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Krishi Setu: A Transparent Digital Platform Empowering Farmers

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[1]***Abstract*—Agriculture is the backbone of India's economy, but farmers still face many problems. Prices of food and essentials keep rising. In 2024, food inflation reached 8.4%, and rural inflation stayed near 7%. Yet, farmers earn less than 40% of what consumers pay. Middlemen control mandis and decide the prices. There is no strong system to check their actions. Most farmers also lack digital knowledge and are unaware of complex platforms like eNAM. To solve these problems, we propose Krishi Setu, a simple and transparent digital platform. It connects farmers, buyers, and the government directly. Farmers can list their crops and sell through verified tenders. Buyers bid under government supervision to keep prices fair. The platform uses a safe wallet system where payment is released only after the product is delivered. Farmers can also rent their equipment to earn extra income. The system makes every step clear and honest. It helps the government track sales and payments. Krishi Setu aims to stop middlemen exploitation, increase farmer income, and give consumers fair prices. It is a step towards a transparent and sustainable agriculture system for India.**

***Index Terms*—Agriculture, Farmers, Digital Marketplace, Inflation, Middlemen, Transparency, Government Tender, eNAM, Fair Price, Krishi Setu**

I. INTRODUCTION

Indian agriculture employs nearly 50% of the workforce but contributes only 18% to GDP, reflecting deep structural inefficiencies. Despite being essential for food security, farmers remain economically vulnerable. A vegetable farmer selling produce at ₹2-3/kg sees it retail at ₹20-30/kg, with 85% absorbed by intermediaries (grainmart, 2019). This exploitation persists because traditional agricultural b produce market committee (APMC) systems involve 6-7 middlemen who compound margins throughout the chain (ranjan, 2017).

Digital platforms like enam have attempted reform since 2016, registering 1.75 crore farmers and processing ₹2 lakh crore in transactions (jaankaar bharat, 2025). However, adoption remains low—68% of farmers in enam areas are unaware of its existence, and 71% find interfaces too complex (idinsight, 2021; samunnati, 2024). more critically, these platforms lack mechanisms to prevent digital re-intermediation, payment guarantees, and real-time government oversight.

This paper proposes krishi setu, an integrated digital ecosystem that addresses five critical gaps: (1) structural

control of resale chains, (2) automated payment security, (3) government-supervised transparent tenders, (4) equipment sharing for additional income, and (5) community support for isolated farmers. Our contribution lies in combining these elements with inclusive design for semi-literate users, creating a holistic solution rather than merely digitizing existing inefficient systems.

II. Literature Review

A. Digital Agricultural Platforms in India

eNAM represents India's flagship digital agricultural initiative, integrating 1,361 mandis across states. Despite impressive scale, actual usage remains minimal. Research reveals critical limitations: 68% farmer unawareness, interface complexity deterring 71% of rural users, and absence of payment protection or value-added services (IDinsight, 2021; Samunnati, 2024). The platform focuses solely on trading without addressing equipment access, community needs, or comprehensive farmer support.

Private platforms like DeHaat and AgroStar operate commercially, prioritizing profitability over farmer welfare. Services concentrate in specific regions and require upfront payments that small farmers cannot afford. Telangana's Saagu Baagu AI initiative shows promise with 21% yield increases and income doubling within 6 months (WEF, 2024), but focuses exclusively on crop advisory, not marketing challenges or payment security

B. Traditional APMC System Inefficiencies

Empirical research documents severe structural problems. Agricultural produce passes through 6-7 intermediaries before reaching consumers, with each extracting margins. Studies on sesame farmers revealed 70.1% experienced poor pricing, 63.2% felt exploited, and 58.3% reported persistently low profits (Ranjan, 2017). Farmers receive less than 15% of final consumer prices while the remaining 85% is absorbed by intermediaries, transportation, and retail margins (Grainmart, 2019).

Payment delays compound these issues. Farmers wait 7-15 days for cash payments without documentation, creating vulnerability to fraud. This forces acceptance of lower prices from immediate-pay buyers, further reducing income.

C. Digital Technology Impact

Global digital agriculture markets are expanding rapidly, from $302.8 million (2023) to projected $5,625 million by 2032, with a CAGR of 41.4% (GM Insights, 2024). Research shows automated escrow systems reduce transaction disputes by 73-82% compared to traditional methods (MDPI Sustainability, 2023). Smart contract-based payments cut transaction costs from 2-5% to 0.1-0.3% while reducing administrative overhead by 40-55% (IEEE, 2024).

McKinsey projects digital platforms can increase farmer incomes by 25-35% through better price realization and reduced intermediation (McKinsey, 2023). Supply chain disintermediation research suggests consumer prices could decrease by 18-25% when middlemen are minimized (ScienceDirect, 2024; ResearchGate, 2024).

III.Research Gaps

Current farming websites and apps have big problems. They don't have a proper government-watched system for tenders that you can check anytime. Farmers can't control resale properly - too many middlemen take their profits. Nobody lets farmers rent out their equipment to earn extra money. But the biggest problem? There's no social community platform made just for farmers to connect and work together.

Right now, websites treat each farmer like they're alone. They forget that farmers are stronger when they help each other. There are no features that mix buying and selling with community support. Also, most apps are hard to use for farmers who can't read well - they need voice commands and pictures to guide them.

Krishi Setu fixes all these problems. It brings everything together in one place. The most important part is the social platform that lets farmers unite and support each other. This turns farming business from lonely deals into a community where everyone helps everyone else succeed.

IV. Proposed Solution: Krishi Setu Platform

Core Innovation: Government-Supervised Tender System and a community platform

Current farming apps miss what farmers really need. There's no proper government-watched system where farmers can check tenders anytime. Nobody controls resale properly - middlemen still take most profits. Farmers can't rent out their tractors or tools to make extra money. But the worst part? There's no social media made just for farmers to join forces and help each other.

Most apps treat farmers like they're working alone. They ignore that farmers are stronger together when they share knowledge and support each other. Apps don't mix business features with community building. Plus, many farmers struggle with apps that need too much reading - they need voice help and simple pictures.

Krishi Setu solves these problems. It has everything farmers need in one place., Krishi setu also offers a social community platform where farmers connect and grow stronger together. It changes farming business from working alone to working as a team.

Our Solution: The Krishi Setu Platform

Two Big Changes: Government Tenders and Farmer Unity
Krishi Setu brings two major improvements to farming markets. First is a government-watched tender system that controls resale. Second is a social media platform built just for farmers to unite and grow stronger.

Government Tender System: The government puts out tenders saying what crops they want, how much, what quality, and what price based on MSP. Farmers list their crops and the system matches them to the right tenders automatically. Buyers bid openly, and any bid below MSP gets rejected right away. Government officers watch everything live and can step in when needed. Winning buyers get a 6-month license to resell.

The platform keeps resale under control with a simple three-person chain: Farmer sells to Buyer 1, who sells to Buyer 2, who sells to Buyer 3, who finally sells to consumers. Each buyer can only sell to three buyers at the next level. Buyer 3 must be the final shop. This cuts the usual 6-7 middleman chain by more than half, putting more money in farmers' and consumers' pockets. The system tracks every sale and blocks any transaction that breaks the rules. Break the rules and you get suspended, fined, or banned completely under government watch.

Farmer Social Platform: Farmers often work alone and nobody hears their voice. Krishi Setu changes this with a social media platform made only for farming communities. It's not like Facebook or Instagram. This platform mixes social connection with business and learning. Think of it as a digital village where farmers meet, share stories, work together, and make their voices heard loud and clear.

Farmers can join groups based on what they grow or care about. They can form digital cooperatives, share today's market prices, post farming tips with photos and videos, and build their reputation when others vouch for them. The platform helps experienced farmers mentor newcomers. It supports local languages and lets farmers post using voice instead of typing. Farmers can join live discussions about farming problems and read success stories from other farmers.

This turns farmers into a connected community that can bargain together and support each other. For too long, farmers have been scattered and weak. Now they can stand together and have real power in markets and with the government.

Table 1 Comparison with Existing Platforms

Feature	eNAM	DeHaat/Agro Star	Krishi Setu
Government Oversight	Barely there	Minimal	Real-time, direct
Payment Security	None	None	Full escrow
Middlemen Control	Zero	Zero	3-person limit
Equipment Sharing	No	No	Yes
Languages	12	Limited	22 + voice
Community	Nothing	Barely any	Full featured
Transaction Cost	2–3%	Varies	0.3–0.5%
Works Offline	No	No	Yes

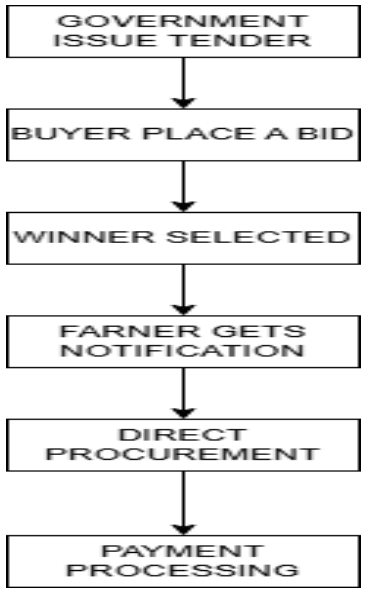

Fig. 1. How the tender system works..

Automated Escrow Payment System: Payment insecurity is addressed through mandatory escrow.
Buyer Deposit: Winning buyers immediately deposit full purchase amount into platform escrow.
Funds Lock: Amount locked until transaction completion
Delivery Verification: GPS-tracked logistics or in-person confirmation.
Quality Check: Buyers have 48 hours to inspect and confirm or raise disputes.
Payment Release: Automatic release upon buyer confirmation or after 48-hour timeout.

Dispute cases: Government arbiter reviews evidence and makes binding decisions executed immediately.

This eliminates the 7-15 day payment delays and default risks that plague traditional markets..

Equipment Rental Marketplace: With 89.4% of Indian farmers operating holdings under 2 hectares (Vision IAS, 2024), equipment ownership is financially impossible. Krishi Setu integrates peer-to-peer equipment rental: Owners list machinery with rates, location, and availability. Farmers book equipment through a platform for specific dates.Same escrow system handles rental payments plus security deposits.Rating systems build trust and reputation. Equipment owners can generate ₹50,000-₹80,000 annually from idle machinery. Small farmers access equipment affordably, increasing productivity without capital investment

Community and Knowledge Sharing: The platform includes social features recognizing farming as both economic activity and social identity. Discussion forums for problem-solving and experience sharing Short videos demonstrating techniques and solutions. Real-time weather alerts, market prices, and government announcements. Expert connections for personalized advice. Local farmer groups for collective activities

All content available in 22 languages with voice-based posting for accessibility.

Government Scheme Integration: Single access point for PM-KISAN status and applications. Real-time MSP data with automatic price comparisons. Subsidy applications with simplified workflows. Crop insurance enrollment and claim filing. Digital soil health cards with recommendations

V. Technical Architecture

Multi-Platform Access: Mobile Application (Primary) Flutter-based native apps for Android/iOS, Optimized for low-end smartphones, Offline-first architecture with automatic syncing, Voice navigation in 22 languages,
Push notifications for critical updates.

Web Application:Responsive interface for buyers and officials, Advanced analytics and reporting tools, Administrative dashboards for government monitoring.

USSD/SMS Gateway:Basic functionality for feature phones, SMS alerts for transactions and prices, Voice call support for critical operations.

Physical Kiosks:Tablet-based kiosks in gram panchayats and mandis, Assisted transactions with trained operators

System Design Backend: Microservices architecture for scalability, RESTful APIs and WebSocket for real-time updates, Node.js and Python-based services, PostgreSQL (structured data), MongoDB (unstructured), Redis (caching)

Integration: Government database connections (land records, PM-KISAN, Agri Stack), Payment gateways (UPI, Net Banking, Digital Wallets), Weather APIs and GPS services

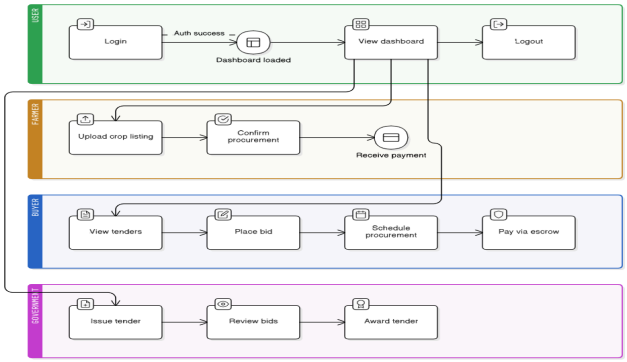

Fig. 2. Technical flow of the platform:

Security . End-to-end encryption Multi-factor authentication Role-based access control Compliance with Digital Personal Data Protection Act 2023

Key Features: Voice interface with speech-to-text in 22 languages. AI-powered crop identification and quality assessment. Offline capability with local storage and conflict resolution. Cloud hosting (AWS/Azure) with CDN for fast content delivery

VI. Benefits and Impact

Economic Benefits:

For Farmers:25-35% income increase through better price realization Example: Tomatoes sold at ₹20/kg vs. ₹5/kg traditionally (300% increase). Zero payment risk with escrow guarantees Additional ₹50,000-₹80,000 annually from equipment rental. Reduced input costs through collective purchasing

For Buyers 18-25% lower procurement costs Quality assurance through documentation and ratingsTransparent pricing preventing manipulation 40-55% reduced administrative overhead.

For Consumers 18-25% lower food price, Fresher produce with shorter supply chains 2-3% food inflation mitigation

For Government Better MSP enforcement and policy implementation. Real-time agricultural data for evidence-based decisions .Reduced subsidy leakage,
Enhanced food security management, 250,000 rural employment opportunities.

Social Impact: Farmer empowerment through transparent markets, Financial inclusion via digital payments, Reduced

agricultural distress and debt, Increased women's participation, Youth engagement in modernized farming, Knowledge democratization through community platform, Strengthened social cohesion via farmer groups.Community engagement, women participation, youth engagement, scheme access.

Environmental Impact: 40-50% reduced transportation through shorter supply chains, Waste reduction from 16-18% to 8-10%.

Efficient equipment utilization reducing manufacturing needs, Accelerated adoption of sustainable farming practices.

VII. Challenges and Mitigation

Technical Challenges Digital Literacy (71% rural population lacks basic skills) Mitigation: Voice-first design, visual interfaces, assisted kiosks, peer learning, SMS fallback, Connectivity (59.19% rural tele-density) Mitigation: Offline-first architecture, low-bandwidth design, SMS functionality.
Scalability (10M concurrent users) Mitigation: Microservices, cloud auto-scaling, database optimization, CDN.Security Mitigation: End-to-end encryption, multi-factor authentication, regular audits, compliance.
Adoption Challenges Middlemen Resistance Mitigation: Gradual transition, licensed trader registration, government enforcement
Trust Building Mitigation: Escrow security, success stories, government endorsement, small trial transactions
Buyer Skepticism Mitigation: Quality documentation, ratings, sample system, dispute resolution
Cultural Factors Mitigation: Respect traditions, local customization, community leader engagement
Regulatory Challenges State-Level Variations
Mitigation: Flexible architecture, individual state partnerships, compliance modules
Legal Framework Mitigation Legal consultation, government co-development, clear terms, arbitration.
MSP Implementation Mitigation Real-time integration, automatic sub-MSP rejection, government dashboards
Financial Sustainability: Revenue Model Transaction fees (0.3-0.5%), Premium services for buyers, Equipment rental commission, Government grants, Anonymized data analytics sales,
Monitoring and Evaluation: Key Performance Indicators
User Adoption: Registered users, active users, transaction frequency, geographic spread
Platform Performance: Transaction success rate, payment settlement time, dispute rate, uptime
User Satisfaction: Rating scores, Net Promoter Score, retention rates

Data Collection: Automated system tracking and analytics, Quarterly user surveys and focus groups, Third-party academic evaluations, Government reporting and dashboards, Continuous feedback loops for improvement.
Key Differentiator: Krishi Setu implements structural reforms preventing digital re-intermediation while ensuring payment security through government-supervised transparent markets, not merely digitizing inefficient traditional systems.
article).

TABLE 2 Price Variation of Fruits & Vegetables (With and Without Middlemen)

Item	Farmer w/ Middlemen (Rs.)	Consumer w/ Middlemen (Rs.)	Farmer w/o Middlemen (Rs.)	Consumer w/o Middlemen (Rs.)
Tomato	8	18	16	18
Potato	9	25	20	22
Onion	12	30	22	25
Apple	30	80	65	70
Banana	20	50	40	45

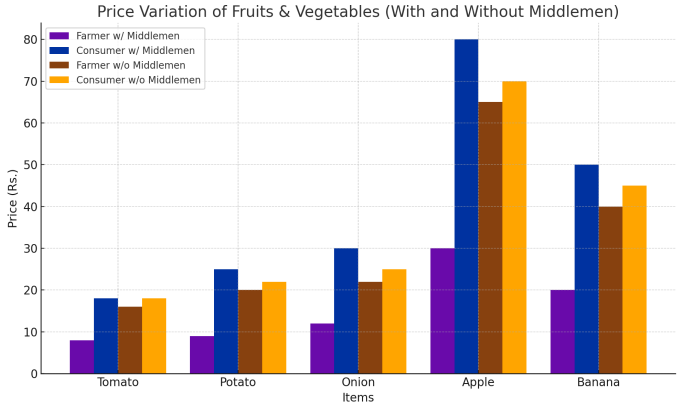

Fig. 3. Price Variation of Fruits & Vegetables (With and Without Middlemen)

VII. Conclusion

Krishi Setu reimagines agricultural markets for the digital age. We're not just building software—we're rebuilding trust, fairness, and opportunity into a system that's been broken for decades.

Government supervision ensures MSP gets enforced. Escrow eliminates payment fear. Equipment rental creates new income. Community features end isolation.

The design respects that many farmers haven't used smartphones much. Voice interfaces, visual navigation, and offline capability make technology accessible instead of intimidating.

If our projections hold—25-35% higher farmer income, 18-25% lower consumer prices, 60% reduction in middlemen margins—we're talking about transforming millions of lives. Not overnight, but steadily through a

three-phase rollout with intensive training and government partnership.

Yes, challenges exist. Digital literacy is low. Internet connectivity is patchy. Middlemen will resist. But these problems have solutions, and similar initiatives like Saagu Baagu in Telangana prove that well-designed technology can genuinely help farmers.

As Krishi Setu scales from pilot districts to national infrastructure, it can become as essential to agriculture as irrigation or rural roads. The data will inform better policies. The community will amplify farmer voices. The transactions will improve countless livelihoods.

The vision is clear: farmers earning fair incomes, consumers getting affordable food, and transparent markets with government oversight. Krishi Setu is the bridge to get there.

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