



# Blockchain-Based Supply Chain Transparency for Agricultural Produce

NFSU '25

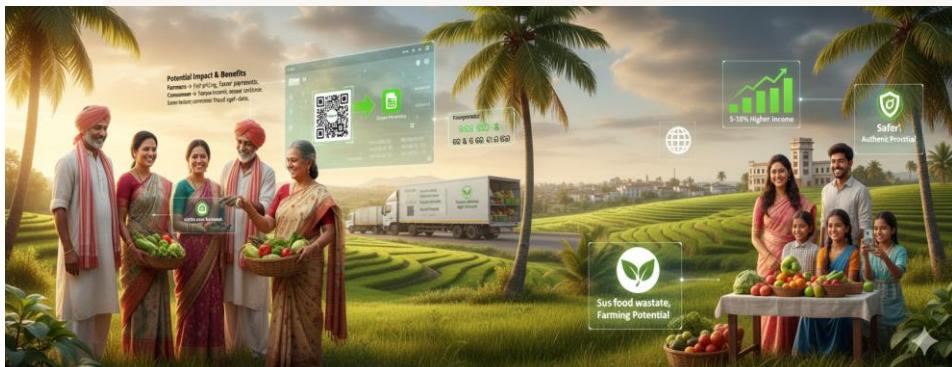
**Problem Statement Title :** Blockchain-Based Supply Chain Transparency for Agricultural Produce

**Organization :** Government of Goa

**Category :** Software

**Problem Statement Number :** 25045

**Development Team Name :** TRACEAGRI



## Description

Create a blockchain-based system to track agricultural produce from farm to consumer, ensuring transparency in pricing, quality, and origin. The solution should allow stakeholders (farmers, distributors, retailers) to verify transactions and reduce exploitation in the supply chain.

## Expected Outcome

A decentralized platform with a user-friendly interface for farmers and consumers to trace produce, reducing fraud and ensuring fair pricing, deployable on low-cost hardware or cloud infrastructure.

## Technical Feasibility

Leverages existing blockchain frameworks like Ethereum or Hyperledger, with smart contracts for automated tracking and QR code integration for consumer access.



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# PROPOSED SOLUTION

- **Web application** with two portals – one for **farmers/distributors/retailers** and one for **consumers**.
- **Smart contracts (Ethereum/Polygon)** ensure tamper-proof lifecycle tracking with **role-based access**.
- **Off-chain storage (IPFS/Cloud)** for large/sensitive data; **hash references** stored on-chain.
- Each produce batch has a **QR code**, which consumers can **scan on the web portal** to see full verified history.

## INNOVATION & UNIQUENESS

End-to-end blockchain traceability of produce (farm → consumer), ensuring tamper-proof records.

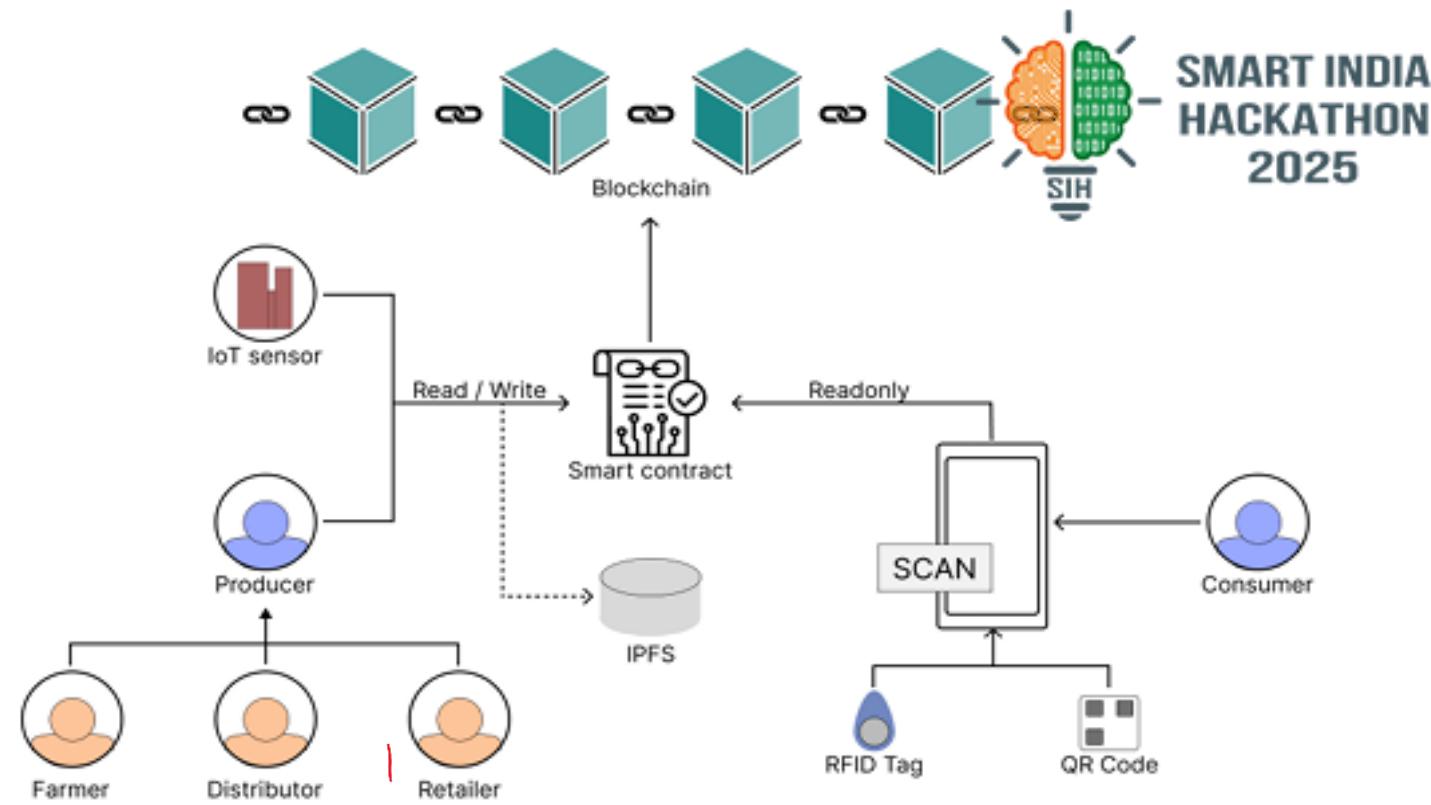
Role-based smart contracts give each stakeholder controlled access, preventing unauthorized updates.

QR-code integration lets consumers instantly verify origin, quality, and lifecycle.

Hybrid on-chain + off-chain design (IPFS/Cloud) reduces cost while preserving integrity.

Farmer-centric and low-cost solution using **Polygon (L2)** for affordable deployment.

Transparent consumer web portal directly connected to blockchain, removing intermediaries.



**FIGURE 1. An architecture with all the components presented in different works.**

## DEPLOY & RUN TRANSACTIONS

### Deployed Contracts 1

AGRISUPPLYCHAIN AT 0x700...

Balance: 0 ETH

#### ADDPRODUCE

\_name: APPLE

\_origin: KASHMIR

( Calldata) ( Parameters) transact

#### GRANTROLE

roleName: FARMER\_ROLE

account: 0xb9abb22159d7c0012d1694ad94

( Calldata) ( Parameters) transact

#### PROGRESSSTAGE

\_confirm: YES

( Calldata) ( Parameters) transact

## DEPLOY & RUN TRANSACTIONS

### GETPRODUCE

\_id: 1

( Calldata) ( Parameters) call

0: tuple(string,string,uint8,address,struct<br>ring[]): APPLE,KASHMIR,1,0x5B38<br>Da6a701c568545dCfcB03FcB875f<br>56beddC4,Harvested by Farmer,Packaged by Farmer

getProduceCo...

getProduceOut... uint256 \_id

### GETSTAGENAME

stageIndex: 0

( Calldata) ( Parameters) call

0: string: Harvested

### HASROLE

roleName: FARMER\_ROLE

account: 0xb9abb22159d7c0012d1694ad94

( Calldata) ( Parameters) transact



## SMART INDIA HACKATHON 2025

dApp Frontend  
UI that integrates  
libraries  
to interact with contracts

web3.js / ethers.js  
JS libraries to read data,  
call functions, send  
transactions

Solidity  
Smart contract language  
for EVM chains  
(Ethereum, Polygon)

Remix IDE  
Browser IDE to write,  
compile,  
test, debug, and deploy  
Solidity

Deploy to  
Ethereum/Polygon  
EVM networks for  
deployment;  
Polygon PoS has lower  
fees

MetaMask  
Self-custodial wallet and  
injected provider for  
accounts

User  
Accounts &  
Signatures

Connect MetaMask

Admin

Current Role: Admin  
Government Admin

## Switch Role

Admin  
System administrator  
CurrentFarmer  
Farm producerDistributor  
Supply chain distributorRetailer  
Retail partner

Tech Stack Flow

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React + Next.js

TypeScript

Tailwind CSS

shadcn/ui

lucide-react

MetaMask

useToast

**Completed** 1

**Your Items** 4

**Admin Panel**

Grant User Role Check User Role

**Actions**

Add New Produce Get All Produce Progress Stage: Enabled

**Current Role Status**

Active Role: Admin  
Can Add Produce: Yes  
Can Progress Stage: Yes

**Produce Output**

Total Produce: 4  
Visible to You: 4  
Last Updated: Just now

**APPLE**  
Origin: Kashmir  
Owner: Admin  
Status: Sold  
ID: #1  
Sold to end consumer  
View History Progress

**Banana**  
Origin: Kerala  
Owner: Admin  
Status: Received  
ID: #2  
Received at destination  
View History Progress

**Wheat**  
Origin: Punjab  
Owner: Admin  
Status: Shipped  
ID: #3  
In transit to destination  
View History Progress

**Rice**  
Origin: Tamil Nadu  
Owner: Admin  
Status: Harvested  
ID: #4

# Feasibility

- ✓ **High Readiness:** 96% mobile coverage + 64% smartphone ownership
- ✓ **Policy Support:** Samrudhi, Ama Krushi, Farmer ID provide foundation
- ✓ **Economic Viable:** 5-10% price gain outweighs system costs
- ✓ **Clear Adoption Path:** Start with FPO pilots, integrate existing platforms

# Challenges

- High gas fees during peak usage.
- Data privacy concerns.
- Tech literacy of farmers.

# Strategies

- Layer-2 solutions (Polygon) for cost efficiency.
- Off-chain storage of sensitive data with hashed references on-chain.
- Intuitive UI design for non-tech-savvy users.



# Impact & Benefits

## Stakeholder Gains:

Farmers: Better prices, instant payments  
Supply Chain: Trusted records, compliance ease  
Consumers: Food transparency, safety assurance

## Key Advantages:

Economic: 5-10% income boost, export growth  
Social: Farmer empowerment, rural inclusion  
Environmental: Reduced waste, sustainable practices





# Research and Reference work:



## Research Papers:

1. Blockchain Technology to Support Agri-Food Supply Chains: A Comprehensive Review-IEEE ACCESS
2. Blockchain-driven Agricultural Product Traceability and Supply Chain Management-IEEE ACCESS

## GIT repos references:

<https://github.com/kerala-blockchain-academy/AgroChain>

<https://github.com/anotherwebguy/Agri-SupplyChain>

<https://github.com/ac12644/Supply-Chain-Smart-Contract>