Albedo - MVP & User Story

Introduction

Agriculture faces an ongoing challenge: unpredictable weather that can devastate crops and livelihoods. Current insurance solutions offer some respite but often involve a cumbersome and delayed reimbursement process.

Agritech addresses this gap head-on. Built on the Solana blockchain, our platform is designed to provide farmers immediate financial relief during adverse weather conditions.

By seamlessly integrating real-time weather data captured through IoT sensors with responsive smart contracts, Agritech streamlines and automates the insurance payout process. This solution removes the need for time-consuming claims and manual oversight, delivering on the promise of a decentralized, transparent, and efficient solution.

Focused on the primary user— the farmer— the MVP is designed to offer:

1. **Automated Insurance Payouts**: Enabled by smart contracts that trigger payments when predefined weather conditions are met, such as a month-long drought or excessive rainfall.
2. **Sensor Data Integration**: Seamless connection to weather sensors that monitor and record key metrics like rainfall and temperature, directly feeding this data to the blockchain.
3. **User-Friendly Interface**: A straightforward UI that allows farmers to easily enroll in the insurance program and monitor both weather conditions and insurance claim status.

Step 1: Decide What “Done” Will Look Like

End State: "Done" in the context of our MVP will mean that farmers are able to enroll in the insurance program via the UI, weather data is successfully collected through IoT sensors and transmitted to Solana smart contracts through Switchboard V3 oracles, and automatic payouts are triggered based on predefined weather conditions.

Step 2: Document Tasks and Subtasks

Tasks

Task 1: User Enrollment:

1. **Subtask 1.1**: Research and select a UI/UX framework compatible with Solana
2. **Subtask 1.2**: Design the UI for sign-up, login, and dashboard

- 1.2.1: User flows for Multi-factor Authentication

3. **Subtask 1.3**: Implement front-end code for the UI
4. **Subtask 1.4**: Integrate with backend services for user management
    - 1.4.1: Store encrypted user data securely
    - 1.4.2: API endpoints for user profile, insurance status, and payouts

Task 2: Weather Data Integration:

1. **Subtask 2.1**: Identify the types of existing sensors and their data formats
2. **Subtask 2.2**: Establish partnerships or agreements for data access
3. **Subtask 2.3**: Develop a data ingestion pipeline to consume sensor data
4. **Subtask 2.4**: Ensure data is securely transmitted to Helium hotspots and then to the LoRaWAN network
5. **Subtask 2.5**: Implement security and verification measures for data integrity

Task 3: Smart Contract Development

1. **Subtask 3.1**: Draft an outline for Solana smart contracts, covering insurance pool, weather condition validation, and payout triggers
2. **Subtask 3.2**: Develop the Solana smart contracts
    - 3.2.1: Add features for contract upgradability or migration
    - 3.2.2: Implement a mechanism to cover transaction fees for automated payouts
3. **Subtask 3.3**: Integrate with Switchboard V3 Oracles for data verification
    - 3.3.1: Define data validation rules in smart contracts
    - 3.3.2: Conduct rigorous testing with real and simulated weather data

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Stretch Goals

Goals

Stretch Goal 1: Data-Driven Farm Management

1. **Subtask 4.1**: Research the possibility of accessing additional existing soil sensors
2. **Subtask 4.2**: Develop a data ingestion pipeline for soil sensor data (if accessible)
3. **Subtask 4.3**: Implement logic to create heat maps for targeted resource allocation
    - 4.3.1: Create data models for soil quality, moisture, etc.
    - 4.3.2: Design and implement the UI for heat maps in the farmer dashboard

Stretch Goal 2: NFT-Based Hierarchical Insurance Proofing

1. **Subtask 5.1**: Feasibility Study
    - 5.1.1: Regulatory implications
    - 5.1.2: Technical limitations
    - 5.1.3: Market demand
2. **Subtask 5.2**: Define NFT Structure
    - 5.2.1: Master NFT metadata schema
    - 5.2.2: Sub-NFT metadata schema
    - 5.2.3: Privacy considerations
3. **Subtask 5.3**: Data Storage and Retrieval
    - 5.3.1: Decide on off-chain storage solutions (IPFS, Arweave, etc.)
    - 5.3.2: Link off-chain data buckets to Master NFT via unique ID
    - 5.3.3: Develop methods for data retrieval
4. **Subtask 5.4**: Smart Contract Development
    - 5.4.1: Develop Master NFT smart contract
    - 5.4.2: Develop Sub-NFT minting mechanisms, triggered by specific events
    - 5.4.3: Establish conditions for NFT release or burn, integrating with existing insurance contracts
5. **Subtask 5.5**: User Interface Integration
    - 5.5.1: Display Master and Sub-NFTs in the user dashboard
    - 5.5.2: Allow for the minting of Sub-NFTs based on past events
6. **Subtask 5.6**: Pilot Testing
    - 5.6.1: Test with select users and insurance providers
    - 5.6.2: Collect feedback and make adjustments
7. **Subtask 5.7**: Marketing and Launch
    - 5.7.1: Develop marketing materials
    - 5.7.2: Marketing campaigns targeting both farmers and insurance providers

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Step 3: Determine User Personas

Primary User Persona: The Farmer

- **Farmer**: Needs timely insurance payouts and data-driven farm management
- **Insurance Company**: Seeks efficient, transparent, and automated claim processing
- **Agronomists/Data Consumers**: Interested in reliable and real-time farm data

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Step 4: Create Stories As Ordered Steps

Steps

User Story 1:

- "As a Farmer, I want to easily enroll in the automated insurance program so that I can protect my crops against adverse weather conditions."
- **Detailed Flow**:
  - Farmer visits the User Interface (UI) on a dApp
  - The UI interacts with a Solana smart contract specifically designed for user management (created under Task 1)
  - Upon successful enrollment, the smart contract updates the blockchain state, and the user receives a confirmation on the UI

User Story 2:

- "As a Farmer, I want the system to automatically collect weather data from my farm so that insurance claims can be processed automatically in case of adverse conditions."
- **Detailed Flow**:
  - Pre-installed DHT22 IoT sensors collect weather data in real-time (Task 2)
  - The data is transmitted via Helium hotspots to the LoRaWAN network
  - Data is passed through Switchboard V3 Oracles for validation and sent to Solana smart contracts (created under Task 3)
  - Smart contracts evaluate conditions for insurance payouts
  - The blockchain state is updated, and the claim status is reflected in the Farmer's UI dashboard

*__User Story 3 (Stretch Goal #1):__

- "As a Farmer, I want to leverage real-time soil and weather data to make better decisions about fertilization and irrigation."
- **Detailed Flow**:
  - Soil sensors (installed under Task 4) collect data on moisture, nutrient levels, etc.
  - This data also transmits via Helium hotspots to the LoRaWAN network
  - Data is then passed to smart contracts via Data Oracles (Switchboard V3 or similar)
  - Data analytics algorithms run on-chain, providing insights into soil conditions
  - These insights generate heat maps or other visual data representations, available on the user's dashboard for resource management

*__User Story 4 (Stretch Goal #2):__

- "As a Farmer, I want a secure and verifiable record of all insurance events that affect me, stored as NFTs."
- **Detailed Flow**:

- A Master NFT is created upon Farmer enrollment (Stretch Goal 2)
- When specific weather events occur, Sub-NFTs are minted automatically
- These Sub-NFTs contain metadata linking to off-chain data storage buckets
- All events are verifiable and transparent, adding a layer of security and trust to the insurance process

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Conclusion

We aim to launch Agritech's MVP in ~five weeks—a groundbreaking decentralized platform built on the Solana blockchain. Our platform will be carefully designed to revolutionize the agricultural insurance sector, eliminating the cumbersome and time-consuming claims process that farmers currently endure.

Agritech automates insurance payouts to offer farmers immediate financial relief in adverse weather conditions by leveraging cutting-edge technology, including real-time IoT sensors and Solana-based smart contracts. Not stopping at that, the platform is architected to support future expansions, including NFT-based proofing systems and data-driven farm management tools.

By providing an agile, secure, and transparent solution, Agritech addresses a critical pain point in agriculture. We're not just solving a problem—we're advancing a complete paradigm shift in how agricultural insurance functions, ultimately creating a more resilient and sustainable farming ecosystem.