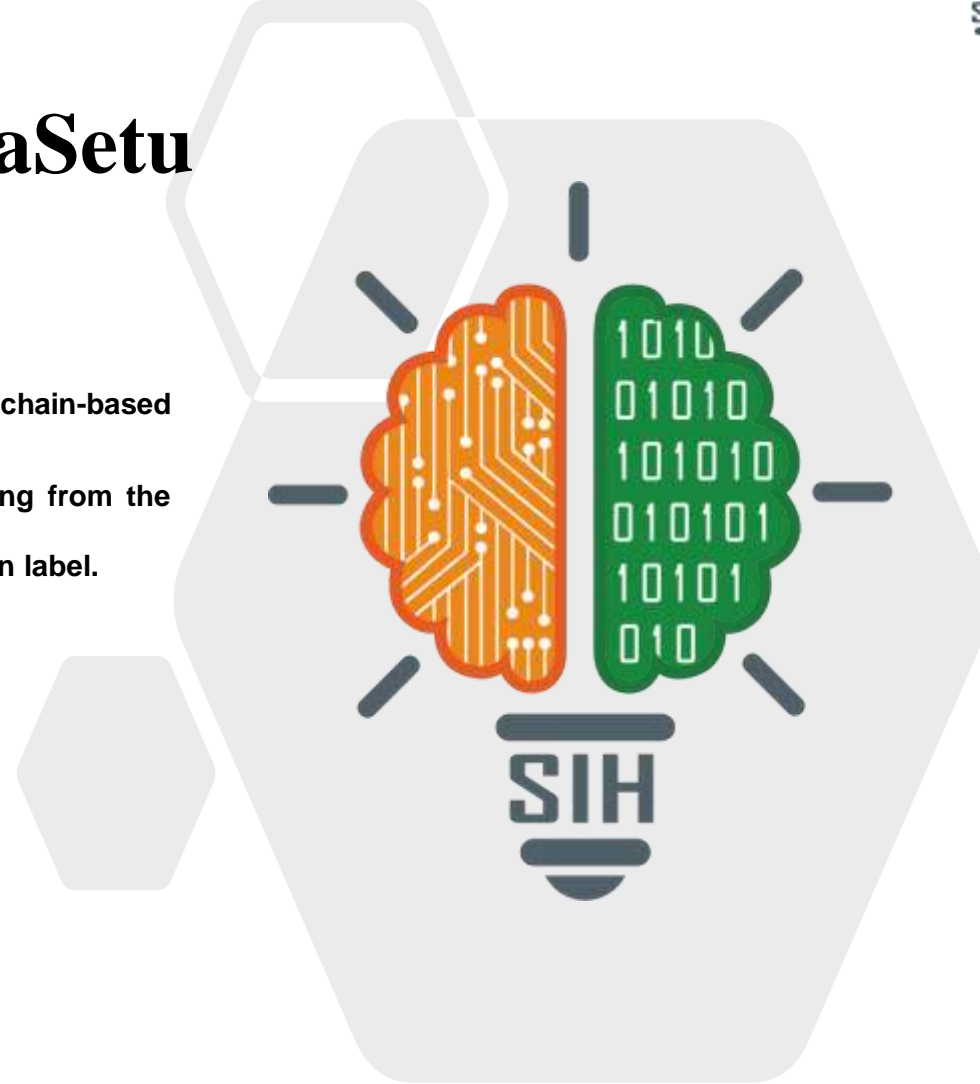


# SMART INDIA HACKATHON 2025



## VaidyaSetu

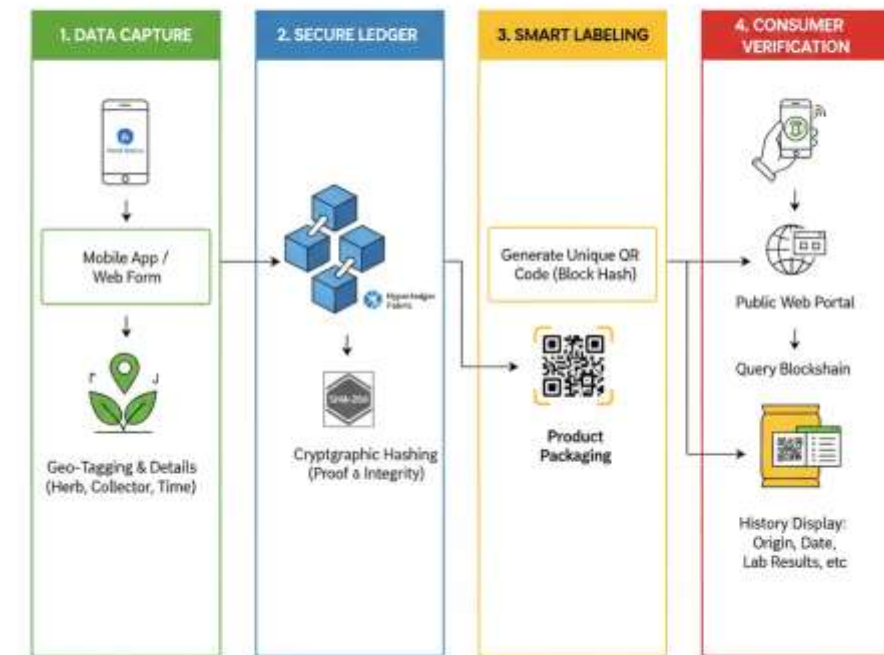
- **Problem Statement ID** –SIH25027
- **Problem Statement Title**-Develop a blockchain-based system for botanical traceability of Ayurvedic herbs, including geo-tagging from the point of collection (farmers/wild collectors) to the final Ayurvedic formulation label.
- **Theme**-Blockchain & Cybersecurity
- **PS Category**- Software
- **Team ID**-
- **Team Name**- VaidyaSetu



# Proposed Solution

- **Blockchain-Secured Traceability** – **Immutable records** ensure authenticity and eliminate **tampering** in the Ayurvedic herb supply chain.
- **Geo-Tagged Collection Data** – GPS-based capture at the source guarantees **accurate provenance** and prevents mislabeling.
- **Smart Contracts for Quality & Sustainability** – **Automated enforcement** of quality checks and eco-friendly harvesting practices.
- **QR Code-Enabled Consumer Transparency** – Easy access for consumers to verify origin, quality, and processing history by scanning a code.
- **End-to-End Chain-of-Custody Visibility** – **Real-time tracking** from collector to consumer, boosting trust and accountability.
- **Automated Compliance Reporting** – Intelligent dashboards for stakeholders to monitor sustainability and regulatory adherence effortlessly.

## Blockchain Traceability for Ayurvedic Herbs



## Technology Stack

### Current Prototype:

**Backend:** Python, Flask

**Frontend:** HTML, CSS, JavaScript (Vanilla), Leaflet.js

**OpenStreetMap tiles :** free map tiles used by Leaflet

**Core Concepts:** Hashing (sha256), QR Code Generation

**APIs / Services :Nominatim API (OpenStreetMap)** – forward geocoding (address > latitude/longitude).No API key required for low-volume usage.Used instead of Google Maps / Google Geocoding API to avoid billing issues.



### Tech Stack (Hyperledger Immutable Prototype)

**Frontend:** HTML, CSS, JavaScript (Vanilla), React, Leaflet.js for maps, QR Code generation

**Backend:** Python / Flask or Node.js, Hyperledger Fabric (blockchain & smart contracts)

**Cloud storage (AWS S3 / Azure Blob) :** immutable / append-only  
**AI Features (Future Scale):** Supply chain optimization and fraud detection

**Core Features:** Immutable blockchain ledger, Geolocation tracking, QR codes for provenance verification





## Feasibility

- **Technically Sound:** We use proven technologies like Python and Flask, with a clear path to production-level tools like Hyperledger Fabric and React.
- **Economically Viable:** The system justifies premium pricing for products, boosts export opportunities, and reduces risk for businesses.
- **High Market Relevance:** The project directly addresses the global demand for ethical and transparent products.



## Viability

- **Market Opportunity:** Our system capitalizes on the growing global demand for ethical and authentic products.
- **Operational Efficiency:** It reduces operational risks for companies, such as costly product recalls and compliance failures.
- **Monetization Potential:** The traceability and trust it provides create opportunities for premium pricing, which benefits both farmers and businesses.



## Challenges

- **Data Accuracy & Integrity:** The system relies on accurate data entry by collectors. Verifying the initial data at the source, especially in low-connectivity areas, is a significant challenge.
- **Adoption & Training:** Getting all stakeholders from small-scale farmers to large manufacturers—to adopt a new digital system requires significant training and infrastructure support.
- **Initial Cost & Scalability:** The upfront cost of building a full-fledged, distributed blockchain network and the required IoT devices can be high.
- **Regulation & Standards:** The system must align with various government and industry standards, which can be complex and vary by region.



## Business Potential

- **Consumer Trust:** Verifiable data ensures authenticity and ethical sourcing.
- **Farmer Empowerment:** Direct market link enables fair pricing for sustainable herbs.
- **Sustainability:** Tracks harvesting to protect endangered species and biodiversity.
- **Business Efficiency:** Clear audit trail supports compliance and quick recalls.

### ★ Supporting facts for feasibility and Viability ★

- **Global Market Growth:** Ayurvedic medicine market valued at USD 5.6B in 2024, projected to cross USD 6.3B in 2025.
- **Herbs Demand:** Ayurvedic herbs market to grow from USD 6.5B in 2024 to USD 15B by 2035 (CAGR ~7.8%).
- **Consumer Willingness:** Studies show buyers pay up to 34.5% premium for transparent, traceable supply chains (2024 survey).

## Benefits

- Consumer Trust: Verifiable data ensures authenticity, boosting confidence in products.
- Farmer Empowerment: Direct link to markets enables fair trade and premium pricing.
- Sustainability: Tracks harvesting to protect biodiversity and prevent overexploitation.
- Regulatory Compliance: Simplifies audits, export certifications, and quality checks.
- Business Efficiency: Provides a transparent supply chain with faster recalls if issues arise.
- Market Advantage: Meets rising global demand for ethical and transparent herbal products.

## Impact

- Enhanced Consumer Confidence: Builds trust through verified, transparent supply chains.
- Farmer Upliftment: Improves income, market access, and recognition for small-scale collectors.
- Biodiversity Protection: Supports sustainable harvesting and conservation of endangered species.
- Global Competitiveness: Strengthens India's position in the herbal and wellness export market.
- Digital Transformation: Brings traditional sectors (farmers, processors) into a tech-enabled ecosystem.
- Public Health & Safety: Ensures authentic, contamination-free Ayurvedic products for consumers.



## References

### Blockchain Platforms:

- **IBM:** <https://www.ibm.com/docs/en/app-connect/12.0.x?topic=hga-food-trust>
- **SAP Cloud Platform Blockchain:** <https://community.sap.com/t5/technology-blog-posts-by-members/introduction-to-blockchain-and-sap-cloud-platform-blockchain-service/ba-p/13377171>
- **Provenance:** <https://www.provenance.org/>

### Feasibility Facts:

- **HerBchain:** <https://www.sciencedirect.com/science/article/pii/S2225411021000870>
- **ResearchGate:** [https://www.researchgate.net/publication/387552836\\_Exploring\\_the\\_Blockchain's\\_Green\\_Revolution\\_in\\_Medicinal\\_Plant\\_Supply\\_Chains\\_Blossoming\\_Trust\\_-\\_A\\_Review](https://www.researchgate.net/publication/387552836_Exploring_the_Blockchain's_Green_Revolution_in_Medicinal_Plant_Supply_Chains_Blossoming_Trust_-_A_Review)

Feature	IBM Food Trust	SAP Cloud Platform Blockchain	Provenance	Our Prototype	VaidyaSetu
<b>Geo-tagged Data Capture</b>	Yes	Yes	Yes	<b>Yes</b> (Manual form entry)	<b>Yes</b> (Mobile DApp with GPS)
<b>Immutable Ledger</b>	Yes	Yes	Yes	<b>Yes</b> (Conceptual chain in Python)	<b>Yes</b> (Hyperledger Fabric DLT)
<b>Smart Contracts</b>	Yes (Enterprise logic)	Yes (Enterprise automation)	Yes (Custom rules)	<b>Yes</b> (Simulated with Flask routes)	<b>Yes</b> (Hyperledger Chaincode)
<b>Consumer Traceability</b>	Yes (QR/Barcode)	Yes (QR/Barcode)	Yes (QR/NFC tags)	<b>Yes</b> (QR code links to ledger)	<b>Yes</b> (Verifiable QR code on product)
<b>Decentralized Network</b>	Yes (Permissioned)	Yes (Permissioned)	Yes (Permissioned)	<b>No</b> (Single node)	<b>Yes</b> (Multi-node Hyperledger Fabric)
<b>AI/Analytics</b>	Yes (Integrated services)	Yes (Integrated services)	Yes (Data analytics)	<b>No</b>	<b>Yes</b> (Future scope)
<b>Cost</b>	High (Enterprise license)	High (Enterprise license)	Varies (Subscription)	<b>Free</b> (Open-source)	Varies (Deployment & training)