**Software Proposal: Blockchain-Based Agricultural Broker**

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15. **Introduction**

The agricultural supply chain in Kenya faces inefficiencies, lack of transparency, and challenges in verifying the origin and quality of produce. This proposal presents a blockchain-based agricultural broker that focuses on traceability and transparency, enabling farmers and consumers to track the journey of agricultural products from farm to market. By leveraging blockchain's decentralized and immutable ledger, this platform ensures trust, verifiable product origins, and seamless transactions—all accessible from a mobile device. Market accessibility is enhanced as a secondary benefit, allowing farmers to reach buyers more easily.

1. **Problem Statement**

The traditional agricultural market suffers from:

* Lack of Traceability: Inability to verify the origin, quality, and journey of agricultural products.
* Lack of Transparency: Farmers and buyers cannot access reliable information about product authenticity or pricing.
* Middlemen Exploitation: Farmers receive minimal profits while consumers pay inflated prices due to intermediaries.
* Limited Market Access: Small-scale farmers lack the network to reach high-value buyers.

By leveraging blockchain, our solution focuses on traceability and transparency, ensuring that every product's journey is recorded and verifiable, while also improving market accessibility as a bonus.

1. **Objectives**

This project aims to:

* Ensure Traceability: Provide a verifiable record of every product’s journey from farm to market.
* Enhance Transparency: Create a transparent supply chain where all stakeholders can access reliable information about product origins and quality.
* Improve Market Accessibility: Enable farmers to reach buyers more easily, though this is a secondary goal.

1. **Justification for the Project**

The Kenyan government is pushing for digitization to enhance efficiency in the supply chain sector. Our blockchain solution aligns with this initiative by:

* Ensuring Traceability: Providing a verifiable record of product origins and journeys.
* Enhancing Transparency: Making all transactions and product information publicly visible on the blockchain.
* Improving Market Accessibility: Allowing farmers to connect with buyers more easily, though this is not the primary focus.

1. **System Features**

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| --- | --- |
| **Feature** | **Description** |
| **Blockchain Ledger** | Stores all transactions (harvest, pricing, transport) immutably. |
| **Mobile Marketplace** | Farmers and buyers trade directly via mobile and web apps. |
| **Smart Contracts** | Automates payment and product verification processes. |
| **Fair Pricing Algorithm** | Uses AI to analyze market conditions and recommend fair prices. |
| **Instant Payments** | Ensures farmers are paid immediately upon transaction completion. |
| **QR Code Tracking** | Consumers scan QR codes to verify product origin and journey |
| **Fraud Prevention** | Eliminates fake transactions and non-payments. |

1. **Development Roadmap (MVP - 3 Months)**

**Month 1:**

* Conduct requirement gathering and align with stakeholders.
* Set up blockchain network and smart contract architecture.
* Develop core backend and database integration.

**Month 2:**

* Implement mobile and web dashboard for listing and transactions.
* Integrate QR code-based product tracking.
* Develop AI-powered pricing mechanism.

**Month 3:**

* Conduct alpha and beta testing with stakeholders.
* Optimize for security, performance, and scalability.
* Launch MVP and onboard early users.

1. **User Personas and Use Cases**

**User Personas**

* Farmer: Needs direct access to buyers, fair pricing, and instant payments.
* Consumer: Wants a reliable, transparent, and convenient way to purchase fresh produce.
* Retailer/Distributor: Seeks guaranteed authenticity and fair market pricing.

**Use Cases**

* A farmer lists produce on the platform with a QR-tagged ID.
* A buyer selects and pays instantly through the blockchain ledger.
* The produce is verified at every stage using QR code tracking.
* Smart contracts release payment automatically upon successful delivery.

1. **Risk Assessment and Mitigation**

|  |  |
| --- | --- |
| Risk | Mitigation Strategy |
| **Low adoption rate** | Conduct farmer and buyer training and offer incentives. |
| **Regulatory compliance** | Engage with legal experts to ensure adherence to local laws. |
| **Scalability issues** | Implement Layer 2 blockchain solutions for faster transactions. |
| **Security threats** | Use strong encryption and conduct regular |

1. **Scalability and Future Proofing**

* Layer 2 blockchain solutions for high-speed, low-cost transactions.
* Integration with IoT sensors for real-time farm-to-market tracking.
* Expansion into new agricultural markets beyond fresh produce.

1. **Data Privacy and Security**

* End-to-end encryption for secure data storage and transactions.
* Role-based access control (RBAC) to ensure only authorized users can access critical data.
* Blockchain immutability to prevent fraud and tampering.

1. **Key Performance Indicators (KPIs)**

* Traceability Accuracy: Percentage of products with verified journey data.
* Transparency Score: Number of transactions publicly visible on the blockchain.
* Market Access: Percentage increase in farmers reaching buyers (bonus metric).

1. **Testing and Quality Assurance**

* Unit Testing: Ensuring individual components (smart contracts, API, UI) function correctly.
* Integration Testing: Verifying smooth interaction between blockchain, web, and mobile applications.
* User Testing: Conducting pilot programs to gather feedback and optimize UX/UI.
* Security Testing: Running vulnerability assessments to prevent attacks and ensure data integrity.

1. **Impact**

* Improved Traceability: Consumers can verify product origins and journeys.
* Enhanced Transparency: All stakeholders can access reliable information about product authenticity.
* Market Accessibility: Farmers can connect with buyers more easily (bonus).

1. **Conclusion**

This blockchain-based agricultural broker focuses on traceability and transparency, ensuring that every product's journey is recorded and verifiable. By leveraging blockchain's trust and automation capabilities, this solution enhances trust, reduces fraud, and builds a modern, digitized supply chain. Market accessibility is improved as a secondary benefit, allowing farmers to reach buyers more easily.