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AgriNet: A Unified Farm Intelligence and Coordination System for the Development and Evaluation of Decentralized Logistics and Market Integration Among Smallholder Farmers.

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EXECUTIVE SUMMARY

The Philippines agricultural sector suffers from not only a 60,000 kilometer farm-to-market road backlog, but from a deeper coordination failure.

Farmers work in isolation. Transportation is fragmented. Pricing information is delayed or manipulated. As a result, farmers absorb high logistics costs, accept low-ball trade offers, and suffer from low profit margins. This stems from a core problem: *The Absence of a Unified Farm Intelligence and Coordination System.*

To solve this, Team AniTech introduces AgriNet, a comprehensive web and mobile platform, designed to empower farms from the barangay level and upward. It serves as a digital agricultural hub, bringing critical real-time logistics and data data gaps through three key features:

1. First, a hyper-localized logistics coordinator that functions like a “Grab-Share” for crops. Which allows farmers to share transportation resources and costs.

2. Second, a market intelligence is delivered to the barangay level, allowing real-time information to ensure transparent pricing. Which ensures farmers are "moving" their products only when and where they can get the highest possible return.

3. Third, a feature that allows individual farmers to form a collaboration and sell their products in one big bulk. This creates a Community-Driven Sale large enough to attract institutional buyers (supermarkets, hotels, etc.), effectively bypassing low-balling traders and small-time middlemen.

An additional feature is a secure network with accredited, verified farmer profiles to foster trust and collaboration. By democratizing data and optimizing the supply chain, AgriNet will reduce post-harvest waste and increase rural income. Transforming disconnected farmers into a resilient, data-driven network.

KEYWORDS

AgriTech, Unified Farm Intelligence, Agricultural Coordination System, Supply Chain Logistics, Hyper-local Agricultural Networking.

PROBLEM STATEMENT

Agriculture remains one of the most essential pillars of the economy, sustaining millions of smallholders farmers and contributing significantly to national food security and rural employment. Despite its importance, structural inefficiencies continue to suppress the earning potential of everyday farmers.

Recent departmental reports and studies have shown that the negative effects of poor infrastructure and limited market integration have significantly restricted farmers' earning potential over the years (Gordoncillo et al., 2023). The Philippines faces a staggering 60,000-kilometers Farm-to-Market Road (FMR) backlogs. While limited communication systems prevent farmers from obtaining accurate real-time market prices and bypass unfair middlemen (Anselme, 2012).

While long-term infrastructure development remains essential, the rapid advancement of digital technology presents an alternative pathway.

Decentralized networking has become a viable method for the remediation of these logistical and communication gaps. This research aims to suggest and develop a Unified farm intelligence and Coordination system (AgriNet) that can help mitigate harmful economic impacts of this FMR backlog and information asymmetry.

The researchers utilized community load-pooling frameworks, real-time market intelligence, and bulk-bargaining networks to form a digital hub that can assist in removing systematic barriers without relying on long term physical infrastructure monitoring (Doguiles, 2026).

The effectiveness of this platform will be assessed by evaluating the perceived operational efficiency of farmers in terms of transportation accessibility, market reach, and pricing transparency.

What is the perceived efficiency of the AgriNet platform in improving agricultural logistics and transportation through the application of the following features?

1.1 Grab-style community Load-Pooling
1.2 Drive and Vehicle Route Tracking
1.3 Direct Communication with Trucking Services

What is the perceived effectiveness of the platform in enhancing market accessibility and data transparency through application of the following features?

2.1 Real Time Market Intelligence Delivery
2.2 Consolidated Bulk Bargaining System
2.3 Verified Farm Social Hub

What are the primary operational challenges encountered by smallholder farmers prior to the implementation of the system in terms of:

3.1 Transportational delays and crop contamination due to FMR deficits
3.2 Information Asymmetry and unfair trader pricing
3.3 Fragmented communication with commercial markets

Is there a significant difference in the perceived operational efficiency of everyday farmers before and after the simulated use of the AgriNet platform in terms of the following parameters?

4.1 Transportation Accessibility
4.2 Pricing Transparency
4.3 Direct Market Linkage

OBJECTIVES

The primary objective of this study is to develop, implement and evaluate “AgriNet,” a Unified Farm Intelligence and Coordination System designed to empower everyday farmers by mitigating physical infrastructure deficits, enhancing direct market accessibility, and streamlining agricultural supply chains through a centralized digital platform.

- First, to develop a Minimum Viable Product (MVP) of the AgriNet web/mobile platform within the hackathon timeframe, successfully programming the core user interface for the community load-pooling and route-tracking feature.

- Second, to integrate a functional market intelligence dashboard prototype using sample data by the midpoint of the development phase, demonstrating exactly how real-time price transparency will be delivered to the end user.

- Third, to build a working simulation of the consolidated bulk bargaining system and verified farmer social hub, allowing hackathon judges or beta testers to successfully execute a mock community driven sale by the final week.

- Lastly, to validate the platform's core concept by conducting rapid user-acceptance testing (UAT) with at least 5 to 10 individuals (such as mentors, peers, or accessible local farmers) and finalizing a high-impact pitch deck prior to presentation day.

METHODOLOGY

To accomplish the study objectives during the accelerated 3-week development period timeframe of the hackathon, this project will utilize the Rapid Application Development (RAD) methodology. This approach prioritizes quick prototyping, iterative development, and immediate user feedback over prolonged planning phases, ensuring that a functional Minimum Viable Product (MVP) is ready for deployment and evaluation by the final week.

The development and testing will be executed in four different phases:

Phase 1: UI/UX System Design and Prototyping (Pre-Development & Week 1)

The initial phase focuses on finalizing the visual architecture and user flow of the AgriNet platform. Wireframes have been finalized, mapping out core interfaces such as the Farm Life Update feed, the Verified Farmer Directory, the integrated messaging system, and the logistics map. During the first week of the hackathon, these designs will be translated into a functional fronted framework.

Phase 2: MVP development and API Integration (Week 2)

The second week will be dedicated to coding the core functionalities required for the MVP. This includes:

- Integrating a mapping and routing API (e.g., Google Maps API) to simulate the hyper-localized logistics and trucking coordination.

- Establishing a basic backend database (e.g., Firebase) to support the real-time chat feature between farmers and transport services.

- Structuring the verified user directory using mock data reflecting the target demographic (e.g., farmers from Alangilan).

Phase 3: Hyper-Local User Acceptance Testing (UAT) (Week 3)

Once the MVP is functional, rapid User Accepting Testing (UAT) will be conducted. The testing audience will consist of a targeted focus group of local farmers within the Batangas area. Participants will be asked to perform specific simulated tasks on the app, such as checking market updates, messaging a mock trucking service, and tracking a delivery route.

Phase 4: Feedback Synthesis and Pitch Finalization (End of Week 3)

The final phase involves gathering the operational feedback from the Batangas testing group to evaluate the perceived accessibility and

effectiveness of the app. This qualitative data will be used to make final UI adjustments, validate the core problem statements, and formulate a data-backed final pitch for the hackathon panel.

Target Groups

AgriNet is designed as a multi-sided platform catering to three primary user groups within the agricultural supply chain. Each user type interacts with a tailored interface designed for their specific operational needs:

1. Smallholder Farmers

- Post upcoming harvest schedules and estimated yields.
- Access the real-time market intelligence dashboard for current pricing.
- Initiate or join community load-pooling for shared transport.
- Participate in consolidated bulk-selling to attract larger institutional buyers.
- Book verified local transportation services.

2. Transport Providers

- Receive and accept hyper-localized delivery requests from farmer pools.
- View optimized routing via the integrated mapping system.
- Communicate directly with farmers and market receivers to coordinate pickup and drop-off logistics.

3. Institutional Market Buyers

- Browse verified bulk listings generated by farmer cooperatives.
- Purchase consolidated agricultural products directly, bypassing traditional middlemen.
- Coordinate delivery schedules and track incoming shipments in real-time.

IMPACT

The implementation of AgriNet will create a transformative ripple effect across the agricultural sector, starting at the barangay level in Batangas and scaling upward. By shifting the power dynamics of agricultural logistics and data from the middleman back to the farmers, AgriNet delivers impact across three criterias:

- **Economic Empowerment & Poverty Reduction:** By providing real-time market intelligence and enabling cooperative bulk bargaining, AgriNet directly combats information asymmetry. Farmers will no longer be forced to accept low-ball offers from traders. Furthermore, the "Grab-Style" community load-pooling feature significantly reduces individual transportation costs, allowing farmers to retain a much higher percentage of their profit margin

- **Supply Chain Resilience & Waste Reduction:** The Philippines currently suffers from a backlog of Farm-To-Market Road, leading to severe delays and post-harvest crop spoilage. AgriNet mitigates this physical infrastructure deficit through digital efficiency. By optimizing truck routing, enabling real-time driver communication, and pooling cargo, farm produce reaches commercial markets faster and fresher, drastically reducing post-harvest waste.

- **Data Driven Institutional Support:** AgriNet does not just help farmers; it generates highly valuable, macro-level logistical data. By tracking which transport routes are most frequently used and where the worst delays occur, the platform can eventually provide the Department of Agriculture (DA) and local LGUs with concrete data to prioritize future FMR constructions and funding.

- **Financial Inclusion & Access to Formal Credit:** Historically, smallholder farmers have lacked the verifiable financial records necessary to secure bank loans, leaving them

vulnerable to informal, high-interest lenders.

Because AgriNet digitally tracks transaction volumes, cooperative load pooling, and consistent delivery histories, it helps farmers build a robust digital footprint. This verifiable credit history can be leveraged by cooperatives and individuals to access formal microfinancing, crop insurance, and targeted agricultural grants, breaking the cycle of predatory debt and allowing farmers to invest in better equipment and inputs.

To conclude, AgriNet transforms everyday farmers from isolated, subsistence-level workers into a connected, commercially viable, and data-driven network.

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