



Terms of Reference (ToR)

Recruitment of Software Development Firm or Team for FeSeRWAM Database Centralization, Admin Portal Integration, and the Platform Enhancement

Short-Term Consultancy

RHFSH – IFDC –CORAF - Soil Values Program

July, 2026



About IFDC, Soil Values Program, RHFSH and CORAF

IFDC is a public international organization active in 20 countries in Africa, Asia, and America. IFDC uniquely approaches the global issues of food security and poverty by bridging the gap between research and impact, combining science-based innovations, holistic market systems development, an enabling policy environment, and strategic partnerships to assist farmers and countries to identify and scale sustainable agricultural solutions, including improved nutrient use efficiency. These approaches are needed to boost soil health and crop productivity while reducing the environmental impact of fertilizer use. IFDC translates research into action by using locally driven, environmentally sound, and impact-oriented solutions. With our partners, we seek to close the yield gap, eradicate global hunger, safeguard the soil on which our lives depend, and generate economic resilience for farming households and the countries in which they live.

Additionally, the Soil Values Program, a 10-year program (2024–2033) financed by the Netherlands Directorate-General for International Cooperation (DGIS), is a regional initiative focused on improving soil health management and promoting sustainable land use practices in West Africa. The project works to strengthen knowledge systems, support farmers and extension services, and enhance agricultural productivity through the adoption of innovative, environmentally friendly soil and water conservation technologies. By generating practical guidance and capacity-building resources, Soil Values seeks to facilitate the operationalization of soil health practices that increase nutrient use efficiency and contribute to resilient farming systems.

The Regional Hub for Fertilizer and Soil Health (RHFSH), launched in June 2024, operates under the ECOWAS framework as a sub-program aimed at improving soil fertility, fertilizer efficiency, and agricultural productivity across West Africa and the Sahel. In line with the Hub's Function about on Bundling Technologies and Services, which focuses on advising countries on how to package crop- and site-specific nutrient management and soil health practices, the Regional Hub, through the International Fertilizer Development Center (IFDC), is supporting countries to design and implement bundled input and service packages that reflect real farming conditions, local soil characteristics, climate risks, and market realities. This bundling approach enables countries to: Integrate fertilizers, improved seed, lime, and agronomic advisory services into coherent and context-specific packages; Link technologies with essential support services such as credit, insurance, and market access; Coordinate delivery systems that reduce adoption barriers and facilitate the scaling of sustainable soil and nutrient management practices; and Strengthen farmers' capacity to improve yields, profitability, and long-term soil health. By placing farmers at the center, bundling enhances their ability to adopt improved practices, manage production risks, and achieve higher and more sustainable returns from healthier soils.

Finally, CORAF is an international non-profit association working to enhance prosperity, food, and nutrition security in West and Central Africa. The objective of CORAF is to improve the efficiency and effectiveness of smallholder farmers and promote the agribusiness sector. CORAF's mission is to improve livelihoods in West and Central Africa through sustainable increases in agricultural production and productivity, promoting competitiveness and markets. The main functions of CORAF are to: Coordinate the NARS of the 23 countries, encourage planning and common financial and administrative systems, harmonize sources, support programs aligned with FAAP principles; Strengthen the capacity of the NARS, create and maintain expertise, promote institutional strengthening, and develop skills; Undertake advocacy, facilitate the adoption of strategic options and the implementation of policies, advocate for the

mobilization of financial resources; and Manage agricultural knowledge, convert information into knowledge, and establish mechanisms to facilitate the dissemination of knowledge. CORAF's priority interventions domains are: agriculture, food and nutrition security; policy, institutions, markets and trade; and gender, youth and social equity.

1. Background and rationale

The Fertilizer and Seed Recommendations Map for West Africa (FeSeRWAM) is digital agricultural tool designed to provide tailored Agricultural Input Packages (AIPs) with recommendations on fertilizers, seeds and good agricultural practices based on country specific agroecological conditions across West Africa. FeSeRWAM serves as a strategic digital solution to accelerate agricultural productivity and yield improvements, particularly for smallholder farmers, while supporting governments, extension services, agro-dealers, and development partners with evidence-based input recommendations. FeSeRWAM currently operates:

- A Web Application (FeSeRWAM Web Platform)
- A Mobile Application (FeSeRWAM Mobile App)
- An Admin Portal

Currently, the web platform and mobile application operate on separate, non-synchronized database environments, which can lead to inconsistencies in data updates, reporting, and user management. The existing mobile application will be fully rebuilt as part of this contract. The current mobile frontend is not GIS-based and cannot be retained as the foundation for the new architecture. The rebuild must conform to the GIS requirements defined in Section 3.11, including MapLibre Mobile SDK for the map interface.

Additionally, the FeSeRWAM platform supports farmers, extension agents, and other stakeholders in adopting improved soil fertility and crop management practices. To strengthen its decision-support capacity and usability, the platform is being enhanced with new functionalities. These enhancements include:

- The integration of illustrative practical factsheets/ technical guidelines (e.g., Microdosing, Urea Deep Placement, Composting, Zai) to provide clear guidance on how to implement step-by-step technologies.
- Addition of a profitability visualization feature which will allow users to see the estimated input costs and approximate output value when selecting an AIP, supporting better economic decision-making.
- Transition from agroecological zone-based fertilizer recommendations to site-specific nutrient management, enabling more precise recommendations based on local soil conditions and crop needs, better reflecting 4R+ and ISFM principles.

The Regional Hub for Fertilizer and Soil Health for West Africa and Sahel through IFDC seeks to engage a qualified Software Development Firm to design and implement a centralized database architecture that ensures real-time or near real-time synchronization across the Web Application, Mobile Application, and Admin Portal, and to upgrade the FeSeRWAM platform by integrating new technical and analytical functionalities that improve the relevance, usability, and impact of Agricultural Input Packages (AIPs).

2. Overall general scope of the work

2.1. General Objective

The primary objective of this assignment is to improve the overall performance and efficiency of FeSeRWAM. The assignment will also support the enhancement of the FeSeRWAM platform through the integration of additional functionalities aimed at improving the technical guidance, economic transparency, and precision of AIPs. The focus will be on the following specific objectives:

2.2. Specific Objective

The specific objective of the software development firm or team under this activity is to:

Core system strengthening objectives (immediate):

- Centralize the existing databases into a unified architecture.
- Establish a single source of truth for all system data.
- Ensure that updates made via the Admin Portal reflect consistently across both the Web Platform and the Mobile Application.
- Improve data integrity, performance, scalability, and security.
- Equip the team with the skills and tools necessary to master the unified architecture effectively.

Platform enhancement objectives (next phase):

- Integrate a functionality that provides users with clear, practical guidance on implementing techniques and practices that improve nutrient use, soil health, and water conservation;
- Develop a functionality that visualizes the profitability of Agricultural Input Packages; and
- Develop a functionality to increase the precision of fertilizer recommendations by moving from agroecological zone-based guidance to site-specific nutrient management (SSNM) approaches.

3. Scope of Work

The selected qualified Software Development Firm shall undertake the following tasks:

Immediate

3.1. System Assessment & Analysis with Annex

- Review existing system architecture (Web App, Mobile App, Admin Portal).
- Analyze various databases structures and relationships.
- Identify data inconsistencies and synchronization gaps.
- Review hosting infrastructure and technology stack.

3.2. Architecture Design

- Design a centralized database architecture that is scalable and flexible, enabling the integration of additional features in the future.
- Propose and implement a scalable backend API structure.
- Establish a secure and optimized data synchronization mechanism.
- Provide detailed system architecture documentation.

3.3. Database Centralization

- Consolidate all data into a unified database.
- Migrate legacy data safely and securely.
- Normalize and optimize database schemas.
- Implement backup and disaster recovery mechanisms with the following minimum targets: Recovery Point Objective (RPO) of 24 hours (maximum data loss in the event of failure); Recovery Time Objective (RTO) of 4 hours (maximum time to restore full service). Backups must be stored in at least two geographically separate locations. A documented recovery procedure must be delivered as part of the deployment guide. The 4-hour RTO target is contingent on the availability of a functional secondary hosting site. Where CORAF's datacenter serves as the secondary site, this RTO is jointly dependent on CORAF maintaining infrastructure meeting minimum specifications defined at inception phase.

3.4. API & Integration

- Develop or enhance RESTful APIs for standard CRUD operations across Web and Mobile Apps. If complex nested data queries are required for the recommendation engine, the firm shall propose a GraphQL layer as a supplementary interface and justify its inclusion in the inception report.
- Ensure secure authentication and authorization mechanisms (e.g., JWT, OAuth).
- Ensure that updates made via the Admin Portal are reflected across the Web Platform and Mobile Application within 60 seconds of the database commit timestamp on the Admin Portal submission.
- Ensure consistency between all platforms (Web and Mobile Apps).

3.5 Admin Portal Enhancement

- Upgrade or modify the Admin Portal to interface with the centralized database.
- Ensure all administrative updates instantly reflect across platforms.
- The minimum required roles are: (i) Super-Administrator — full system access, assigned to IFDC and CORAF technical leads; (ii) Country Administrator — data management rights for their country only, intended for national focal points where institutional capacity and designated personnel exist (NARS); (iii) Data Contributor — can submit new or updated AIP data pending approval, no publish rights; (iv) Read-Only Viewer — public or registered access to recommendations. Detailed permissions matrix shall be finalized at inception phase in agreement with IFDC and CORAF. Additional roles could be added during implementation, RBAC design should accommodate any new request.
- Ensure performance optimization for bulk updates and reporting.

3.6 Testing & Quality Assurance

- Conduct system integration testing.
- Perform data integrity validation.

- Load and performance testing against the following minimum benchmarks: (i) a concurrent user load to be defined during inception phase based on platform usage analytics provided by IFDC, with a minimum floor of 200 concurrent users; (ii) API response time under 500 milliseconds for recommendation queries; (iii) web platform fully usable on a 3G mobile connection (page load under 5 seconds). Results must be documented and shared with IFDC and CORAF before deployment approval.
- User Acceptance Testing (UAT) support.

3.7 Documentation & Knowledge Transfer

- Provide:
 - Technical documentation
 - Database schema documentation
 - API documentation
 - Deployment guide
- Conduct handover and training session for FeSeRWAM technical team.

3.8 GIS Architecture and Spatial Data Requirements

The FeSeRWAM platform is named and described as a "map" and a "georeferenced" system. The new implementation must fulfill this claim through proper GIS architecture. The following requirements are mandatory:

3.8.1 Spatial Database

The centralized database must use PostgreSQL with the PostGIS extension as the spatial data engine. All geographic data (AEZ boundaries, country borders, soil polygons, point locations) must be stored as native PostGIS geometry objects in WGS84 coordinate reference system (EPSG:4326).

3.8.2 Web Map Interface:

The web platform must include an interactive map as the primary location selection mechanism. Users must be able to click a point on the map to automatically identify their location's country, regional AEZ (Semi-arid, Sub-humid, Humid), and country-specific AEZ sub-zone. Dropdown-only location selection is not acceptable as the sole interface. Recommended libraries: Leaflet.js or MapLibre GL JS (both free and open-source).

3.8.3 Mobile Map Interface:

The mobile application must include an equivalent interactive map with GPS-based location detection. Recommended: MapLibre Mobile SDK.

3.8.4 AEZ Boundary Layers:

The map must display AEZ boundary polygons as toggle-able overlays matching the existing FeSeRWAM AEZ taxonomy (regional: Semi-arid, Sub-humid, Humid; country-specific sub-zones per country). Boundary polygons must be sourced from or validated against the FAO/IIASA GAEZ dataset for Africa (available from Harvard Dataverse, doi:10.7910/DVN/HJYYTI, available for non-commercial research use — verify exact license terms with IFPRI before inclusion in platform documentation) and imported into PostGIS. The consultant must extract and validate the existing AEZ zone definitions from the current FeSeRWAM database during the assessment phase.

3.18.5 Spatial Query Engine:

Location-based AIP recommendations must use PostGIS spatial functions (ST_Within, ST_Contains, or equivalent) to determine the applicable AEZ for a given GPS coordinate. This replaces manual dropdown selection for location-aware queries.

3.8.6 GeoJSON API:

All spatial data (AEZ boundaries, country extents, point locations) must be accessible via GeoJSON-returning API endpoints to enable future integration with third-party platforms.

3.8.7 SSNM and AEZ Coexistence:

AEZ layers must remain active and functional when SSNM data is introduced (see Section 3.10). The two layers are complementary: SSNM provides precision recommendations where data exists; AEZ provides the default fallback for all other locations.

Next Phase

3.9 Integration of illustrative factsheets and guidelines

The service provider will integrate a minimum of 15 illustrative factsheets into the FeSeRWAM platforms. The exact list of factsheets shall be provided by IFDC and CORAF at inception phase and appended to the contract. Any addition or removal requires written agreement from both IFDC and CORAF. These pdf materials will provide clear and practical guidance on implementing techniques and practices that improve nutrient use, soil health, and water conservation. Each factsheet should be linked within the platform to relevant AIPs and crop systems, and easily accessible and downloadable by users.

3.10 Development of AIP profitability visualization

Based on the proof of concept developed and validated by the stakeholders, the platform will be enhanced with a feature that allows users to view the estimated economic performance of an AIPs. When an AIP is selected, the platform should display:

- Estimated input costs (e.g., seeds, fertilizers, soil amendments, other inputs);
- Estimated output value based on expected yields and market prices;
- A simplified overview of potential gross margin or profitability indicators.

This functionality aims to:

- Help extension agents and farmers better understand the economic implications of different AIPs;
- Facilitate comparison between alternative packages;
- Support more informed decision-making by farmers and advisory services.

The validated proof of concept, including UI wireframes, data inputs, and calculation methodology, is available. Bidders must base their technical proposal on this specification. Any deviation must be justified in writing.

3.10 Extension to Site-Specific Nutrient Management Recommendations Dual Layer Recommendation Engine

The platform shall maintain AEZ-based recommendations as the default layer for all locations. Where site-specific soil data is available (as provided by the Regional Hub), SSNM recommendations should be

displayed as a complementary precision layer. AEZ-based recommendations shall remain the fallback for all locations lacking validated SSNM data. The transition to SSNM is therefore additive, not a replacement. The service provider will:

- Review existing fertilizer recommendation logic within the platform;
- Create an API integration to connect FeSeRWAM with the site-specific nutrient management recommendation model developed by the Regional Hub for Fertilizer and Soil Health. This deliverable is conditional on the availability of a documented, accessible API from the Regional Hub at the time of contract award. If the API is not available, this sub-task shall be replaced with a documented integration architecture design, to be implemented in a subsequent phase.
- Adapt the recommendation engine to produce site-specific nutrient guidance where data is available

4. Deliverables

The developer shall deliver:

1. Inception report outlining the methodology, implementation plan, and timeline.
2. System Assessment Report
3. Centralized Architecture Design Document
4. Unified Database Structure
5. Fully Integrated Admin Portal
6. Updated Web and Mobile API integrations
7. Tested and deployed centralized system
8. Comprehensive guide that details steps to ensure rapid recovery in response to system events.
9. Complete Technical Documentation to assist in training the IFDC and CORAF technical team, and selected stakeholders and managing the platform to ensure knowledge transfer.
10. All software developed under this contract is a public good co-owned by IFDC and CORAF. The source code shall be released under the Apache 2.0 open-source license and hosted in a shared repository co-administered by both IFDC and CORAF. The selected firm retains no exclusive intellectual property rights over deliverables produced under this contract. IFDC and CORAF each hold equal rights to independently deploy, modify, and maintain the software.
11. Provide one-year warranty support covering the following: (i) Software bugs — defects in code causing incorrect behavior compared to agreed specifications, resolved within 5 business days of confirmed report; (ii) Security vulnerabilities — critical patches applied within 48 hours of disclosure; (iii) Exclusions — new feature requests, infrastructure failures, third-party API changes, and data entry errors are excluded from warranty scope. Warranty does not include hosting costs. A formal bug reporting process (ticketing system or equivalent) must be established at project handover.
12. Integration of approximately 15 illustrative factsheets within the FeSeRWAM platforms.
13. Operational profitability visualization functionality for Agricultural Input Packages into the platforms.
14. Upgraded fertilizer recommendation module supporting site-specific nutrient management.
15. Provided technical documentation describing system upgrades and functionalities.

5. Expected Outcomes

- One centralized database serving all platforms.
- Real-time synchronization between Admin, Web, and Mobile Apps.
- Elimination of data duplication and inconsistencies.
- Improved reporting accuracy.
- Scalable and secure architecture.
- Users have access to illustrative factsheets for clear guidance on soil fertility and crop management practices.
- Users can view the profitability of Agricultural Input Packages to support economic decisions.
- Fertilizer recommendations are site-specific, enabling more precise, locally adapted guidance.
- Technical documentation enables the understanding and management of system upgrades and functionalities.

6. Duration of Assignment

The assignment is expected to be completed within:

6 months, subject to detailed work plan approval.

The developer shall submit a detailed implementation timeline including:

- Phase 1: Assessment
- Phase 2: Architecture & Design
- Phase 3: Development & Migration
- Phase 4: Testing & Deployment
- Phase 5: Technical training for IFDC, CORAF, and selected stakeholders

7. Required Qualifications

The developer or firm must demonstrate:

- Proven experience in database architecture and migration.
- Strong backend development expertise (Node.js, Laravel, Django, .NET, or similar).
- Experience with mobile and web application integrations.
- API design and development expertise.
- Knowledge of cloud hosting environments (AWS, Azure, DigitalOcean, etc.).
- Experience in secure system implementations.
- Portfolio of similar centralization or enterprise-scale integration projects.
- Soil fertility management and nutrient management
- Integrated Soil Fertility Management (ISFM) and 4R nutrient stewardship
- Agricultural economics and farm-level profitability analysis
- User-centered design and agricultural extension tools.

8. Reporting Requirements

The developer shall:

- Report to the selected IFDC and CORAF employees with technical expertise.
- Provide weekly progress updates.
- Submit milestone reports.

- Seek approval before moving to subsequent project phases.

9. Budget and Resources

The applicant will provide a detailed breakdown of the budget required to conduct the tasks, including costs required, and any other necessary resources associated with a work plan and a clear calendar.

10. Application submission

The applicant should submit a detailed proposal outlining their approach to JToviho@ifdc.org. This should include a project plan with associated timelines, the proposed team structure with a brief on each team member's role, a cost breakdown, and deliverables timetable.

Annex — Current System Architecture (Required Pre-Bid Disclosure)

Bidders shall be provided with Annex D prior to proposal submission. If Annex D is unavailable at TOR issuance, the procurement timeline shall be suspended until IFDC produces this documentation. Bidders must base their technical assessment methodology on the information contained in Annex D. Without this information, bidders cannot accurately scope database normalization, API refactoring, or migration work. The annex must include:

- (i) Current hosting provider and infrastructure (cloud platform, server specifications, operating system).
- (ii) Backend technology stack (framework, language, version).
- (iii) Frontend technology stack (framework, language, version) both web and mobile.
- (iv) Current database engine and version, including schema diagram or entity-relationship model.
- (v) Existing API documentation (if any).
- (vi) Current admin portal technology and access method.
- (vii) Known technical debt, unresolved bugs, or documented issues inherited from previous development.
- (viii) Current domain, SSL certificate, and DNS management arrangements.

This annex must be finalized before the TOR is issued. Proposals received without access to this information will reflect inaccurate scoping and unreliable budget estimates.