# SMART INDIA HACKATHON 2025

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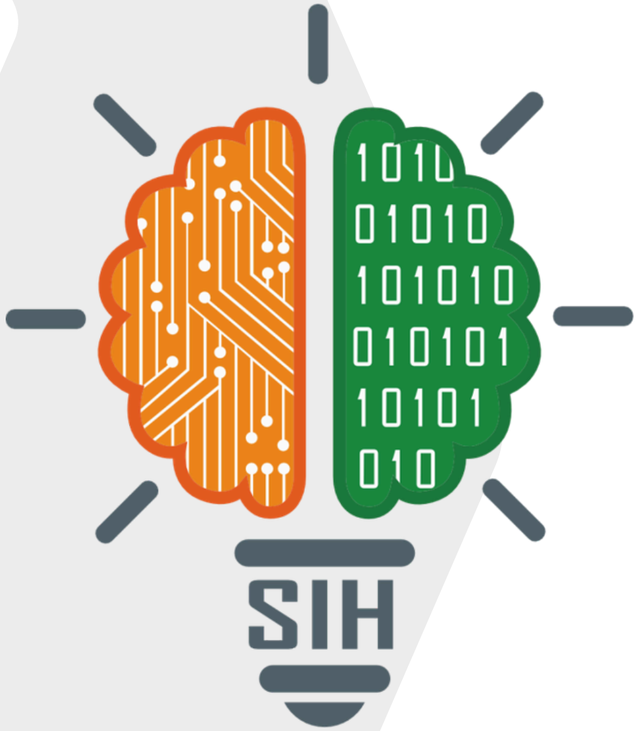
- **Problem Statement ID –** 25045
- **Problem Statement Title-**Blockchain-Based Supply Chain Transparency for Agricultural Produce
- **Theme-** Agriculture, FoodTech & Rural Development
- **PS Category-** Software
- **Team ID-** 101632
- **Team Name (Registered on portal):-** Agri_Avengers



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# AgriDirect – Transparent QR-Verified supply-chain platform

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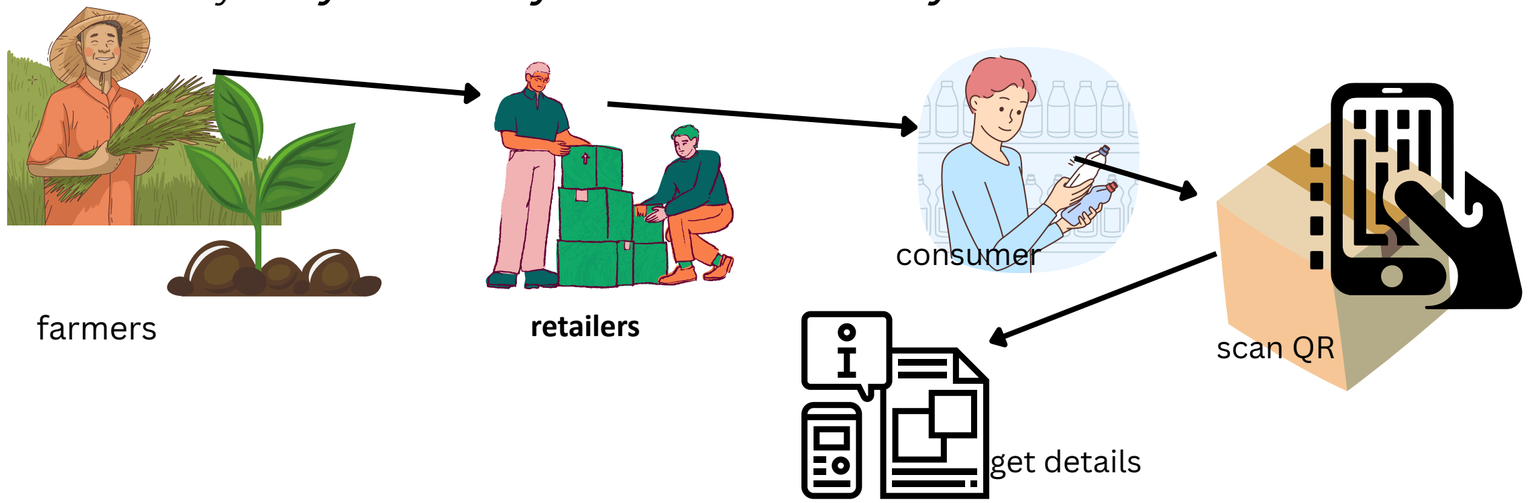
## Our Idea:-

*Implemented **DOS (Decentralized Operating System)** as a **blockchain-based platform** to store and manage all crop-related data securely*

- *Ensured every transaction and crop detail is **tamper-proof, transparent, and immutable** from farmer to consumer**.***
- *Used **Ethereum smart contract**s to automate verification of each supply chain stage.*
- *Enabled **end-to-end traceability**: farmer → distributor → retailer → consumer.*
- *Each crop is linked to a **unique QR code**, allowing stakeholders and consumers to instantly **verify authenticity and transaction history**.*




## Problem Resolution

- Implemented a **QR-based blockchain system** where each crop's details are securely stored and verified at every stage, **ensuring authenticity** and **transparency**.
- Enabled consumers to scan a single QR code to trace the full journey from farm to market, guaranteeing fair pricing and tamper-proof records

**What We Have additionally Built:**

1. **AI-Powered QR Verification** – Validates certificates, farming methods, and necessary documents, then generates QR codes.
2. **Dynamic Pricing Model** – AI-based pricing for fair and optimized rates.
3. **Personalized Marketplace** – Customers can choose specific categories (e.g., Jain groceries).
4. **AI Assistance for Farmers** – Helps farmers with crop guidance and decisions.
5. **Flexible Payment Options** – Supports online payments and cash on delivery.
6. **Local Logistics Integration** – Empowers small farmers and ensures customers trust their purchases.

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# TECHNICAL APPROACH

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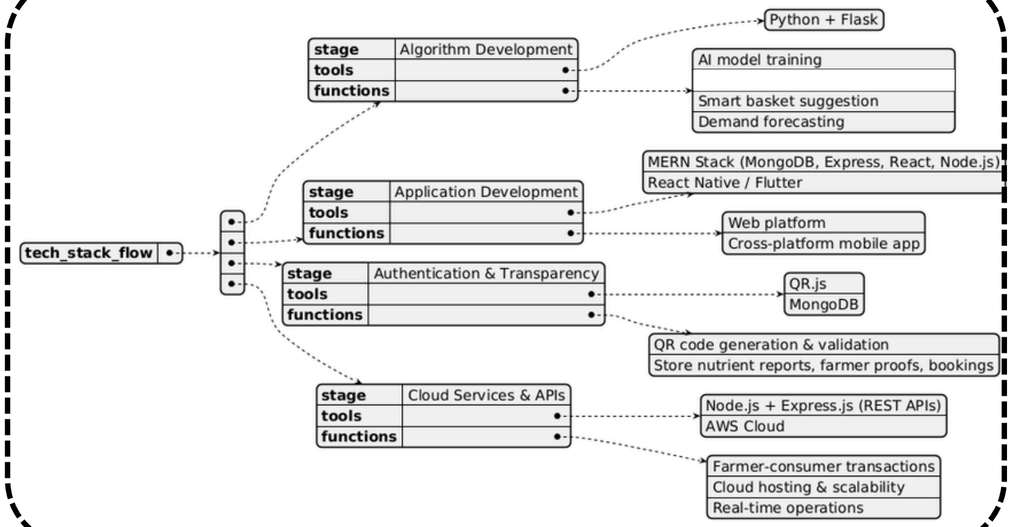
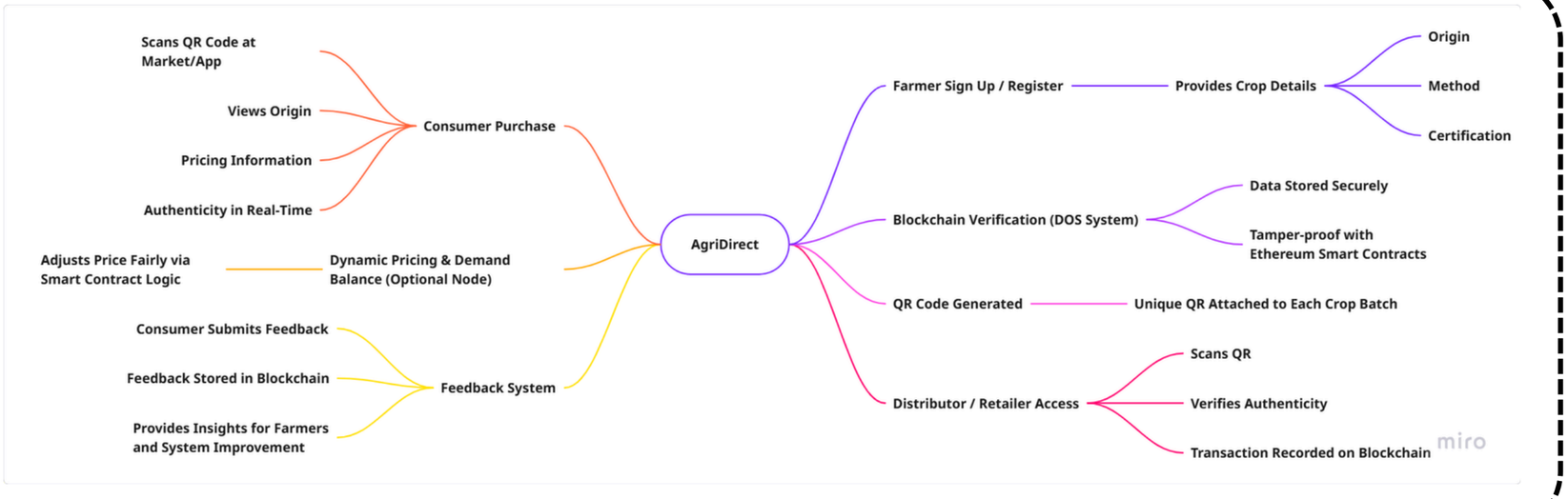
- **Blockchain Framework :** Ethereum
- **Verification & Transparency :** DOS,QR.js (for QR-based authentication)
- **Backend Development :** Node.js + Express
- **Frontend Development :** HTML,CSS,JS
- **Database :** MongoDB (for storing reports, proofs, and booking records).
- **AI & Pricing Models :** Python (Flask) for dynamic pricing, demand prediction, and personalized recommendations.
- **Cloud & Hosting :** AWS




## FLOWCHART




fairtrade + transperency = AgriDirect

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# FEASIBILITY AND VIABILITY

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## 1. Technical Feasibility

- MERN Stack: Fast, scalable development.
- Blockchain: **Immutable crop & farmer records.**
- **QR Verification**: Instant **farmer & crop authenticity**.
- Cloud Deployment: **Real-time operations**, scalable.

## 2. Operational Feasibility

- Farmer Onboarding: **Necessary document upload**, **QR & blockchain link**.
- Consumer Verification: Scan **QR for full crop journey**.
- Middleman Workflow: Supported, while keeping transparency intact.
- Payments: **UPI/Stripe integration** for seamless transactions.
- Admin & Audit: **Tamper-proof record-keeping** via blockchain.

## 3. Economic Viability

- Low Infrastructure Cost: **Cloud + blockchain cost**-efficient.
- Revenue Model: Small **transaction** commission or **subscription**.
- Scalable: Supports large farmer, middleman & consumer base.
- Market Advantage: **Transparency attracts conscious buyers**.

## 4. Social Impact

- Trust in Supply Chain: **Verified farmers** & **crop history**.
- Farmer Credibility: Verified profiles boost reputation.
- Tech Adoption: **Blockchain literacy** among **stakeholders**.
- Promotes Sustainability: Supports **natural/organic** farming.

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# IMPACT AND BENEFITS

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## IMPACT

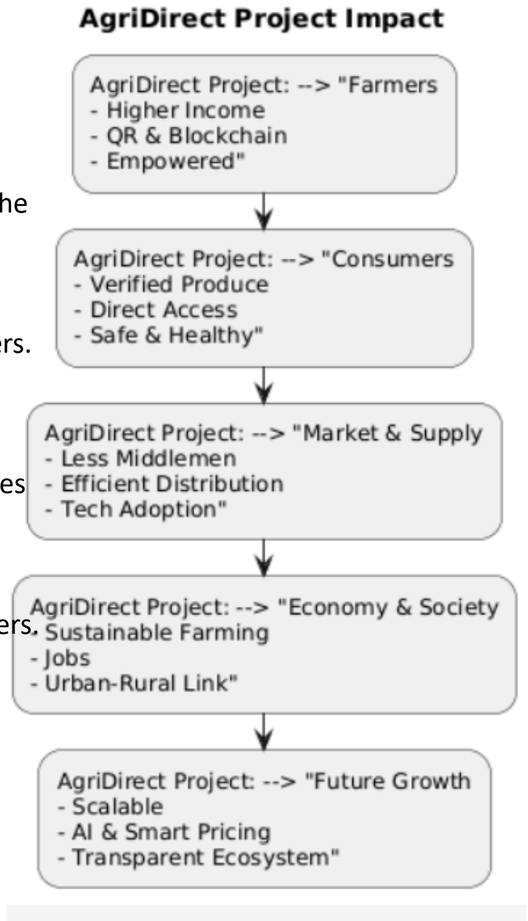
**1. Farmers**
**Higher Income**: Direct sales increase revenue.
**Transparency**: QR + blockchain ensures **fair pricing and secure records.**
**Empowerment**: Easier **onboarding** and **verified recognition** in the market.

**2. Consumers**
**Trust**: Scan QR to verify **crop origin, quality, and journey.**
**Convenience**: Access fresh, organic produce directly from farmers.
**Health & Safety**: Verified natural produce reduces risk of contamination.

**3. Market & Supply Chain**
**Efficiency**: Optimizes **distribution**, reduces wastage, and stabilizes pricing.
**Technology Adoption**: Encourages **digital literacy** in agriculture.

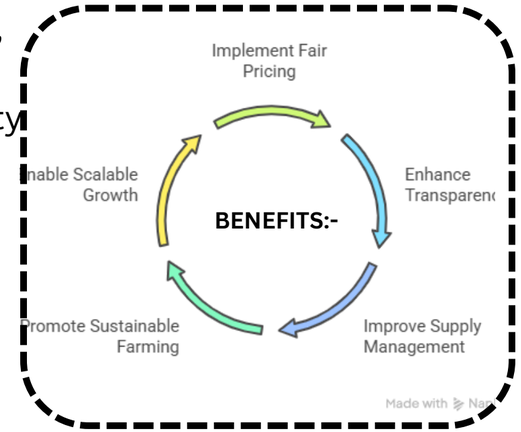
**4. Economy & Society**
**Sustainable Agriculture**: Supports **natural** and **small-scale** farmers.
**Job Creation**: Opportunities in logistics, tech support, and verification.
**Urban-Rural Linkage**: Strengthens rural income and urban consumer access.

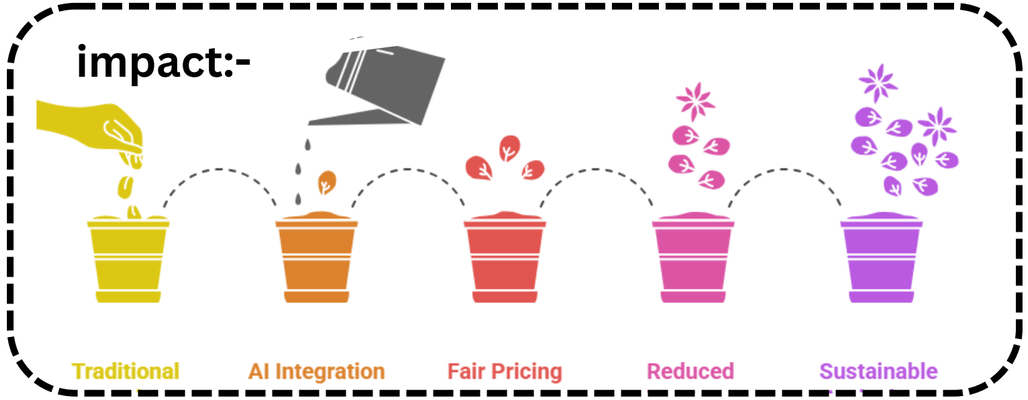
**5. Future Growth**
**Scalability**: Expandable to multiple cities, crops, and farmer networks.
**Innovation Potential**: **Integrates AI, dynamic pricing, and predictive supply models.**
**Long-term Impact**: Builds a **transparent, trustworthy,** and **efficient agricultural ecosystem**.




## BENEFITS

- **Empowers Farmers**: Higher income, verified identity, and recognition.
- **Builds Consumer Trust**: Verified, fresh, and healthy produce.
- **Transparent Supply Chain**: Full visibility of farmer and crop journey via QR & blockchain.
- **Strengthens Society**: Promotes sustainable farming and rural-urban linkage.




**we are building trust and transperancy here!! which lacks in real world**

**prototype** :- click on this

**we hit our 50% mark! you can see it right here, clear as day!**

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# SYSTEM-LEVEL SCALABILITY OF AGRIDIRECT

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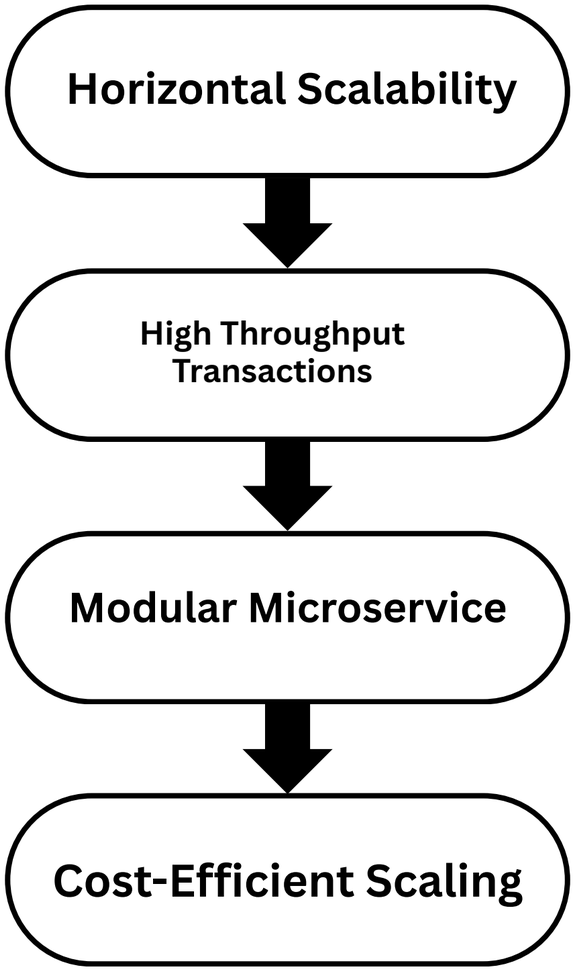
**1. Horizontal Scalability**
Event-based mini-blockchain per product → enables parallel processing
Each product generates its own 12-block chain → no global bottleneck
MongoDB horizontally scalable with sharding
IPFS (Pinata) naturally scales storage across distributed nodes
Node.js backend supports cluster mode & load balancing

**2. High Throughput Transactions**
Every event (Farmer → Distributor → Retailer) is lightweight JSON
No heavy consensus mechanism → instant recording
SHA-256 hashing + append-only ledger keeps speed constant even at scale
Multiple farmer/distributor/retailer actions can occur simultaneously

**3. Modular Microservice-Ready Design**
Farmer, Distributor, Retailer modules already separated
Each service can run independently in different containers
Future upgrade: deploy on Kubernetes with autoscaling
API-gateway-ready routing for handling large traffic

**4. Cost-Efficient Scaling**
No expensive gas fees (dummy checkout)
No full blockchain nodes needed
IPFS reduces server-side storage load by 80–90%
Only metadata stored on DB → huge cost reduction at scale



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# BUSINESS-LEVEL SCALABILITY OF AGRIDIRECT

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**1. Adding More Stakeholders**

AgriDirect can easily scale to:

- FPOs
- Warehouse operators
- Cold storage units
- Government procurement agencies
- Exporters
- Banks & insurance systems (loan verification via certificateCID)

Each new actor only requires:

- A new event
- A new schema
- A new front-end page
- → No redesign of the core system.

**2. State & National-Level Expansion**

- Works for any crop (paddy, millets, vegetables, fruits, spices)
- Works for any geography (district → state → national marketplace)
- QR-based traceability supports consumer trust for supermarkets

**3. Commercial Scalability**

Revenue models that scale linearly with users:

- ₹1–₹2 per certificateCID generated
- Subscription from FPOs / Distributors
- Freemium for Farmers, paid add-ons for analytics
- Marketplace commission when products sold
- Logistics integrations (revenue share)

**4. Government-Ready Scalability**

AgriDirect supports:

- MSP traceability
- Millet Mission
- Organic certificate verification
- Supply-chain audits
- Food safety compliance
- e-NAM integration

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# Business Model

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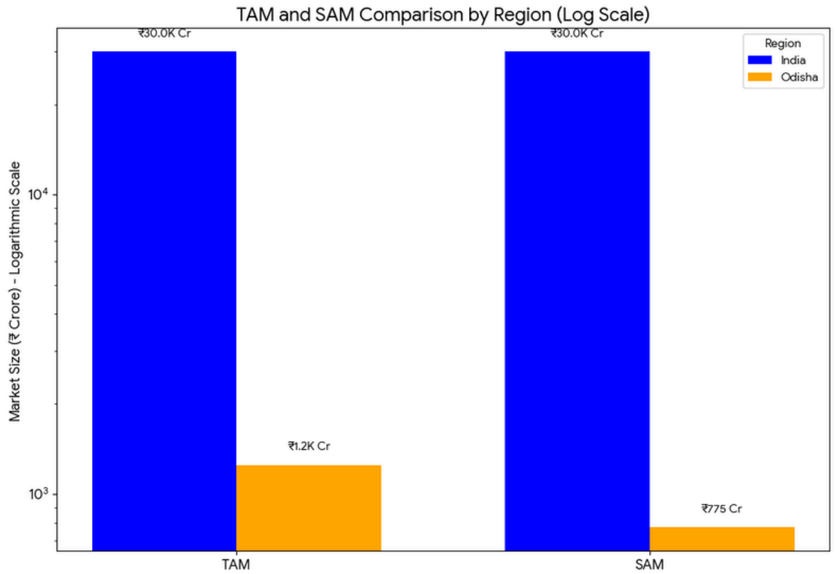
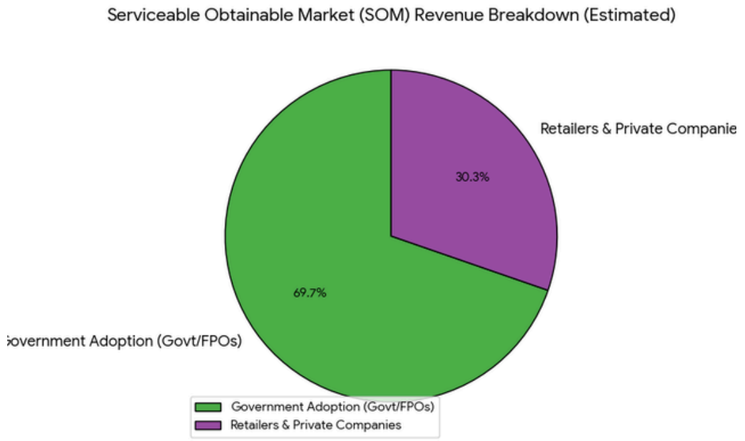



## TAM (Total Addressable Market)

- India's total agriculture sector is valued at ₹30 Lakh Crore (~$400B).
- About 10% of this depends on supply chain, logistics, and traceability functions.
- This creates a digitization opportunity of ~₹3 Lakh Crore (~$40B).
- Current digital agri–supply chain market (2023–24) is ₹25,000–35,000 Crore (~$3–4.5B) with 18–25% CAGR.

Final TAM (Blockchain Traceability in India)
₹25,000–35,000 Crore




## SOM (Serviceable Obtainable Market)

"The realistic market share AgriDirect can capture in 3–5 years."

A. Odisha Government Adoption (Most Achievable)
Realistic departments you can onboard:

- TDCCOL (tribal procurement)
- MARKFED (state agri federation)
- OMFED (milk & agri value chain)
- Odisha Millets Mission
- 30–40 active FPOs

Estimated Govt Revenue:
₹8 – ₹15 Crore / year

B. Retailers & Private Supply Chain
Onboarding potential in 3–5 years:

- 10–15 private FPOs
- 25 supermarket chains / stores
- QR-based traceability for 8–10 lakh packets per year

Estimated Private Sector RevenueCrore / year

## SAM (Serviceable Available Market) – Odisha

Definition:
SAM is the portion of TAM your product can serve, based on region (Odisha).

A. Market Size

- Total agriculture economy: ₹1.20–1.30 Lakh Crore
- Active trade value (Govt procurement + private market): ₹55,000–65,000 Crore
- Key crops: Paddy, Millets, Pulses, Oilseeds, Spices

B. Digitization Potential

- Procurement tracking (MSP, KALIA, Millet Mission): ~30%
- Logistics & warehousing: ~20%
- Retail/export traceability: ~10%
- Total digitizable portion: 60%

⭐ SAM Calculation

- 60% of Odisha's agri supply chain:
- ₹65,000 Cr × 0.60 = ₹39,000 Crore
- Realistic blockchain adoption (initial years): 2–4%
- Effective SAM = ₹700–1000 Crore

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# UI/UX(Mock-ups)

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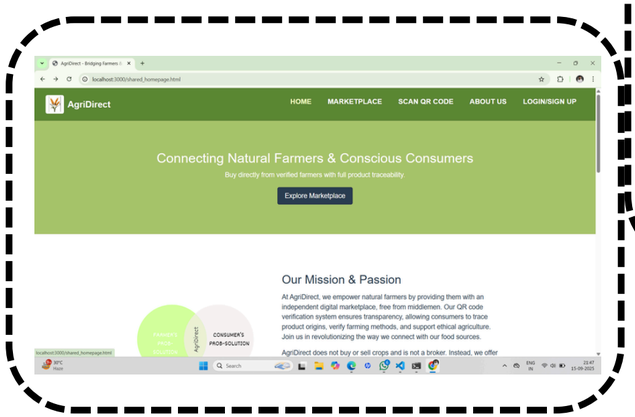


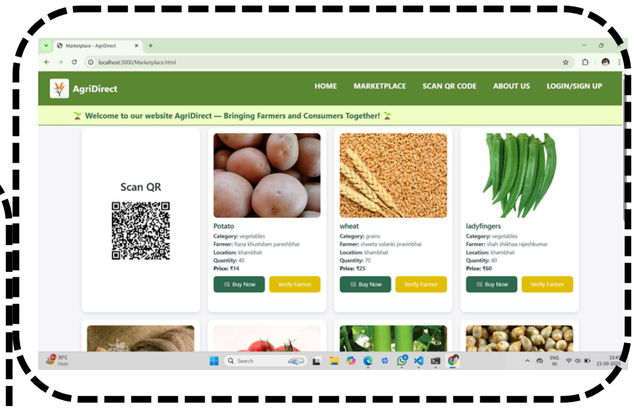


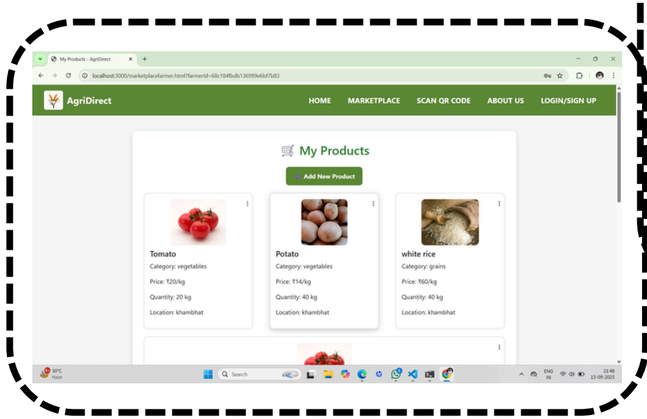


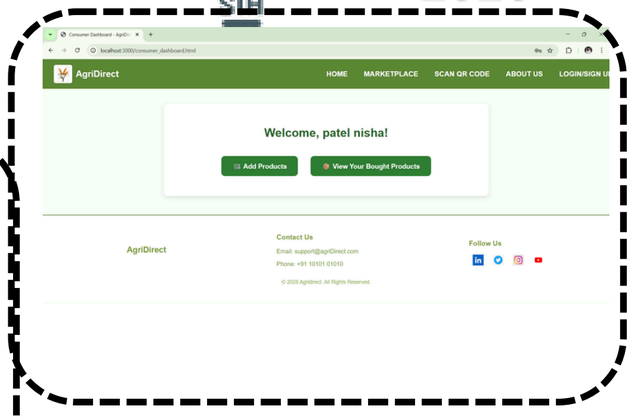


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