



# Blockchain-Based Supply Chain Transparency for Agricultural Produce

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

**Development Team Name :** AgroChain Innovators

## 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.

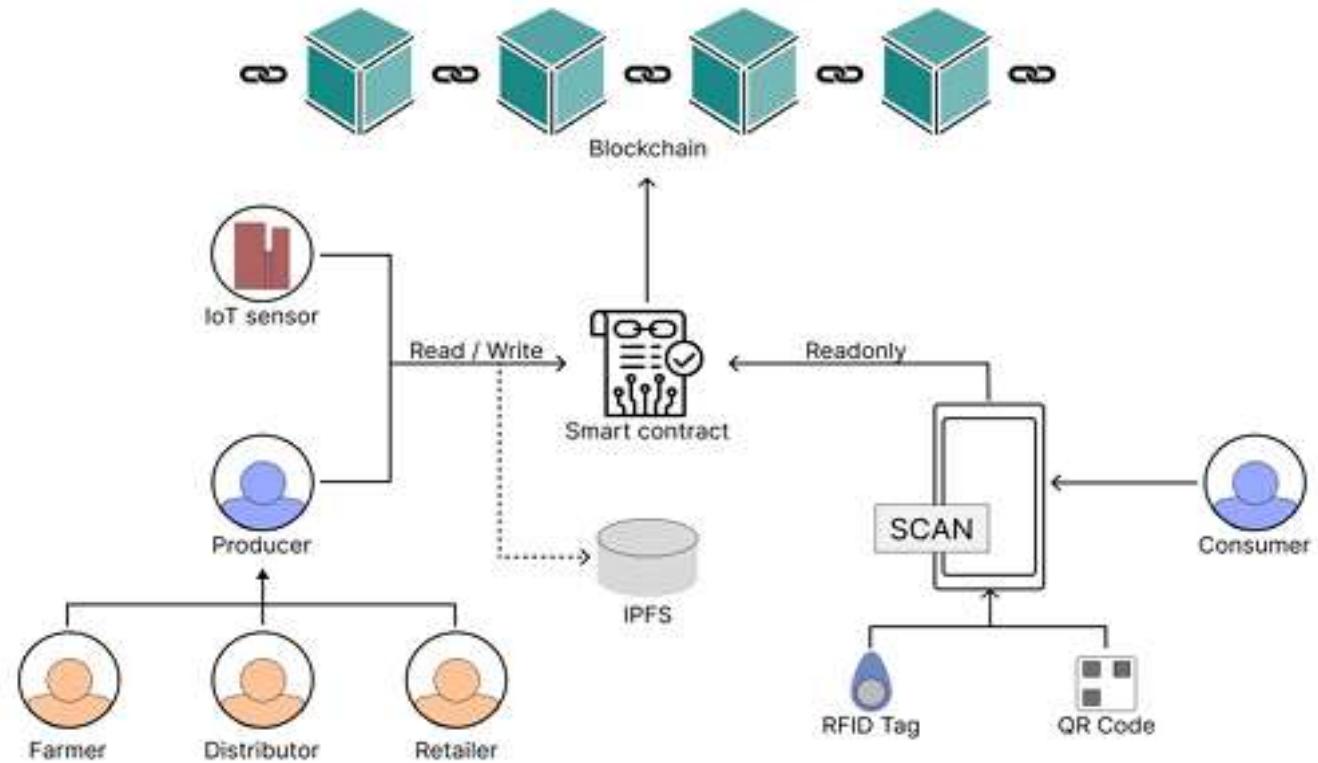
## Technical Feasibility

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



# 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.



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

## 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.

## DEPLOY & RUN TRANSACTIONS

### Deployed Contracts 1

AGRISUPPLYCHAIN AT 0x700...

Balance: 0 ETH

#### ADDPRODUCE

\_name: APPLE

\_origin: KASHMIR

#### GRANTROLE

roleName: FARMER\_ROLE

account: 0x7b9abb22159d7c0012d1694ad94

#### PROGRESSSTAGE

\_confirms: YES

## DEPLOY & RUN TRANSACTIONS

### GETPRODUCE

\_id: 1

( CallData  Parameters

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

uint256 \_id

#### GETSTAGENAME

\_stageIndex: 0

( CallData  Parameters

0: string: Harvested

#### HASROLE

roleName: FARMER\_ROLE

account: 0x7b9abb22159d7c0012d1694ad94

( CallData  Parameters

**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

dApp Frontend  
UI that integrates  
libraries  
to interact with contracts

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

**MetaMask**  
Self-custodial wallet and  
injected provider for  
accounts

**User**  
Accounts &  
Signatures

Admin  
System administrator  
Farmer  
Farm producer  
Distributor  
Supply chain distributor  
Retailer  
Retail partner  
Completed:  
1Your 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

## APPLE

@ Kashmir

R. Owner: Admin

 Sold ID #1

Sold to end consumer

 View History → Progress

## Rice

@ Tamil Nadu

R. Owner: Admin

 Harvested ID #4

Fresh produce harvested from farm

 View History → Progress

## Produce Output

Total Produce:

4

Visible to You:

4

Last Updated:

Just now

## Banana

@ Kerala

R. Owner: Admin

 Received ID #2

Received at destination

 View History → Progress

## Wheat

@ Punjab

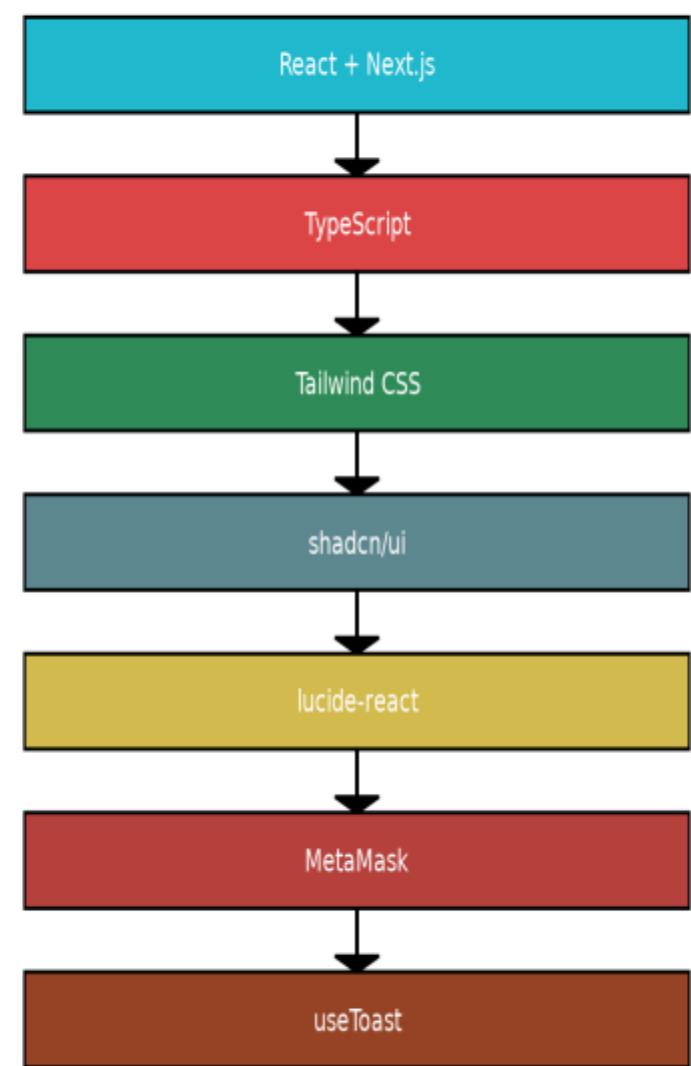
R. Owner: Admin

 Shipped ID #3

In transit to destination

 View History → Progress

## Tech Stack Flow



# 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>