

THE REPUBLIC OF UGANDA

**THE AGRICULTURE CLUSTER DEVELOPMENT PROJECT (ACDP)**

**TERMS OF REFERENCE**

**Consultancy services to develop an Agriculture Water Management Information System**

**Revised**

**March 2020**

# Background

Agriculture is of strategic importance to the Ugandan economy, contributing about 25% of the country’s annual GDP and providing livelihoods for almost 75% of its working population. The agricultural sector is fragmented and dominated by small holder farmers most of whom combine subsistence farming with cash crop and livestock farming. Although Uganda is able to rely on agriculture due to the country's excellent access to waterways, fertile soils, and the two seasons of rainfall, the country suffers from intermittent droughts. With increasingly unpredictable rainfall and more frequent prolonged dry spells, the result is a reduction in total agricultural production.

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) together with the Ministry of Water and Environment (MWE) jointly developed a National Irrigation Policy aiming at promoting irrigated agriculture, increasing efficient water use in irrigation and contributing to agricultural production and productivity.

Currently, the Government is in the process of developing a comprehensive National Irrigation Master Plan (NIMP) as a long-term plan that will guide irrigation planning and provide a strategic framework for prioritized investments for development of irrigation infrastructure to be technically feasible, economically viable, socially desirable and environmentally sustainable.

Uganda’s Vision 2040 mentions total irrigated area in Uganda to be approximately 14,500 ha (3.6%) of the total irrigable area which is estimated at 420,000 ha. The estimate for irrigable area has since been changing with the latest estimate by the Nile Basin Initiative at 3,000,000 ha. After field investigations and review of the available literature, this estimation will be confirmed.

Also, of the estimated 14,500 ha, commercial plantations occupy about 5,300 ha (36.6%) leaving the rest being shared between the 5 government irrigation schemes of Mubuku Irrigation Settlement Scheme (516 ha), Doho Rice Scheme (830 ha), Olweny Swamp Irrigation Scheme (500 ha), Agoro (13 ha), Kiige (60 ha), plus small-scale irrigation (300 ha). The current status of each scheme, actual crop yields compared to potential and research yields, management and extension system in every scheme should be established during field visits.

During the preparation of the National Irrigation Master Plan (NIMP), existing irrigation schemes and areas with irrigation potential will be identified and all their attribute information defined.

The preparation of the NIMP recommends development of an irrigation MIS where all this information such as irrigation coverage will be organized for access and decision making. In addition, the NIMP recommends incorporation of geographic locations of farmers, irrigation schemes, their water demand/use, available water at different locations of the river reaches to facilitate irrigation scheduling, market centers, among others. Such an MIS is envisaged to provide valuable information to evaluate water use efficiency for increased productivity, evaluation of success or failure of irrigation schemes/activities in Uganda.

Currently agriculture water data is scattered in different documents and also across different databases in different software, formats, and maintained by different agencies.

At the same time, operationalizing water use regulation through water rights and water permits requires data that is better managed in an information management system. Designing of a distribution management system with procedures for routine use, irrigation scheduling, water rights, water allocation, water availability, is key for proper farmer managed irrigation systems. This requires water balance studies, however these are outside the scope of this exercise given budget limitations.

Geographical Information systems (GIS) have been identified as a suitable option to organize and display water management information analysis, planning and decision making. A GIS aided system will enable integration of multi sectoral data such as climate data, water use data, soil data among others and provides a basis for establishment of spatial relationships, distribution and prioritization of future infrastructure investments. In addition, use of remote sensing data is increasingly becoming the most suitable option for obtaining information such as cropping pattern, planting and harvest time, irrigation coverage, area under irrigation and this needs to be incorporated.

The Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), through the Agriculture Cluster Development Project (ACDP) wishes to develop a GIS web based Agriculture Water Management Information System (AWMIS) as a component of the overall integrated web-based Agricultural Management Information System (AMIS).

Among the Ministry expected outputs are; development of Infrastructure and use of water for agricultural production along livestock, crop and fisheries value chains developed and supported and Sustainable systems to collect, process, maintain and disseminate agricultural statistics established.

It is against this background that MAAIF, through ACDP is seeking consultancy services of a competent firm to develop an Agriculture Water Management Information System (AWMIS).

# Objective of the assignment

The main objective of the consultancy services is to **collect, compile, design and develop** of a web-based Agriculture Water Management Information System (AWMIS).

The aim of the AWMIS is to provide a platform for visualization of spatial distribution of Agriculture water data and information there by improving service delivery through timely provision of accurate, well- organized data, to support evidence based decision making by various stakeholders.

# Scope of Work- Key Tasks

The scope of this consultancy is divided into three phases, namely the **inception Phase**, **Development Phase** and **Maintenance Phase** as shown below.

1. **Inception Phase**: During this phase, the consultant shall review existing literature on Agriculture Water for production including the National Irrigation Master Plan and Agriculture Sector Strategic Plan (ASSP), during a requirements gathering activity where existing data will be identified and compiled. During this phase field trips to carry out specific data collection will be carried out. This inception phase shall include an inception meeting with relevant stakeholders where the consultant presents their understanding of the assignment and also proposes the following;
   1. Data collection plan including a review of data collection tools. Data to be collected shall be limited to only Agriculture infrastructure with a water for production component. Such infrastructure include irrigation schemes, multi-purpose dams, and other infrastructure identified during literature review.
   2. System design and architecture,
   3. Content management system,
   4. System components,
   5. Hard ware and Software requirements,
   6. System Requirement Specifications (SRS)
   7. System performance and monitoring measurable indicators and plan
   8. Cloud services (NITA–U)
   9. Project implementation plan,
   10. System testing plan and optimization requirements
   11. Budget requirements.
2. **Development phase**: This phase shall include development of the system dashboard, thematic databases for the different components and development of the web-service. Using the implementation plan, software frameworks agreed to during the inception phase, the consultant shall independently develop a prototype which will be tested. Anticipated steps during system development include;
3. System development
4. Database development
5. System testing: Using the UT plan agreed upon during the inception phase, the Consultant and relevant ACDP and MAAIF staff- DAIMWAP will carry out user acceptance testing. The consultant shall address the changes as recommended and ACDP notified upon completion of this step.
6. Data migration. The client shall together with the consultant agree on the datasets to be uploaded into the system and their thematic areas.
7. System installation/deployment
8. Institutional Capacity building: The Consultant shall conduct a series of trainings to enable ACDP, MAAIF staff- DAIMWAP and district officials to fully use and maintain the system.
9. **System Maintenance Phase**: During this phase, the consultant will supervise the use and regular updating of content for the system, Fixation of bugs, incorporation of minor changes and provide trouble shooting solutions when needed for a period up to 1 year.

This will include on-the-job support and handholding (including in-person, telephone and on-line support), as well as formal courses at regular intervals throughout this assignment.

**NOTE:** The one (1) year of support and maintenance is not part of the activity period, the bidder/bidder will pledge to be available to support the developed system for a period of one (1) year after sign off.

**Documentation**: During the implementation of this assignment, the consultant shall document all processes including submission of an inception report, Development phase report and overall system report. Other documents expected include system manual including instructions for system use, maintenance, repairs, and upgrades.

**Ownership of Source Code and Products**

All tools, source code, data and information products under this contract shall belong to the Ministry of Agriculture, Animal Industry and Fisheries. Vendor advertisement or labels on the products are not acceptable and will not be allowed.

# Functionality requirements

The key functionalities of the AWMIS shall include, but not limited to the following;

1. The AWMIS shall be an integration of the identified system components accessed through a web – based platform.
2. The system shall be developed with compatibility with the overall MAAIF Agriculture Information Management System
3. The system shall be able to support emerging technologies and new trends on data analytics, artificial intelligence and machine learning
4. It shall be optimized for use on portable devices such as smart phones and tablet computers
5. The system shall be accessible with Chrome, Mozilla firefox and Internet explorer.
6. The AWMIS shall be a fully customizable, comprehensive and user-friendly geospatial system
7. The development shall be built on platforms and software frameworks that do not require annual licensing.
8. The system shall enable interactive visualization of map content with functionality such as hover over, pop-ups of attribute information, zoom in and zoom out, among others.
9. The ability to interactively visualize time series data, plotting functionality
10. The proposed solution shall be built with the capacity to generate a map and print it
11. Ability to handle GIS and remote sensing datasets both vector and rasters.
12. The system shall enable regular content updates by MAAIF staff through manual data entry, real time web based or mobile technologies.
13. The system shall enable downloading and sharing spatial data, PDF map CSV, and Zipped file including a search and filter capability by logged in users.
14. The system shall be able to produce periodic and on demand formatted reports
15. The system shall provide a visitors log, unique visits, new visits
16. It should be able to distinguish roles and rights for each type of user (system administrator, content manager, guest/user etc.
17. And other functional requirements identified during the inception phase.

# Expected Deliverables

The consultant is expected to deliver the following outputs;

1. Inception report including system design, system requirement specifications, implementation plan, training plan, data collection and compilation and Budget requirements
2. AWMIS platform with User manual (front end and back end manual)
3. User Acceptance report
4. Trainings as agreed during the inception phase

# Qualifications and experience of the firm

The interested firm should have at least five continuous years of experience, in the field of design and development of management Information systems.

The consultant will provide a team of experts with qualifications and experience in the field of software development, system design, database design and spatial data collection as shown in the table below.

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| **Expert** | **Qualification** | **Experience** |
| **Team Leader** | Minimum qualifications: MSc degree in software engineering, information technology, MIS, Computer science/Engineering or related field | A minimum of 7 years of professional experience in systems and information systems development, including management of web based development projects, supervision of agriculture related data collection and working with communities among others. |
| **Web developer/ programmer/System design** | Bachelor degree or higher in Computer Science, Information Technology (IT), engineering or related fields, Certificate in Web design and development is preferred. | A minimum of 5 years of Experience in development of web based software solutions, knowledge and experience of JavaScript, JQuery, HTML5, CSS3, Web Programming Skills, E-Commerce, cross-browser compatibility, Web User Interface Design (UI), Security Principles, Object-Oriented Design, Web Services (REST/SOAP), Multimedia Content Development, API's; Extensive designing and development of GIS feature based web based applications including interactive map development, data visualization, geodata conversion, geodata transformation and geospatial analysis. |
| **Database**  **specialist** | Masters level degree or higher preferred in Computer Science, Information Technology (IT), data management, or database administration.; | 5 years’ experience in information technology in database design, development and management and information systems; demonstrated experience with relational databases, GIS data structures such as raster and shapefiles, and database query languages. Experience in Agriculture Water datasets is an added advantage. |
| **Agriculture Water Management expert** | Degree in Agricultural Engineering, or Water Resources Engineering/ management/ Irrigation Engineer/ Hydrologist | A minimum of five (5) years’ experience in irrigation planning and development/ Agricultural infrastructure and development. Knowledge of Agricultural water management infrastructure/ water resources modelling is an added advantage |
| **GIS Analyst** | Degree in Geographic Information system, Geo informatics, Surveying, IT or related field | Atleast 3 years of experience in GIS related data management, Experience with standard, current GIS tools and technologies for data collection, Experience in use of GIS applications for water resources, is an added advantage |

# Level of effort

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| **Expert** | **Man Months** |
| **Team Leader** | 8 months |
| **Web developer/ programmer/System design** | 2 months |
| **Database specialist** | 2 months |
| **Agriculture Water Management expert** | 3 months |
| **GIS Analyst** | 2 months |

# Reporting obligation:

During this assignment the consultant firm will report to the Permanent Secretary of the Ministry of Agriculture, Animal Industry and Fisheries with day – to –day supervision by the ACDP GIS specialist

* The final reports should have revisions and recommendations incorporated;
* The bidder shall submit three (3) copies of the final report to the permanent secretary, Ministry of Agriculture. Copies will come in both hard and softcopies (readable format);
* The reports will be accepted subject to approval by the Permanent Secretary on recommendation of the evaluation committee, comprising of the technical team;
* MAAIF will be the absolute owner of the application, and will have full ownership, and the bidder shall not replicate, or reproduce or use any software datasets used for this assignment without prior consent of the owner.
* The system will be review by MAAIF staff from DAIMWAP
* MAAIF staff shall supervise data collection
* MAAIF staff shall support user acceptance testing and participate in system training.

# Duration and Time lines for the assignment

The duration of the assignment will be eight (8) months.

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| **Activity** | **Month 1** | **Month 2** | **Month 3** | **Month 4** | **Month 5** | **Month 6** | **Month 7** | **Month 8** |
| **Inception Phase** |  |  |  |  |  |  |  |  |
| Requirements gathering |  |  |  |  |  |  |  |  |
| Literature review |  |  |  |  |  |  |  |  |
| Data collection |  |  |  |  |  |  |  |  |
| System design |  |  |  |  |  |  |  |  |
| Inception report |  |  |  |  |  |  |  |  |
| **Development Phase** |  |  |  |  |  |  |  |  |
| Database design |  |  |  |  |  |  |  |  |
| Interface and System design |  |  |  |  |  |  |  |  |
| Data migration |  |  |  |  |  |  |  |  |
| System deployment |  |  |  |  |  |  |  |  |
| Documentation |  |  |  |  |  |  |  |  |
| Capacity building of MAAIF staff |  |  |  |  |  |  |  |  |
| **Maintenance Phase** |  |  |  |  |  |  |  |  |
| Hand over |  |  |  |  |  |  |  |  |
| Training |  |  |  |  |  |  |  |  |