Technical Proposal: OFSP Digital Marketplace Platform

Prepared for: Concern Worldwide
Project: Orange-Fleshed Sweet Potato (OFSP) Value Chain Digital Platform
Location: Machakos County (Kangundo, Kathiani, Masinga, Yatta Sub-Counties)
Reference: RFP SR104600
Date: November 2025
Project Duration: 25 Days

Executive Summary

We propose to design, develop, and deploy a robust, scalable digital marketplace platform specifically tailored for the Orange-Fleshed Sweet Potato (OFSP) value chain in Machakos County. Leveraging our proven **Jirani platform** with specialized adaptations for agricultural value chains, we will deliver a comprehensive solution that connects OFSP farmers, buyers, County Agricultural Officers, and Concern project staff through an intuitive, multi-channel digital platform.

Our Solution Delivers:

Aspect	Details
Platform Type	Agricultural marketplace with real-time aggregation center management
Target Users	OFSP farmers, buyers, County Agricultural Officers, Concern project staff
Access Channels	Web application, mobile app (PWA), USSD for feature phones
Core Focus	Order management, aggregation center tracking, peer monitoring, market information
Timeline	25 days from contract signing
Sustainability	County government ownership with capacity building plan
Compliance	Kenya Data Protection Act (2019), agricultural data security standards

Key Differentiators:

✅ **Proven Platform** - Based on Jirani marketplace, production-tested for African markets
✅ **Multi-Channel Access** - Web, mobile app, and USSD for universal farmer inclusion
✅ **OFSP-Specific** - Tailored for sweet potato value chain requirements
✅ **Real-Time Tracking** - Aggregation center inventory management (stock in/stock out)
✅ **Peer Monitoring** - Farmer leaderboards and knowledge sharing for competition
✅ **Mobile-First** - Optimized for low-bandwidth, offline-capable
✅ **County Handover Ready** - Sustainability plan for long-term local ownership

1. Understanding the Assignment

1.1 Project Context

Machakos County faces critical challenges in the OFSP value chain:

- **Weak market linkages** between farmers and buyers
- **Limited access** to timely market information
- **Poor coordination** among value chain actors
- **Low productivity** (< 10 tons/hectare vs. potential 15-30 tons/hectare)
- **Information asymmetry** affecting farmer income

1.2 Our Interpretation

The platform must serve as a **digital coordination hub** that:

Objective	Our Approach
Connect Stakeholders	Direct farmer-buyer interaction, order posting, marketplace functionality
Enable Transparency	Real-time aggregation center tracking, peer activity monitoring
Provide Visibility	Dashboards for County Officers and Concern staff for monitoring
Ensure Inclusion	Multi-channel access (web, app, USSD) for all farmer segments
Build Capacity	Training, documentation, and handover for sustainability
Scale Impact	Extendable to other counties and crops beyond project duration

1.3 Expected Outcomes

✅ Increased farmer income through better market access
✅ Reduced post-harvest losses via efficient aggregation
✅ Improved coordination across OFSP value chain
✅ Enhanced transparency in pricing and transactions
✅ Sustainable, locally-owned digital infrastructure
✅ Data-driven decision making for County Agricultural Officers
✅ Knowledge sharing and peer learning among farmers

2. Jirani Platform - Our Foundation

2.1 Platform Overview

Jirani is our proprietary digital marketplace platform with proven deployment experience in African agricultural markets. For this OFSP project, we will customize Jirani with OFSP-specific features while maintaining the core architecture that ensures reliability, scalability, and ease of use.

Platform Highlights:

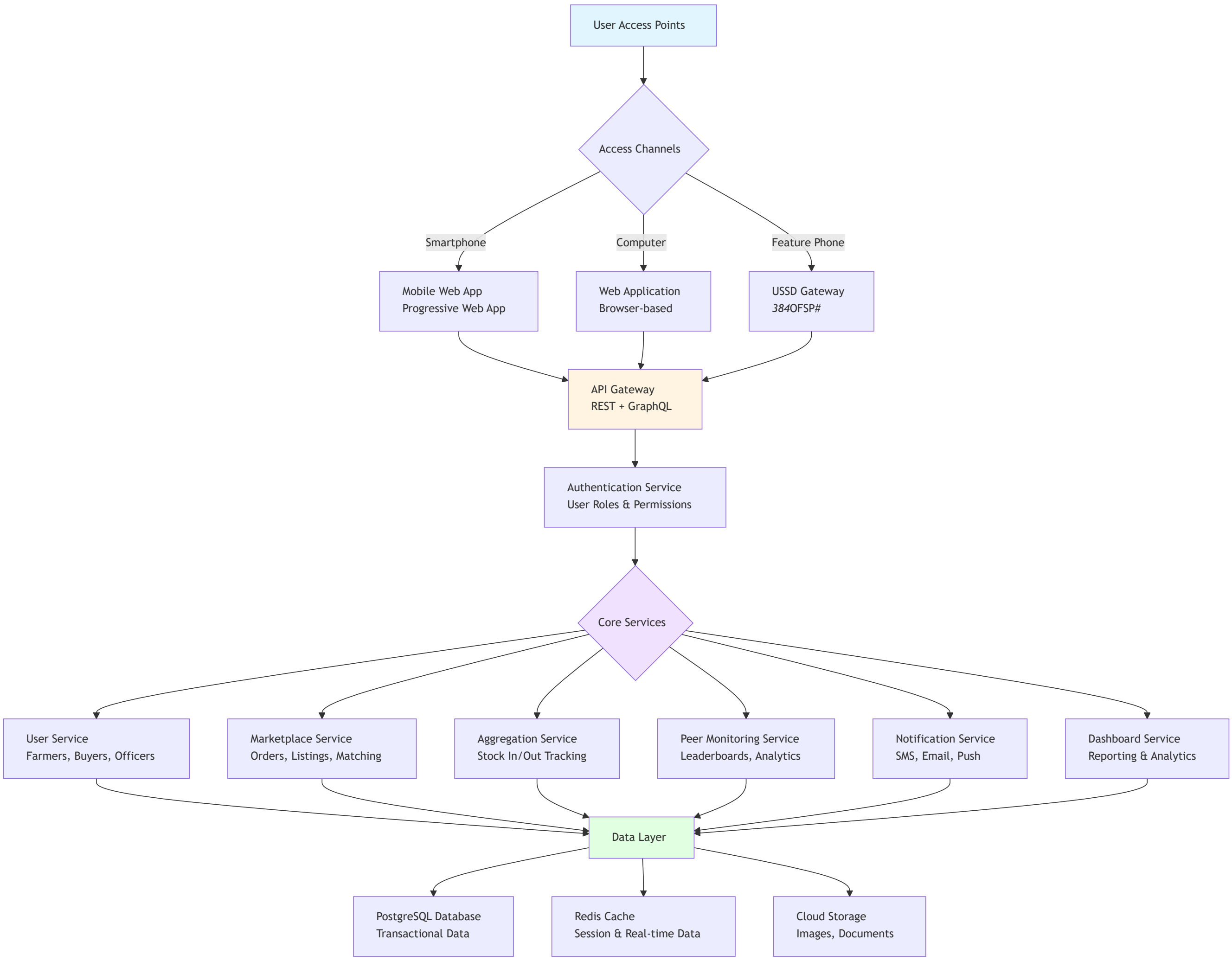
Aspect	Details
Current Status	Production-ready, actively deployed in agricultural markets
Architecture	Multi-tenant, microservices-based, highly scalable
Mobile Optimization	Progressive Web App (PWA), offline capabilities, low-bandwidth optimized
Payment Integration	M-PESA, Airtel Money, bank transfers, cash on delivery
Proven Track Record	Deployed for similar agricultural value chain projects

2.2 Core Technical Capabilities

Capability	Implementation
Real-Time Data	WebSocket connections for live updates on orders, inventory
Offline Mode	Service workers enable offline data entry, syncs when connected
Low Bandwidth	Adaptive content loading, <100KB initial load, image optimization
USSD Integration	Feature phone access for farmers without smartphones
Multi-Language	English, Swahili, Kikamba (local language support)
SMS Notifications	Order confirmations, price alerts, delivery updates
Responsive Design	Works on any device from feature phones to desktops
Security	End-to-end encryption, Kenya Data Protection Act (2019) compliant

3. Proposed System Architecture

3.1 High-Level Architecture

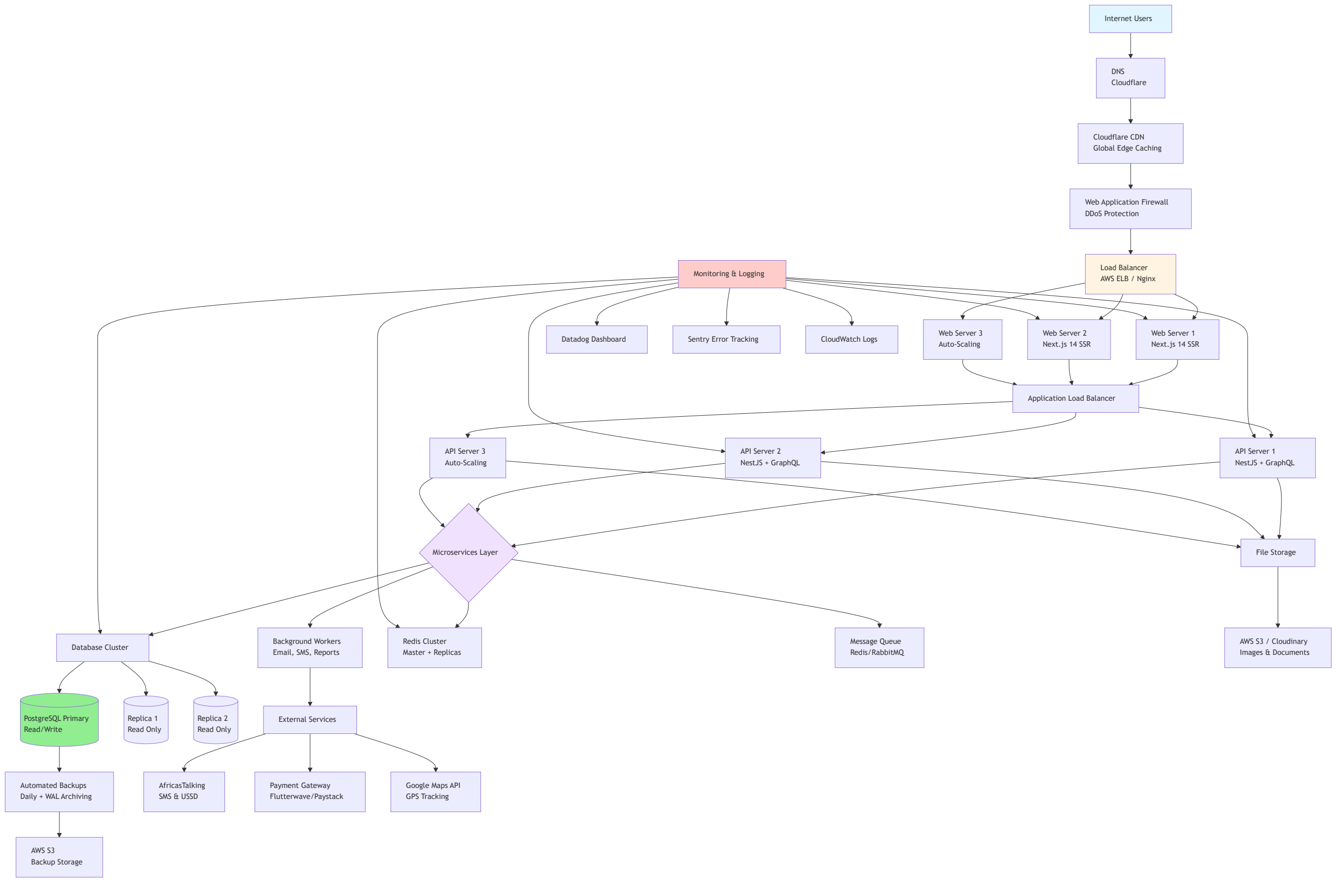


3.2 System Components

Component	Technology	Purpose
Frontend	React 18 + Next.js 14, TailwindCSS	Web and PWA interface
USSD Gateway	AfricasTalking USSD API	Feature phone access
Backend API	NestJS + GraphQL + REST	Business logic and data access
Database	PostgreSQL 15	Primary data storage
Cache	Redis 7	Session management, real-time data
Storage	AWS S3 / Cloudinary	Image and document storage
SMS/Notifications	AfricasTalking SMS API	Farmer notifications
Hosting	AWS EC2 / DigitalOcean	Cloud infrastructure
CDN	Cloudflare	Content delivery, DDoS protection
Monitoring	Datadog / Sentry	Performance monitoring, error tracking

3.3 Production Deployment Architecture

High-Availability Infrastructure for Scale:



Infrastructure Specifications:

Component	Specification	Quantity	Purpose
Web Servers	4 vCPU, 8GB RAM, Ubuntu 22.04	2-5 (auto-scaling)	Serve frontend application
API Servers	4 vCPU, 8GB RAM, Ubuntu 22.04	2-5 (auto-scaling)	Handle API requests
Database Primary	8 vCPU, 16GB RAM, 500GB SSD	1	PostgreSQL master (read/write)
Database Replicas	4 vCPU, 8GB RAM, 500GB SSD	2	PostgreSQL replicas (read-only)
Redis Cache	2 vCPU, 4GB RAM	3 (1 master + 2 replicas)	Session & caching
Background Workers	2 vCPU, 4GB RAM	2	Process background jobs
Load Balancer	AWS ELB / Nginx	2 (active + standby)	Distribute traffic
Storage	AWS S3 / Cloudinary	Unlimited	Images, documents, backups
Monitoring	Datadog/Sentry agents	On all servers	Performance & error tracking

Auto-Scaling Configuration:

Metric	Threshold	Action
CPU Usage	>75% for 5 min	Add 1 web/API server
Memory Usage	>80% for 5 min	Add 1 web/API server
Request Rate	>1000 req/min	Add 1 API server
Response Time	>1s (p95) for 5 min	Add 1 API server
CPU Usage	<30% for 15 min	Remove 1 server (min 2 servers)
Database Connections	>80% pool	Scale database vertically

High Availability Features:

Feature	Implementation	Benefit
Load Balancing	AWS ELB with health checks, automatic failover	Distribute traffic, remove unhealthy servers
Database Replication	PostgreSQL streaming replication (master + 2 replicas)	Read scaling, automatic failover
Redis Clustering	Redis Sentinel (1 master + 2 replicas)	Cache availability, automatic failover
Automated Backups	Daily full backup + continuous WAL archiving	Point-in-time recovery (RPO: 5 min)
Multi-AZ Deployment	Servers across 2 availability zones	Zone failure protection
CDN Caching	Cloudflare edge caching (static assets)	Fast global access, reduce server load
Health Checks	HTTP health endpoints every 30s	Automatic unhealthy server removal
Blue-Green Deployment	Parallel environments for zero-downtime updates	Safe deployments

Disaster Recovery Plan:

Scenario	RTO (Recovery Time)	RPO (Recovery Point)	Procedure
Server Failure	<5 minutes	0 (no data loss)	Auto-scaling adds new server, load balancer reroutes
Database Failure	<10 minutes	<5 minutes	Automatic promotion of replica to master
Data Center Outage	<30 minutes	<15 minutes	Failover to secondary availability zone
Complete Regional Failure	<4 hours	<1 hour	Restore from backups to new region
Data Corruption	<2 hours	<1 hour	Point-in-time recovery from WAL archives
Security Breach	<1 hour	0	Isolate affected servers, restore from clean backup

Backup Strategy:

Backup Type	Frequency	Retention	Storage Location
Full Database Backup	Daily at 2 AM	30 days	AWS S3 (encrypted)
Incremental (WAL)	Continuous (every 5 min)	7 days	AWS S3
Application Files	Daily	7 days	AWS S3
Configuration Backups	After every change	90 days	Git repository + S3
User-Uploaded Files	Real-time (S3 versioning)	Indefinite	AWS S3 with versioning

Security Infrastructure:

Layer	Implementation	Purpose
DDoS Protection	Cloudflare	Mitigate distributed attacks
Web Application Firewall	Cloudflare WAF	Block SQL injection, XSS, etc.
SSL/TLS	Let's Encrypt SSL certificates	Encrypt all data in transit
Network Isolation	VPC with private subnets	Database not publicly accessible
Firewall Rules	Security groups (whitelist only)	Restrict access to known IPs
Intrusion Detection	AWS GuardDuty / OSSEC	Detect suspicious activity
Secret Management	AWS Secrets Manager / HashiCorp Vault	Secure API keys, passwords
Database Encryption	PostgreSQL encryption at rest	Protect data on disk
Access Logging	CloudWatch Logs	Audit trail of all access
2FA for Admin	TOTP-based 2FA	Protect admin accounts

Monitoring & Alerting:

Metric	Tool	Alert Threshold	Action
Server Uptime	Datadog	<99.5%	Page on-call engineer
API Response Time	Datadog	>1s (p95)	Auto-scale, investigate
Error Rate	Sentry	>1%	Alert dev team
Database CPU	CloudWatch	>80%	Scale database
Disk Space	Datadog	>85%	Add storage, clean logs
Failed Payments	Custom alerts	>5%	Alert payment team
SMS Delivery	AfricasTalking webhook	<95%	Switch to backup provider
Backup Success	Cron monitoring	Failed backup	Immediate alert
Security Breach	GuardDuty	Any detection	Emergency response

Cost Optimization:

Strategy	Savings	Implementation
Auto-Scaling	30-50%	Scale down during off-peak hours (8PM - 6AM)
Reserved Instances	40%	Commit to 1-year reserved instances for base load
CDN Caching	60% bandwidth	Cache static assets at edge locations
Database Query Optimization	25% CPU	Index optimization, query tuning
Image Optimization	70% storage	WebP format, compression, lazy loading
Log Retention	50% storage	Keep only 30 days of logs
Spot Instances (Workers)	70%	Use spot instances for non-critical background jobs

Estimated Monthly Infrastructure Cost:

Item	Cost (USD)	Cost (KES)
Web Servers (2-5 instances)	$50-150	6,500-19,500
API Servers (2-5 instances)	$50-150	6,500-19,500
Database (Primary + 2 Replicas)	$150-250	19,500-32,500
Redis Cache (3 instances)	$30-50	3,900-6,500
Load Balancers	$30	3,900
Storage (S3 / Cloudinary)	$20-50	2,600-6,500
Data Transfer	$20-40	2,600-5,200
Monitoring (Datadog/Sentry)	$30-60	3,900-7,800
CDN (Cloudflare)	$20-40	2,600-5,200
Backups	$10-20	1,300-2,600
SMS & USSD	$50-100	6,500-13,000
Payment Gateway Fees	Variable	Based on transaction volume
Domain & SSL	$10	1,300
Contingency (10%)	$50-100	6,500-13,000
Total Estimated	**$520-1,060**	**67,600-137,800**

Note: Costs scale with usage. Lower in early stages, higher with more users.

Capacity Planning:

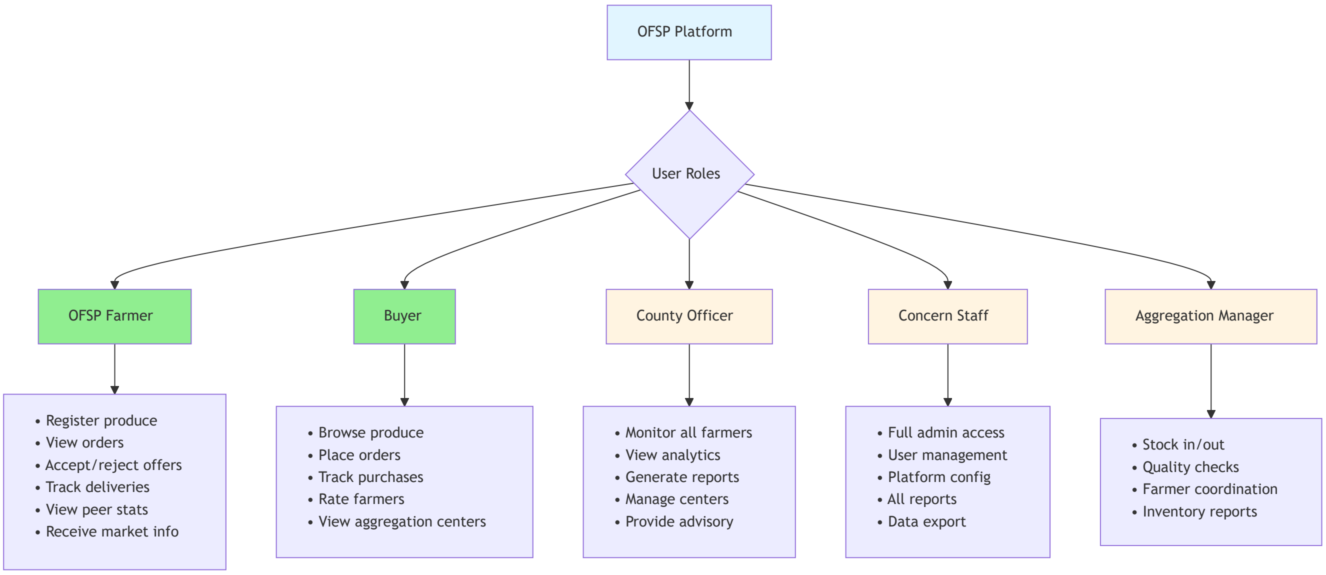
Users	API Requests/Day	Database Size	Bandwidth	Infrastructure Cost (Monthly)
500 farmers	50,000	10 GB	100 GB	~$500-700 (~KES 65,000-91,000)
1,000 farmers	100,000	25 GB	200 GB	~$700-900 (~KES 91,000-117,000)
2,000 farmers	200,000	50 GB	400 GB	~$900-1,200 (~KES 117,000-156,000)
5,000 farmers	500,000	125 GB	1 TB	~$1,500-2,000 (~KES 195,000-260,000)

4. User Roles & Permissions

4.1 User Groups

User Role	Access Level	Key Functions
OFSP Farmers	Standard User	Register, post produce, view orders, track sales, view peer activity, receive market info
Buyers	Standard User	Register, browse produce, place orders, track purchases, rate farmers
County Agricultural Officers	Extension Officer	View all farmers, monitor activities, generate reports, provide advisory, manage aggregation centers
Concern Project Staff	Administrator	Full platform access, user management, analytics, reporting, system configuration
Aggregation Center Managers	Operator	Stock in/out tracking, quality checks, farmer coordination, inventory reports

4.2 Permission Matrix


OFSP Platform
User Roles
OFSP Farmer
Buyer
County Officer
Concern Staff
Aggregation Manager
• Register produce
• View orders
• Accept/reject offers
• Track deliveries
• View peer stats
• Receive market info
• Browse produce
• Place orders
• Track purchases
• Rate farmers
• View aggregation centers
• Monitor all farmers
• View analytics
• Generate reports
• Manage centers
• Provide advisory
• Full admin access
• User management
• Platform config
• All reports
• Data export
• Stock in/out
• Quality checks
• Farmer coordination
• Inventory reports