200–500 per hour instead of purchasing expensive equipment
- Enables hiring of certified agricultural experts
- Helps equipment owners monetize idle machinery

4.3 Cold Chain and Logistics Management

- Uses IoT sensors to monitor temperature and storage conditions in real time
- Applies AI-based route optimization to reduce delays
- Reduces post-harvest wastage from 40% to below 10%
- Uses blockchain for produce traceability and premium pricing

4.4 Government Services Integration

- Integrates Soil Health Cards and eNAM platforms
- Enables tracking of subsidies and crop insurance
- Helps improve crop yield by 15–20%

4.5 Phygital Support Layer

- Provides a voice-enabled user interface in Hindi and regional languages
- Establishes local training and support hubs
- Offers offline-first functionality for low-connectivity regions

• Includes ROI and cost-benefit calculators for farmers

4.6 Analytics and Decision Support Dashboard

• Displays crop profitability analysis
• Provides weather forecasts and pest alerts
• Offers personalized farming recommendations

Overall Impact: - 25–35% increase in farmer income - Up to 70% reduction in operational costs - Reduction of post-harvest wastage to below 10%

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5. Technology Stack and Development Approach

The development of KisanSetu uses modern, scalable technologies:

• **Frontend/Web Dashboard:** Next.js 14 for SEO optimization and server-side rendering
• **Backend:** Node.js with Express for scalable and real-time services
• **Database:** MongoDB for flexible data storage and Redis for caching
• **AI and Machine Learning:** TensorFlow.js and Python for price prediction and route optimization
• **Blockchain:** Hyperledger Fabric for secure produce traceability
• **IoT Integration:** AWS IoT Core for cold chain monitoring
• **Deployment:** AWS EKS and Vercel for auto-scaling and CI/CD pipelines

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6. Impact for Farmers

KisanSetu delivers the following measurable benefits:

• Eliminates middlemen by enabling direct B2B and B2C sales, increasing income by 25–35%
• Reduces equipment ownership costs through affordable rental services
• Minimizes post-harvest losses using IoT-enabled cold chain logistics
• Overcomes digital literacy barriers through voice-based interfaces and local support hubs
• Improves productivity and yield through data-driven recommendations and soil analysis

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7. Conclusion

KisanSetu is a comprehensive, farmer-centric digital platform that demonstrates strong full-stack software engineering principles. By integrating AI, IoT, blockchain, and cloud technologies, the platform addresses critical agricultural challenges such as middlemen exploitation, high wastage, and limited resource access. KisanSetu highlights how scalable and inclusive technology can create significant social and economic impact for India’s farming community.

Course: B.Tech CSE (2nd Year)

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