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Raitha Sethu: AI-Driven Blockchain-Based Agricultural Bidding and Escrow Platform

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ABSTRACT

Out in the fields, delays and unclear prices slow down trade because old methods rely on layers of brokers and foggy data. Instead of waiting days for money, farmers now see faster movement through a system built on blockchain and artificial intelligence. A snapshot of crops gets analyzed by software, giving instant feedback on quality without guesswork. Bids come in live, adjusting as interest shifts, letting growers choose offers as they happen. Behind it all, smart contracts lock steps into place so no one skips ahead. Payments sit guarded until proof arrives that goods reached their destination. Trust builds not from promises but from visible actions recorded permanently. Middlemen fade where code handles terms fairly. Transparency becomes normal when every move stays logged and clear. Better pay for farmers might come from safer deals, clearer prices, one smooth trading process. This study looks into tools like artificial intelligence, blockchains, self-executing contracts, farm product bidding, locked-in payments until delivery, crop grading methods, deep learning models, protected exchanges, digital marketplaces for crops, tech-driven farming setups.

INTRODUCTION

Farming shapes both regional economies and how much food reaches people. Not knowing what happens behind the scenes makes old-style trade tough for growers. Hidden steps mean prices tilt unfairly, payments stall, extra hands take cuts, security in money transfers stays weak. When local brokers judge crops by eye alone, income shrinks fast. Traders call the price shots - leaving those who grow without leverage. Right now, tools fail to back strong payment flows or solid checks on harvest quality that follow clear rules.

Because of this, farming communities want a digital space built on smart tech to build trustworthy pricing and clear procedures - bringing confidence into deals between growers and buyers. Behind the scenes, creators shaped an answer using AI plus blockchain, adding an escrow payment setup to ease concerns. This online marketplace blends safety with openness by combining artificial intelligence, deep learning, smart contracts, and distributed ledger tools. Snapshots of harvests go live through farmer uploads, followed by machine-led visual checks for accuracy.Each step gains clarity when details lock into place across a shared digital ledger, leaving little room for doubt. When proof arrives through confirmed deliveries, money moves without waiting, guided by preset rules instead of human pushes. Checks happen quietly behind scenes, matching prices to real conditions while guarding data like a vault. Trust grows slowly here - not from promises but structure - shifting power toward those tilling soil rather than those counting coins. Middlemen fade not by force but because they're no longer needed in a world where truth updates itself. A field's worth gets measured cleanly, recorded permanently, seen openly by all who matter.

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Figure 1: Farmer Bidding System

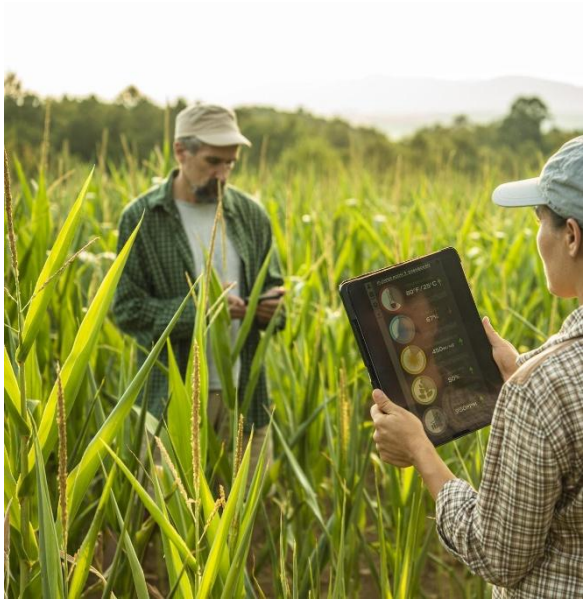

Figure 2: Crop Quality Prediction

LITERATURE SURVEY

1. S. Patil, R. Deshmukh and P. Joshi, 2025 "Blockchain Technology in Agri Supply Chain Management: A Transformative Approach"

This study looks into how blockchain might change farm-to-table logistics, offering clearer records through better visibility. Food origins become easier to follow because digital trails reduce guesswork. Fraud drops when data stays locked and unchangeable across networks. Different players in farming ecosystems find new ways to work together thanks to shared access. A closer look reveals QR codes helping track items from field to shelf. Smart contracts step in to automate agreements without middlemen. Systems grow safer as rules execute themselves under preset conditions.

One downside is how the report focuses mostly on tracking farm produce. It skips over using artificial intelligence to study crops. Coverage of payments held by third parties also gets left out.

2. D. Kumar, N. Singh and R. Agarwal, 2024 - "Blockchain-Based Smart Contract for E-Bidding System".

Built on Ethereum, this auction platform runs using smart contracts to keep bidding open and secure. Instead of relying heavily on outside organizers, it handles transactions directly between users. While some auctions show bids openly, others hide them until the end. Through decentralized tech, trust comes from code rather than middlemen

One problem is that current studies focus solely on broad digital auction platforms. Yet they ignore how farming harvests are assessed. Besides, checks through blockchain-held payments get overlooked too.

3. J. Brown, L. Wilson and M. Taylor, 2024 "Agro-Blockchain Markets (ABM): A Secure and Transparent Model for Smallholder Farmers"

A fresh approach to farming markets emerges through blockchain tech, linking growers straight to buyers using automated agreements and shared networks. Instead of middlemen, trust comes from code, opening doors to clearer pricing, fairer pay access, all while keeping trades online and safeOne downside is that the system lacks smart technology to grade crops. It also misses built-in prediction tools for judging how good the harvest might be. Intelligence that adapts isn't part of its design when it comes to quality checks on produce. Instead of using learning algorithms, it sticks to basic methods without forecasting abilities.

4. A. Mehta, K. Reddy and V. Prakash, 2025 "Development of AI-Based Crop Quality Grading Systems using Image Recognition"

A fresh approach to sorting crops appears in this work, where machines take charge using smart imaging tricks like CNNs and borrowed learning strategies. Instead of people deciding everything, the tool labels each harvest batch as top tier, okay, or unfit - quietly making choices on its own. Accuracy stays strong even when hands-off control kicks in. The method leans on pattern spotting in photos, mixing older math models with modern vision code behind the scenes.

One gap stands out. Real-time testing missed blockchain tools entirely. The study skipped how escrow payments work in live farm product trades. Trading platforms got left behind too - no on-the-ground checks were made.

5. R. Sharma, P. Verma and S. Kulkarni, 2025 "AI-Driven Crop Quality Assessment using Deep Learning and Image Analysis with Integrated Smart Farming Support System"

A new method for checking crop health uses cameras plus artificial intelligence built on deep learning patterns. Instead of relying on old techniques, it spots sickness in plants by studying images through computer vision networks. While working fast, delivering results as soon as pictures are taken, it also shares up-to-the-minute weather changes farmers can use daily. Alongside disease detection, quality sorting happens automatically based on visual traits captured in fields. On top of that, pricing trends from local markets appear within the tool helping track value shifts over time.

One downside sticks out - the research looks just at how crops are judged for quality. It skips anything about using blockchain. Security in bidding stays untouched too.

6. M. Alshammari, R. Alhakami, and A. Alsubaie, 2024 "Smart Contracts for Managing the Agricultural Supply Chain: A Practical Case Study"

This study introduces AgroChain, a system built on Quorum blockchain and powered by smart contracts to boost visibility across farm-to-market networks. Instead of relying on centralized logs, it uses decentralized ledgers to lock in data, reducing tampering risks while improving oversight. Tracking crops becomes more reliable since each step gets recorded immutably. Security strengthens because information spreads across nodes rather than sitting in one spot. Fraud drops when every actor knows actions are permanently logged. Records stay intact over time thanks to consensus-based validation. Transparency grows not through promises but through shared access to verified events.

One downside though - most of the study focuses on handling supply chains, leaving out how artificial intelligence could check crop quality. It also skips any mention of live bidding systems, oddly enough.

7. X. Wang, Y. Liu and H. Zhang, 2024 "Research on Blockchain-Based E-Bidding System"

A fresh approach to e-bidding emerges when blockchain meets real-world rules. Instead of old-style tracking, trust builds through code that runs on Hyperledger Fabric. Bids lock in via smart contracts - no human touch needed once they're live. Hidden identities ride on Idemix, letting users act without showing who they are. Zero knowledge proofs slip into place quietly, confirming bids without exposing data. Fraud finds less room when every move logs permanently. Fair play grows because everyone sees the same unchangeable record. Privacy stays strong even as actions stay visible. What used to bend under pressure now holds its shape.

One downside is this approach works as a general e-bidding setup, so it lacks tools made for buying and selling farm crops. Features like smart systems that evaluate harvests using artificial intelligence are missing too.

8. G. Kiran Kumar, K. Pavan Kumar, N. Satya Yamini, P. Venkata Madhan and B. Somesh, 2026 "Secure Escrow Bond Smart Contract for Trustless Transactions on the Solana Blockchain"

The authors introduce a secure, blockchain-backed escrow payment method using Solana smart contracts, Rust language, and the Anchor framework. Their mechanism allows escrow generation, cash depositing, conditional payment releasing, refund giving, and dispute solving operations to be run automatically for trustless trading. One of the main advantages of the system is that it is extremely fast, transparent and reduces transaction costs when compared to Ethereum-based escrow systems. According to the study, an experimental test showed a transaction confirmation time of about 400 milliseconds and a transaction success rate of 99.2%.

Drawback: The article mainly centers on decentralizing financial escrow systems and leaves agricultural crop bidding and AI-based crop quality analysis untouched.

PROBLEM STATEMENT

Traditional agricultural trading systems are often marred by the lack of transparency, unfair setting of crop prices, payments that happen after a long delay, and over-dependence on intermediaries. Manual crop quality inspection is the cause of errors most of the time. It is risky to entrust the payment verification to a system that is not secured and the transaction management that is not transparent - these are some of the drawbacks in the existing systems that raise the chances of fraud and customer disputes. As a result, there is a demand for a smart and safe marketplace for agriculture that uses AI for analyzing the quality of crops, blockchain for securing transactions, live bidding, and escrow payment methods to guarantee fair pricing, transparency, and safe trading between farmers and traders.

EXISTING SYSTEM

1. Traditional agricultural trading mainly relies on middlemen and village markets.
2. Quality checking of crops is done by human eye only, and so there may be errors and misjudgments.
3. Farmers are often paid less than what their crops should be worth.
4. Current systems do not show the full picture of transactions and allocations.
5. There is no method to securely check that a payment has been made.
6. Systems that are based on a single point of control can easily be cheated or have their data changed.
7. Most systems lack a feature for live digital auctioning.
8. Payment delays and lack of mutual confidence still plague the relationships between farmers and buyers.

OBJECTIVES

1. Harness the potentials of blockchain technology for creating a secure and transparent agricultural bidding system.
2. Deploy AI powered image processing techniques for crop quality analysis.
3. Facilitate equitable crop pricing through real-time digital bidding.
4. Design and deploy smart contracts for reliable transaction management.
5. Design an escrow mechanism for payment security and verification.
6. Enhance trust, transparency, and efficiency in agricultural marketplaces.

METHODOLOGY

Out there, a new kind of auction space grows quietly - shaped by artificial intelligence, blockchains, and self-running agreements. Pictures and details travel through an app when farmers show what they've grown. From that moment on, machine eyes scan each photo, judging crop condition without anyone stepping in. Once checked, those crops appear online where buyers step forward, offering prices as events unfold in real time. Every bid, every transfer gets locked into a chain of records that do not bend or fade. Agreements coded into the system act on their own, moving money only when conditions match exactly. Cash sits still, guarded, until proof arrives - the goods have reached their destination. Only then does ownership pass cleanly, hand to unseen hand across distance. Trust builds not from promises but patterns etched in code and clarity. Backed by layers most never see, it just works: quiet, firm, unswerving.

SYSTEM ARCHITECTURE

Farmer links with Trader through connected systems - machines exchange signals without pause. While artificial brains check plant health with quiet precision, a chain of blocks locks every agreement in place. Deals stay sealed by design, no gaps allowed. Bids race across displays, guided by code instead of paper shakes. Funds shift solely if terms align, held safe till mutual approval arrives. Every move hides a silent deal, waking when conditions hit just right. Watching closely stands one key figure - the administrator - stepping forward only when alerts fade or flash danger. What counts as fair emerges from unblinking inspection: sensors track output, facts mold worth. Confidence builds through footprints etched on a public ledger, visible to all who look back.

Farmers log in through mobile devices, then share details on crops - photos of yields uploaded directly. When offers appear, pricing shifts show up instantly inside the interface. Earlier transactions remain stored, accessible later whenever needed. Conversations unfold with purchasers via secure messaging tucked within the platform. Middlemen fade as commerce moves straight from soil to digital space. Out there, fresh eyes on harvests break through barriers that used to shut farmers out. Instead of stacks of forms, clicks now clear the way - smoother access for growers where red tape once tangled progress.

Out in the fields, decisions start with what the screen shows - not hunches. One moment someone checks a live auction, the next they're studying an AI report on bean quality. When numbers are visible to everyone, bids form without pressure or tricks. A farmer earns fair pay because proof backs every claim about their harvest. On the flip side, those buying know exactly what arrives, thanks to open records shaping trust. Deals settle at prices that make sense, simply because nothing hides.

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Every little mark in a photo helps computers figure out healthy plants through color, outline, texture, also signs of crispness. Images uploaded are examined by clever systems built to catch signals invisible to regular sight. Not relying on human hunches anymore, choices follow constant logic that does not wear down or wander off track. Errors shrink once programs take charge of inspections, cutting back arguments about worth. Confidence builds since farmer and buyer alike view outcomes rooted in common evidence. Out of nowhere, numbers appear - neat, sharp, done. No more waiting; by noon, it's already over while people sip coffee.

Once crops show up and meet standards, payments start right away. Locked chunks of information hold every agreement firm, scattered over countless machines so changes are impossible. What you see is what happened - step by step, time stamped, visible to all. Rules set ahead of time remove guesswork, replacing hand-done tasks with steady logic. Proof must land first before anything activates. Only then do conditions fire, tying transfer to confirmed arrival

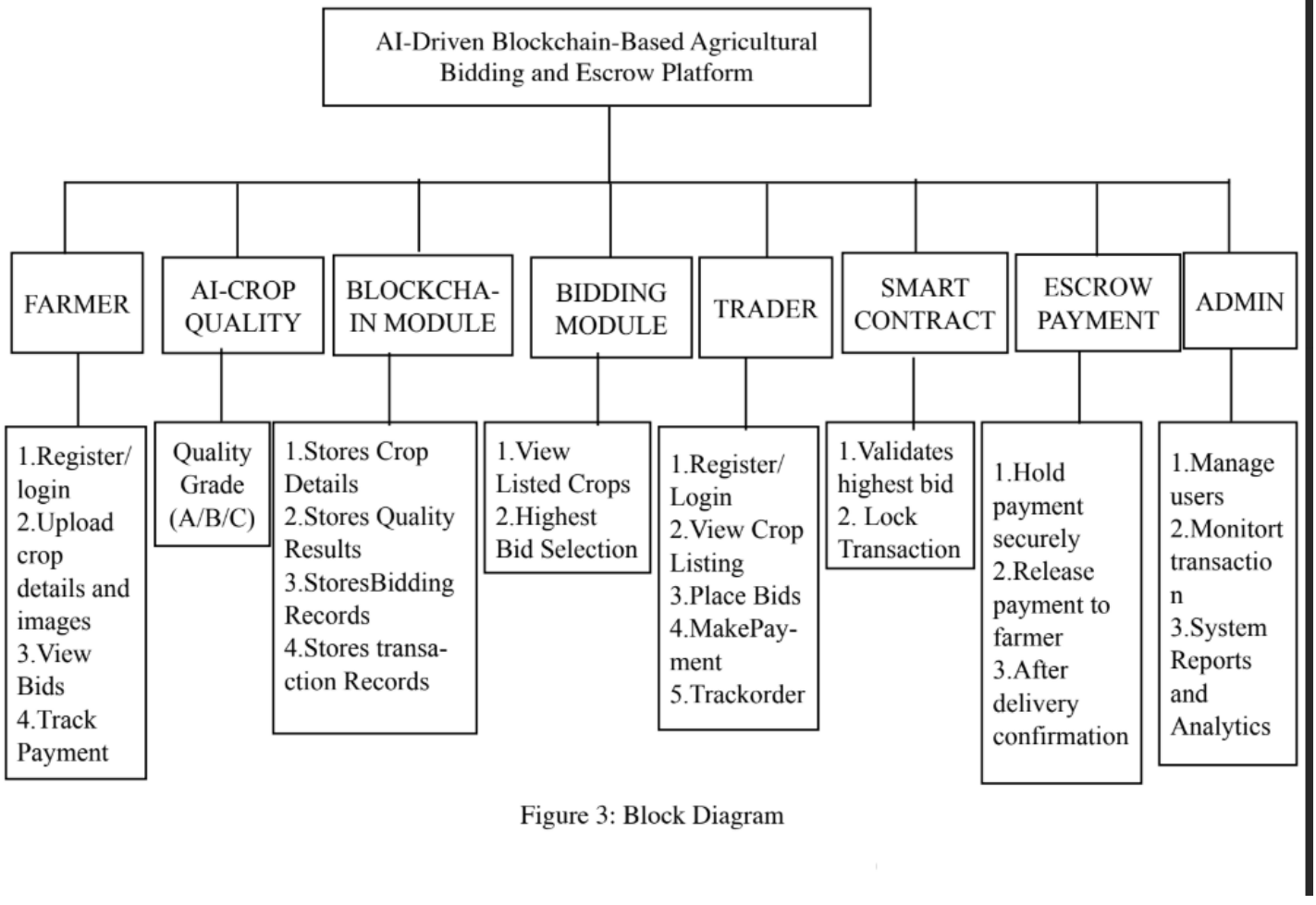

Figure 3: Block Diagram

WORKFLOW

Out of the gate, growers submit details about their harvest - photos included - and those visuals go straight into AI systems built to judge crop condition. Once checked, that data finds a home on the blockchain, locked in place. From there, buyers jump into real- time auctions while automated contracts run checks in the background. Payments sit guarded until goods arrive, then funds shift only when everything lines up. Delivery proof flips the switch.

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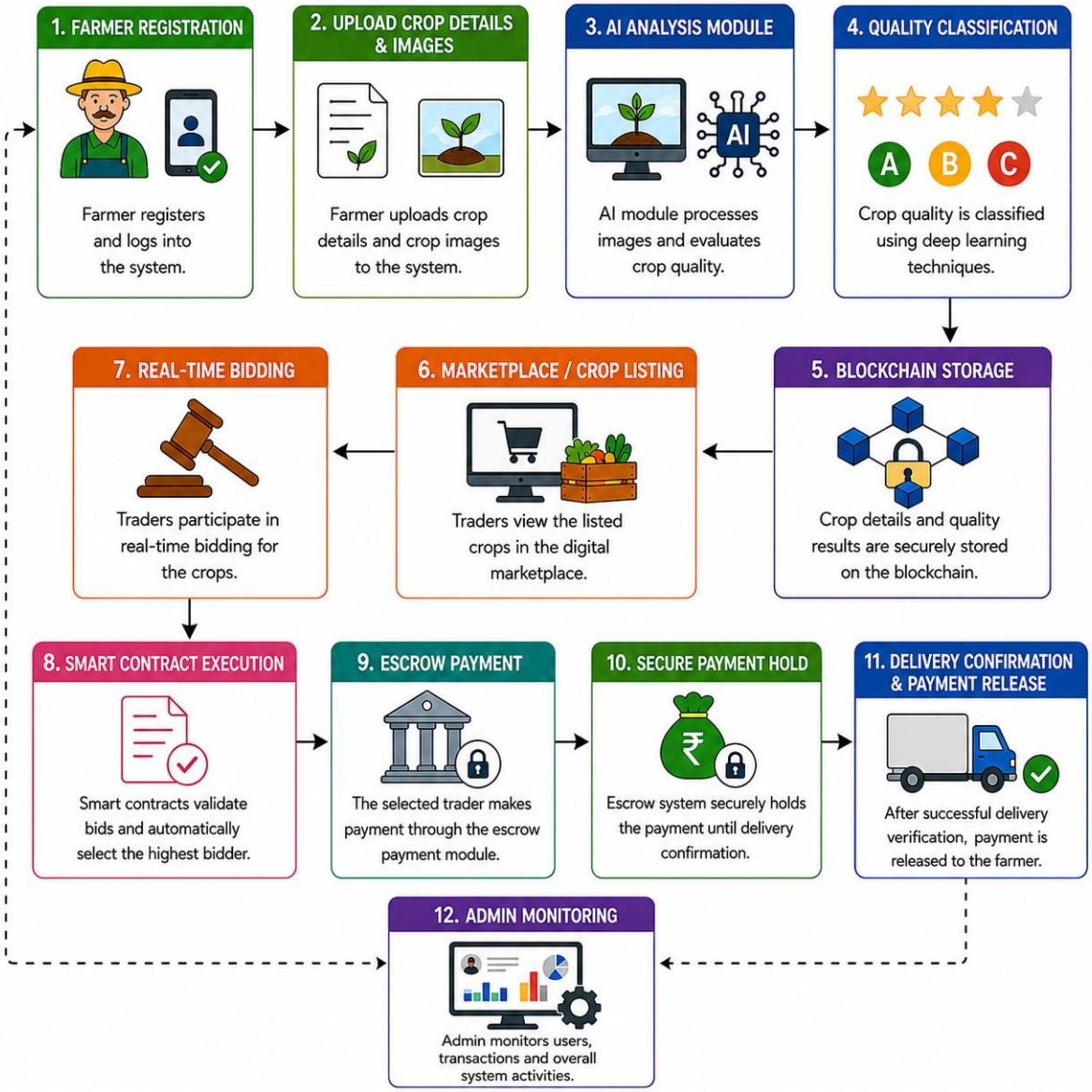

Figure 4: Workflow

APPLICATIONS

1. Intelligent agricultural marketplaces
2. Safe crop trading systems
3. Agricultural supply-chain tracking and management
4. Online real-time auction systems
5. AI-driven monitoring of crop quality
6. Blockchain-based agricultural trading
7. Digital farmer-to-trader marketplaces

CONCLUSION

One step ahead, this farming trade tool uses artificial intelligence along with blockchain to clear up how crops are bought and sold. Old-school markets often struggle - prices get skewed, money arrives late, too many middlemen take control, transactions lack safety nets. Instead of accepting that, a new setup steps in, blending smart computing and decentralized ledgers within one protected space. Problems like trust gaps or slow payouts start fading when tech reshapes the core process from the ground up.

A camera watches the harvest, feeding pictures into a smart program that judges crop quality without human help. Locked digital records track every deal, leaving no room for changes once saved. As bids come in real time, growers see what buyers truly pay right now. Money stays held aside until proof of arrival triggers release

Most times, smart farming networks link growers and buyers directly - building stronger confidence while cutting down dishonest practices. Because artificial intelligence works alongside encrypted ledgers, transactions become safer by design. When payments are held until delivery confirms, smoother trade follows naturally. These tools together shape how digital farm economies might operate ahead. Trust grows where tech checks each step without slowing things down.

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