# **GIS TRACKS FOOD PRODUCTS**

# **PROJECT PROPOSAL**

# **Project Title:** Supply2U – Transforming Agricultural Supply Chains From Farm to Fork

## **1. Team Members**

Behind Supply2U is a dynamic team of forward-thinking individuals united by a shared mission.

This section outlines the core team members, their roles, and the value they contribute to the project.

* **Dr. Lawrence Nderu -***The Principal Investigator*: responsible for overseeing the entire project and providing the necessary resources required for its success
* **Ian Ndolo -***Team Lead and Backend Developer*: manages the team and the development process and is responsible for the server-side logic and database management.
* **Neema Ogao -** *Frontend Developer*: responsible for creating an intuitive and user-friendly interface for our platform, ensuring that users can easily navigate and utilize the system’s features.
* **Maureen Mukami-***Frontend Developer*: focuses on designing and implementing the visual aspects of our platform, making it both functional and aesthetically pleasing.
* **David Nzambuli -** *DevOps Engineer*: Manages CI/CD pipelines and ensures the security, scalability, and smooth deployment of the platform.
* **Pharis Kariuki -** *Real Time Systems Engineer*:responsible for building and maintaining the real-time data infrastructure by ensuring seamless data flow from various sources.

## **2. Executive Summary**

Supply2U is a data-driven platform revolutionizing agricultural supply chains across East Africa. By leveraging real-time analytics, IoT integration, and consumer behavior insights, the platform connects farmers, agro-dealers, logistics providers, and retailers. It addresses critical inefficiencies such as post-harvest losses, inconsistent quality, lack of traceability, and limited transparency. Supply2U not only enhances supply chain efficiency but also ensures fair pricing, better access to markets, and improved consumer trust. The project is scalable, sustainable, and commercially viable, with strong potential for impact in the region.

## **3. Background**

Globally and especially in East Africa, agricultural supply chains, small-scale farmers, agro-dealers, and urban retailers face significant challenges in ensuring food products' efficient, sustainable distribution.

Consumers increasingly demand to know the origins of their food, and retailers require precise information to manage inventory and meet consumer demand. Agricultural supply chains in East Africa suffer from inefficiencies that reduce farmer income, increase food prices, and restrict access to high-quality produce. These issues include:

* Up to **33% post-harvest losses** for perishable goods.
* Inconsistent product quality leading to consumer dissatisfaction.
* A lack of transparency in sourcing, affecting consumer trust and pricing fairness.

These issues compromise farming's economic viability, restrict consumer access to fresh produce, and hinder fair value distribution. Despite growing demands for transparency and efficiency, existing solutions need more comprehensive integration for all stakeholders, including farmers, agro-dealers, retailers, and logistics providers.

There is a critical need for a transformative platform that seamlessly connects these stakeholders, prioritizing efficiency, sustainability, and profitability throughout the supply chain.

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## **4. Objectives**

### **General Objective:**

To develop a smart agricultural supply chain platform that ensures transparency, efficiency, and sustainability from farm to consumer.

### **Specific Objectives:**

* Minimize post-harvest losses using real-time logistics tracking  
   The system will utilize GPS and sensor technologies to monitor transportation in real-time, allowing stakeholders to quickly respond to delays, route changes, or environmental threats. This reduces the risk of spoilage and ensures timely delivery of perishable goods.
* Provide reliable quality and availability through predictive analytics  
   By analyzing historical data, weather patterns, and demand trends, the platform will forecast optimal harvesting and distribution schedules. This ensures that products are delivered fresh, in the right quantities, and when markets need them most.
* Enable full traceability and transparency using geolocation and data integration  
   Every stage of the supply chain—from harvesting to final delivery—will be recorded and traceable. This builds trust among stakeholders and supports compliance with food safety and quality regulations.
* Create a user-friendly platform to connect all supply chain stakeholders  
   The web-based system will offer an intuitive interface that allows farmers, distributors, logistics providers, and retailers to collaborate, track orders, communicate, and make informed decisions in real time.

## **5. Project Scope**

**In-Scope:**

* Real-time GPS tracking for farms and transportation  
   Implementation of geolocation tracking to monitor trucks, farm pickups, and delivery routes in real-time to improve logistics coordination and reduce delays.
* A web-based platform for stakeholders  
   A responsive and accessible web application that provides role-based access for farmers, transporters, distributors, and retailers, facilitating interaction and oversight.
* Real-time analytics dashboard and ML-powered insights  
   Visual dashboards showing live metrics like truck location, order status, delivery times, and predictive analytics (e.g., demand forecasting, delivery delays).
* Secure API integrations  
   Seamless connections to third-party services (e.g., SMS/email gateways, payment platforms, or weather APIs) using secure and scalable APIs.

**Out-of-Scope (for initial launch):**

* Mobile app (planned for future phase)  
   Although highly valuable, a dedicated mobile application will be considered after the core web system is fully deployed and adopted.
* International market deployment  
   The initial version targets the local and regional market; global scalability will be explored after successful local implementation and feedback.

## **6. Commercial Viability & Revenue Model**

### **Revenue Generation:**

The platform will adopt a **freemium model**, offering basic functionalities like shipment tracking and order creation at no cost to ensure widespread adoption, particularly among smallholder farmers. **Premium features**—including advanced data analytics, automated reporting, and integration with existing ERP or logistics systems—will be available through **paid plans**, creating revenue from users who require more sophisticated tools.

**Subscription Tiers:**

The pricing structure will include **monthly and annual subscription plans**, with tailored packages for different user groups such as farmers, distributors, and retailers. For example, farmers may access basic shipment tracking and sales dashboards, while distributors can unlock fleet management tools and forecasting reports.

**Transaction-Based Revenue:**

Another revenue stream will involve **small commissions on completed and verified deliveries**, especially those conducted via the integrated marketplace. This model incentivizes quality service and reduces platform misuse, as only successful transactions trigger a fee.

### **Target Customers:**

The platform primarily targets **small to medium-scale farmers** who lack access to organized logistics solutions. It also caters to **agro-dealers, wholesalers, and regional distributors** seeking visibility into delivery operations and product sourcing. **Urban retailers and supermarkets**, concerned with product quality and reliability, form a secondary market with potential for higher-tier subscriptions.

### **Pricing Strategy:**

A **tiered pricing model** will ensure accessibility while maximizing monetization potential. Lower-cost plans will allow smaller operators to get started, while higher-tier packages will provide enhanced tools and support. **Incentives such as discounts for early adopters** or **reduced rates for annual subscribers** will be used to drive initial traction and customer retention.

### **Competitor Analysis:**

| **Competitor** | **Weakness** | **Supply2U Advantage** |
| --- | --- | --- |
| Twiga Foods | Limited traceability | Full farm-to-fork transparency |
| AgroCenta | Ghana-focused | East Africa localized solution |
| FarmDrive | Credit-focused only | Supply chain + logistics + market data |

### **Differentiation:**

The system sets itself apart through a combination of cutting-edge technologies and a strong commitment to openness and adaptability. At its core, the platform leverages **real-time analytics** and **IoT-enabled traceability**, ensuring every step in the supply chain is tracked, verified, and optimized. This allows stakeholders to access actionable insights and improves transparency, reducing inefficiencies and loss.

Unlike proprietary systems that lock users into specific tools, the platform is **fully open-source**, offering flexibility for local customization, integration with existing tools, and contributions from a growing community of developers and stakeholders. Its design unifies key supply chain components—**a built-in marketplace**, **logistics monitoring**, and **intelligent data dashboards**—creating a single interface where users can manage orders, monitor truck routes, analyze performance, and make informed decisions.

### **Scalability Potential:**

The platform is designed with long-term growth and wide adoption in mind. It supports **multi-region deployment**, enabling expansion across counties and eventually to neighboring countries without a complete architectural overhaul. The backend is hosted on a **cloud-native architecture** using tools like Kubernetes for container orchestration and Apache Spark for processing large volumes of data, ensuring high availability and fault tolerance.

Recognizing that not all users have access to smartphones or internet-enabled devices, the platform includes the potential to integrate **SMS and USSD-based interfaces**. This ensures that even farmers in low-connectivity rural areas can access essential features like order updates, delivery confirmations, or market prices, helping to bridge the digital divide.

## **7. Go-To-Market Strategy**

To drive adoption and awareness, the project will deploy a comprehensive **marketing strategy** focused on both digital and grassroots efforts. **Online marketing campaigns**—leveraging SEO, Google Ads, and social media—will be tailored to reach agro-industries, distributors, and farming communities. Additionally, the team will establish **strategic partnerships** with NGOs, farmer cooperatives, and agro-input companies to promote credibility and amplify reach. **Educational content** such as webinars, blog posts, and real-world case studies will be published to showcase impact and educate users on system benefits.

For **user acquisition**, the rollout will begin with a **pilot program in Kenya**, working closely with local cooperatives. Early adopters will benefit from **referral incentives** to promote viral growth and community-based onboarding. **Training workshops** for agro-dealers and farmers will ensure confident usage and gather feedback for refinement.

The **pilot testing phase** will involve collaboration with **three cooperatives**, each comprising 20–30 farmers. The pilot will test end-to-end functionality, including live vehicle tracking, traceability logs, and the analytics dashboard. Insights gathered during this phase will guide performance improvements and UI/UX updates.

**Customer support** will be an ongoing priority. A **built-in support chat system** on the web platform will handle user queries in real time, while a **feedback dashboard** will allow stakeholders to report issues or suggest features. Regular **community check-ins via WhatsApp groups and SMS updates** will foster engagement and provide timely assistance to users.

## **8. Methodology**

We adopt Agile as our core software development methodology, structured around iterative sprints with well-defined deliverables at each stage. This ensures flexibility, faster feedback loops, and continuous improvements based on real-world insights. Rapid prototyping guides the development of key features — especially the real-time components — allowing us to validate functionality with stakeholders early in the process.

CI/CD pipelines are managed using GitHub Actions, enabling automated testing, integration, and deployment with every commit. Docker containers are used to maintain consistent environments across development, staging, and production phases.

The backend is built using Django and Django REST Framework, ensuring a robust, scalable API layer. PostgreSQL is used for structured data, while Apache Kafka and Apache Spark handle real-time data streaming and processing..

On the frontend, we use React.js for building dynamic interfaces, complemented by tools like Figma for UI/UX design and interactive prototyping. These prototypes are used to gather user feedback before full implementation.

For geospatial features, the platform integrates Google Maps APIs (Directions, Routes, Places, and JavaScript Maps APIs) to enable location-based services like tracking and routing.

## **9. Timeline**

| **Phase** | **Duration** | **Key Deliverables** |
| --- | --- | --- |
| Research & Planning | Month 1 | Architecture, partner onboarding |
| MVP Development | Months 2–3 | Web dashboard, GPS tracking |
| Pilot Launch | Month 4 | Test with 3 cooperatives |
| Feedback Integration | Month 5 | Feature updates and bug fixes |
| Public Launch | Month 6 | Open platform with marketing launch |

## **10. Resources**

| **Resource** | **Purpose** | **Estimated Cost (USD)** |
| --- | --- | --- |
| **GPS/IoT Hardware** | Used for real-time tracking of farm operations and transportation logistics. | 3,000 |
| **Cloud Infrastructure** | Provides compute power, storage, and hosting for APIs, backend services, and analytics. | 2,000 |
| **Marketing** | Supports digital marketing, partner outreach, and awareness campaigns for product launch. | 3,000 |
| **Pilot Logistics** | Covers initial pilot project costs, including transport, stakeholder training, and field ops. | 2,500 |
| **Google Maps API** | Enables directions, route optimization, geolocation, places search, and map rendering features. Breakdown: - **Directions API**: Route planning and delivery paths. - **Routes API**: Optimal delivery routes and real-time updates. - **Places API**: Location-based search (e.g., agro-dealers, drop-off points). - **Maps JavaScript API**: Embedding and interacting with maps on the web dashboard. | 2,000 |
| **Miscellaneous** | Buffer for unexpected technical, operational, or support expenses. | 1,500 |
| **Total** |  | **14,000** |

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## **11. Expected Outcomes**

At the conclusion of the project, several key deliverables are anticipated to showcase the system’s readiness and effectiveness. Foremost among them is a **fully functional web platform** that integrates real-time truck tracking, intelligent dashboards, and analytics for supply chain visibility. This platform will serve as the central hub for all stakeholders, allowing users to manage logistics, monitor delivery status, and gain insights into supply performance and product flow.

In addition, a robust **API layer** will be developed to support seamless integration with third-party services such as inventory systems, mobile money platforms, government monitoring tools, or external logistics providers. This ensures the platform remains extensible and adaptable to future needs.

The pilot phase will yield **comprehensive testing and evaluation reports**, including user feedback from farmers, cooperatives, and distributors. These insights will inform system refinements before full-scale deployment. Finally, the project will present a **go-to-market strategy and scale-up roadmap**, outlining phased expansion, marketing efforts, partnership models, and onboarding strategies to ensure a smooth public launch and future growth.

## **12. Risk Assessment / Challenges**

While the project is backed by strategic planning, several **risks** may affect development, deployment, and adoption. Each risk has been carefully analyzed, and **mitigation strategies** have been put in place to ensure resilience.

**Hardware malfunction**, such as GPS devices or sensors failing, could disrupt logistics data capture. To address this, the team will partner with **multiple hardware suppliers** and enforce **routine device testing and maintenance** to ensure reliability and minimize downtime.

**Connectivity issues** in rural areas may affect real-time data transmission. The system accounts for this by implementing **offline data caching and syncing** features. In addition, **SMS and USSD alternatives** will allow users to receive or send essential data even in low-bandwidth areas.

Concerns around **data privacy** and misuse of sensitive information are mitigated by enforcing **end-to-end encryption**, secure authentication, and a **transparent data policy** aligned with data protection regulations.

Lastly, potential **resistance to adoption**—especially from users unfamiliar with digital systems—is addressed by offering **incentives for onboarding**, such as discounts or free trials, and by training **local field agents** who can guide users through the transition and provide personalized support.

## **13. Evaluation and Success Criteria**

The project’s success will be measured using a mix of **functional, business, and impact-based criteria**, ensuring it meets user needs, achieves sustainability, and creates real-world value.

On the **functional** front, performance indicators include the **accuracy of the analytics dashboard**, **precision of real-time tracking**, and the **effectiveness of ML predictions** in forecasting delays or demand. The goal is to deliver a reliable, seamless user experience across devices.

From a **business perspective**, success will be evaluated by tracking the **number of active users**, **user retention over time**, and the **revenue generated** from subscriptions, commissions, and partnerships. These metrics reflect both market acceptance and financial viability.

The **broader impact** will be gauged by measurable outcomes such as a **reduction in post-harvest losses**, which currently affect a large percentage of fresh produce in Kenya. Additional metrics include **consumer trust levels**, derived from feedback and review scores, and **improvements in supply chain speed**, especially in last-mile delivery efficiency.

## **14. Conclusion**

Supply2U is a transformative solution addressing critical supply chain challenges in East Africa's agricultural sector. It provides transparency, reduces losses, empowers smallholders, and improves market dynamics. With a solid architecture, strong commercial strategy, and a go-to-market plan, Supply2U is well-positioned for lasting impact and scale.

## **15. References**

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