

# IGAD Center for Pastoral Areas and Livestock Development (ICPALD), Regional Pastoral Livelihoods Resilience Project (RPLRP)

# Consultancy to Establish Regional Range/Fodder Monitoring and Forecasting System for Early Warning Application

# Terms of Reference

# Background

The Greater Horn of Africa (GHA) region is considered by the Intergovernmental Panel on Climate Change (IPCC) as one of the most vulnerable regions of the world to climate change, particularly the arid and semi-arid lands (ASALs). The ASALs is home for pastoralist and agro-pastoralist communities who are dependent on livestock rearing and largely characterized by bimodal rainfall system: long rain season during March, April and May months and short rain season during October, November and December months. The two rainy seasons are followed by dry season, predominated by shortage of natural fodder and water resources, especially if seasonal precipitation (amount and distribution) is below long-term average.

An effective and efficient early warning system (PWS) for pastoralist and agro-pastoralist requires a reliable and timely forage availability forecast method, estimated based on environmental variables. Potential fodder production forecast of a season helps to manage pastoralist risk especially during drought period. It augments local, national and regional efforts to support vulnerable communities in ASALs. The task of forecasting can be executed by incorporating remote sensing and GIS technologies with modeling in order to estimate biomass (forage) production and availability based on forecasted climatic and other environmental parameters.

The work of range fodder early warning in some of the IGAD member States so far depends on assessing range/fodder condition, without forecast into the future, which has a limitation in providing early warning information for preparedness and response. There are also efforts in other part of Africa, case in point is the rangeland monitoring tool domiciled in AGHYMET, Niamey for the SAHEL region. The system relies on both remotely sensed data and ground verification on available seasonal range condition and does not involve seasonal forecast into the future.

The distribution of precipitation during the rainy season modulated by their redistribution by surface runoff is a determining factor in the production of biomass and vegetation cover. The planned fodder biomass forecast will be based on seasonal climatic forecast produced by IGAD Climate Prediction and Application Centre (ICPAC) and other international centers that includes rainfall, temperature, vegetation condition, etc combined with other biophysical features of the target area, including soil type, terrain and land use. The system will be able



to provide timely information on the availability of fodder at different spatial scales (local, zonal, national and regional) by estimating fodder production during and at the end of the two rainy seasons, with a view to establish effective prediction of fodder situation for an early warning purpose.

The IGAD Climate Prediction and Applications Centre (ICPAC) already provides medium range and extended climate forecasts. ICPAC uses two techniques to provide climate outlooks namely dynamical and statistical forecast approaches; with the latter being derived from WMO Global Producing Centers amongst others. The seasonal climate forecasts has been a blend of the two techniques and more recently ICPAC is generating a WMO standard objective forecast products which provides continuous surface estimates in probabilities and amounts. ICPAC has all the infrastructure and capability to access and process up-to-date satellite images for environmental monitoring. With accessibility to reliable E-station data from ICPAC's climate related products such as NDVI, RFE and other satellite derived products, these data inputs will be used for a comprehensive outlook on seasonal ASALs rangelands.

Accessibility to water and quality pasture are the driving force which often are not limited to national boundaries but are cross border in nature and are intensified during the dry season or drought conditions. Cross-border and seasonal livestock mobility is an inherent adaptive and coping strategy for pastoralists to optimize production under a heterogeneous landscape often characterized by high spatial and temporal rainfall variability. The proposed prototype rangeland fodder monitoring and forecasting system will build up on existing effort at regional and member's states levels and will focus on cross-border areas.

# About the RPLRP

The Regional Pastoral Livelihoods Resilience Project (RPLRP) is World Bank funded initiative and it is part of the broader food security resilience building initiative in the Horn of Africa. The RPLRP has been implemented concomitantly in three IGAD member States (Kenya, Ethiopia and Uganda) under the general coordination of IGAD, within the framework of the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI). The parallel RPLRP project in the three countries converge at IGAD level, giving regional context. The Project objectives are to enhance livelihood resilience of pastoral and agro-pastoral communities in cross-border drought prone areas of selected countries and improve their capacity to respond promptly and effectively to an eligible crisis or emergency. The focus of IGAD RPLRP are policy harmonization, knowledge exchange on good practices across the countries and coordination of cross-border activities.

The project has five main components: PC1, Natural Resources Management: aims at enhancing the sustainable management and secures access of pastoral and agro-pastoral communities to natural resources (water and pasture) with trans-boundary significance. PC2, Market Access and Trade: aims at improving the market access of the agro-pastoralists and pastoralists to the intra-regional and international markets of livestock and livestock products. PC3, Livelihood Support: aims at enhancing the livelihoods of pastoralist and



agro-pastoralist communities. **PC4, Pastoral Risk Management**: aims at enhancing drought-related hazards and preparedness, prevention and response at the national and regional levels. **PC5, Project Management and Institutional Support**: focus on all aspects related to overall project management, including monitoring safeguard mitigation measures identified in the different frameworks disclosed, and institutional strengthening at national and Regional levels for drought resilience.

This task will contribute to RPLRP component one, Natural Resources Management that aims at enhancing the sustainable management and secures access to natural resources (water and pasture) for pastoral and agro-pastoral communities with trans-boundary significance. Consequently this will also build up on resilience efforts to the vulnerable cross border communities. It also contributed to component four of the project that aims at enhancing drought-related hazards and preparedness, prevention and response at the national and regional.

### Scope of the work for the consultant

The IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) is seeking a highly qualified Geospatial Developer consultant (s) under the RPLRP, to design and customise a prototype rangeland monitoring and forecast system for the cross-border areas of IGAD. This monitoring tool will disseminate vital information to decision makers related to biomass productive potential of the rangeland in a season. It will be useful monitoring tool for trend over time and to plan responses at different stress scales as well as for early warning. Geographically the focus of this assignment will be two cross-border areas, namely Karamoja Cluster (Uganda-South-Sudan-Kenya-Ethiopia) and IGAD's Cluster 2 (Kenya-Ethiopia-Somalia). Specifically it covers Karamoja (Districts) region in Uganda; West Pokot, Turkana, Marsabit, Wajira and Madhera counties in Kenya; South Omo, Borana and Dawa Zones in Ethiopia; Gedo region in Somalia.

Rangeland fodder early warning system will have different component of analysis (i) mapping of land cover of the target area (ii) seasonal rainfall and other environmental parameters (iii) the development of statistical model for rangeland prediction based on the functional relations of Rainfall (RF) and Normalized Difference Vegetation Index (NDVI). The Rangeland Early Warning is to develop predictive Statistical models that is based on the three indicators of RF, NDVI and Biomass production within pre-determined land cover types based on in-depth analysis of deriving bio-physical and human factors.

# Specific Task includes but not limited to:

- a. Review existing rangeland monitoring system in Africa (Kenya NDMA and AGHYMET of Sahel) and elsewhere;
- b. Using recent satellite image and other secondary sources to produce base map including land use, other environmental parameter of target areas (Uganda-Kenya-South Sudan-Ethiopia-Somalia);



- c. Produce a baseline data on past drought disaster in the interest area;
- d. Identify and characterize key indicators for monthly/seasonal monitoring and forecasting of rangeland conditions and provide guidance on development and design of data & products for the effective, timely and informative rangeland early warning system;
- e. Develop an applications portal for rangeland monitoring and forecasting and its related products;
- f. Design innovative map viewer for dashboard, analytics for the geospatial data such as but not limited to statistics/reports, info graphics on trend analysis of key parameters, and configure map designs and web apps on the portal;
- g. Populate test data for the apps portal and integration of other spatial and non-spatial data;
- h. Conduct data quality assurance and quality control, standardizing and synchronizing spatial & non-spatial databases;
- i. Develop automate backup and recovery of the virtual machine that will host geonode;
- j. In house training and user manual preparation and training;
- k. Provide technical and creative expertise to create, manage and update content in the geoportal for the effective functionality of geoportal.

### **Expected Deliverables**

- a. An inception report on a conceptual framework and work plan;
- b. Prepare key indicators for monitoring and forecasting rangelands based on multiple indicators, with possibility of peer review
- c. Produce base map spatially depicted climate and environmental parameters using national, continental and global data,
- d. Development of customized rangeland monitoring and forecasting tool that will include; designing and setting up a geoportal interface and Interactive map viewer;
- e. Automate Backup and recovery of the virtual machine that will host geonode; and
- f. Manuals for maintenance, user and training.

#### **Consultancy Location and Office Accommodation**

Throughout the assignment, the consultant will be based at ICPAC with regular meeting with coordinator at ICPLAD and use office accommodation and facilities.

#### Equipment

ICPAC will provide work station, data and necessary software for this work. The consultant will access photocopying, telephone and Internet facilities from ICPAC office while doing his/her field work in the member states.

#### **Consultancy Duration and Fees**



- The consultancy work shall start within 15 (fifteen) days after signing of work contract with IGAD,
- The consultancy is fixed at a maximum of 120 person-day spread over a period of 8 months, and
- Validation of the work will be continuous process based on availability of additional funding.

# Qualifications Education Academic Qualifications

• Master's degree or equivalent in Computer Science, Information Technology, Geospatial engineering, Geographical Information Systems (GIS) or related field.

# Work Experience and other competencies

- Strong analytical skills and environmental modeling preferably on rangelands and pastoral and agro-pastoral livelihood systems.
- Proven track record of spatial data analysis and design of a systematic and sound methodology
- Design, implementation and maintenance of spatial database using either commercial or open source technologies.
- Design, implementation and maintenance of web mapping application or Geoportal
- Experience working with Geoserver, Mapserver, ArcGIS server, Window based server
- Strong skills and experience in application programming in one or more of the following languages: Python, Javascript, Java, HTML, CSS
- Knowledge and implementation experience of open standards for geospatial web services (e.g. WMS, WFS, WCS)
- Experience working with time series raster datasets will be an added advantage.

# Work experience

- At least 2 years working experience in application development, maintenance and operation
- At least 5 years working experience with GIS and/or RS

# Other Experience/ Knowledge / Abilities

- Self-starter with the ability to strategically plan information and knowledge management work.
- Strong interpersonal skills and experience of working with regional and international organisations.
- Verbal and written communication skills in English. French will be added advantage.

# **Selection Criteria**



• The selection criteria are education, relevant work experiences (as described above), good track record in delivering assignment, experience of working in IGAD region and familiarity with Pastoralism context and rangelands.

# **Reporting Requirements and Time Schedule for Deliverables**

The Consultant will work under the direction and guidance of the RPLRP Project Coordinator (PC) and technical supervision of ICPAC's DRM GIS Specialist. The output's indicated above will be approved by the PC and any payment will be subject to this approval. The reports referenced herein will conform to a format approved by ICPLAD. All paper copies of the deliverables must be accompanied by electronic versions in the respective Microsoft Office application format (e.g: MS Word for documents, MS Excel for spreadsheets), all images shall be provided in an editable digital format (e.g. high quality JPG or PNG).

#### Insurance cover

The consultant will be responsible for his/her own medical and life insurance covers for the duration of the assignment.

#### Taxes

The consultant will be responsible for remitting his/her own taxes.

#### Report will be submitted to

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