



**IGAD Centre for Pastoral Areas and Livestock Development (ICPALD)**  
**Consultancy to Expand and Improve Regional Range/Fodder Monitoring**  
**and Forecasting System for Early Warning Application**  
**Terms of Reference (ToR)**

**Background**

IGAD was established in 1986 to mitigate the effects of recurrent drought and environmental degradation, boost agricultural production, and facilitate sustainable management of natural resources. IGAD came into being also to protect the environment while simultaneously pooling resources for their regional development efforts. With the emerging political, security, and socio-economic challenges, the Assembly of Heads of State and Government in 1996 resolved to expand IGAD's mandate to include cooperation and integration, peace and security, and socio-economic dimensions. IGAD region members include Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan, and Uganda. IGAD's mandate is to promote the resilience of the region through regional cooperation and integration, fostering peace and security, boosting agricultural sector development, facilitating sustainable management of natural resources, and environmental protection.

The IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) was established in July 2012 as an IGAD Specialized Institution mandated to "promote and facilitate sustainable and equitable drylands and livestock development in the IGAD region." To fulfil its mandate, ICPALD provides a platform for regional cooperation and coordination in drylands, pastoralism, and livestock development. ICPALD thrusts in the improvement of animal health, production and marketing, enhanced dryland production and pastoralism, including value-added alternative livelihood products from non-wood rangeland products (NWRP) and artisanal minerals (in areas of production) with the aim of bringing positive impacts on food and economic security, especially in rural pastoral populations. Regional cooperation and coordination of actions based on evidence of risks to shared resources, animal feed security, climate change adaptation and mitigation, animal health, and the evaluation of other factors of production and consumption remain the principal means of achieving these benefits.

**About the Program to Build Resilience for Food and Nutrition Security in the Horn of Africa (BREFONS)**

IGAD has secured funding from African Development Bank (AfDB) for BREFONS Program. The objective of the Program is to build resilience for food and nutrition security whilst contributing to improved living conditions - particularly for women and youth, increasing resilience to the effects of climate change. This regional component is part of the regional investment operation, which will be implemented in 6 countries: Djibouti, Ethiopia, Kenya, Somalia, South Sudan, and Sudan. The Program is expected to (i) increase the productivity of



agro-pastoral production systems, (ii) increase incomes from agro-pastoral value chains, and (iii) enhance the adaptive capacity of the people to better prepare for and manage climate change risks and variation. The Project will provide a regional approach in order to bring an integrated package of interventions to build resilience in target communities within the six beneficiary-countries. The Regional Component's Executing Agency is IGAD IDDRSI and will be implemented by the ICPALD, ICPAC, IITA/TAAT and CIAT over a period of four-five calendar years.

Under Outcome 1, Increased Resilience of Agro-pastoral Production System, ICPALD will undertake three main actions that will result in the promotion of Sustainable Management of Agro-pastoral Lands: 1) Operationalization of the IGAD Regional rangeland management strategic framework 2) Operationalisation of cross-border MOU signed by Ministers to enhance TADs and Zoonosis control in cross-border areas 3) Enhancing the competitiveness of livestock value chains in the IGAD Region through compliance with SPS measures and market research under AfCFTA.

As part of operationalising IGAD regional rangeland management strategic framework, ICPALD will support the expansion of regional predictive rangeland forage monitoring tool for early warning and early action. An effective and efficient early warning system (EWS) for pastoralists and agro-pastoralist requires a reliable and timely method of rangeland feed availability forecast estimates based on environmental variables. Potential rangeland feed forecast of a season helps to manage pastoralist risk, especially during drought periods. It augments local, national and regional efforts to reduce the risk vulnerability of pastoral and agro-pastoral communities. The task of forecasting can be executed by incorporating remote sensing and GIS technologies with modelling in order to estimate biomass (forage) production and availability based on forecasted climatic and other environmental parameters.

The distribution of precipitation during the rainy season modulated 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 data relayed from the E-station at IGAD Climate Prediction and Application Centre (ICPAC) and other sites that include but not limited to 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 rangeland feed (grazing and browsing) at different spatial scales by forecasting into three months, during and at the end of the rainy seasons. Thus, the system aims to establish effective prediction of natural feed conditions for the purpose of early warning and preparedness.

The IGAD Climate Prediction and Application 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 Centres, amongst others. The seasonal climate forecast has been a blend of the two techniques. ICPAC, more recently, is generating a WMO standard objective forecast product which provide continuous surface estimates in probabilities and amounts.



Furthermore, ICPAC has all the infrastructure and capability to access and process up-to-date satellite images for environmental monitoring.

IGAD Center for Pastoral Areas and Livestock Development (ICPALD) has already mapped some of the cross-border area livestock migratory patterns, land use land cover and invasive plant species. Furthermore, ICPALD has rangeland and livestock technical expertise. With accessibility to reliable E-station data from ICPAC's climate related products and data domiciled at ICPALD, these data inputs will be used for a comprehensive outlook on seasonal ASALs rangelands. Therefore, the proposed prototype rangeland fodder monitoring and forecasting system will build up on existing efforts at regional and member states' levels focusing on cross-border areas.

### **Scope of the work for the consultant**

The IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) is seeking a highly qualified Rangeland and Geospatial Analyst as a consultant under the BREFONS, to design and customise a prototype rangeland feed monitoring and forecast system for the cross-border areas of IGAD region. This task has a component of developing a model for rangeland feed situation forecast and a platform for disseminating the information to decision makers. The geographic interest area includes cross-border areas shared between South Sudan-Sudan and cross-border areas shared between Ethiopia and Somalia and Kenya-Ethiopia. The geographic scope of the two clusters will be determined based on uniform rainfall patterns and agro-pastoral ecology.

The task of building a rangeland feed early warning/forecasting system will have different components that feed to each other: (i) reviewing the secondary data domiciled at ICPALD and ICPAC and filling data gaps from available sources, including primary data collection for environmental parameters (ii) develop/improve the statistical model for rangeland prediction based on the functional relations of Rainfall (RF) and preferred vegetation indices (NDVI, VCI, etc.). It is a predictive statistical model 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. (iii) And establish a web platform for dissemination.

### **Specific Task includes but not limited to:**

- a. Review existing rangeland monitoring systems in ICPAC and ICPAD, and elsewhere;
- b. Identify and, characterise key variable indicators for monthly/seasonal monitoring and forecasting of rangeland conditions (to 3 to 6 months) and provide guidance on the development and design of data & products for the effective, timely and informative rangeland early warning system;
- c. Work to operationalise the biomass forecasting system and support system integration in the existing web platforms
- d. Add impact-based forecasting to the early warning system for Rangeland areas.



- e. Produce a baseline land cover map in the interest area, including mapping of unpalatable invasive plant species distribution.
- f. Design/improve innovative visualisation (dashboard), on-the-fly analytics for the geospatial data such as but not limited to range statistics/reports, infographics on trend analysis of key parameters (time series), and configure map designs and web apps on the portal;
- g. Populate data for the apps portal and integration of other spatial and non-spatial data;
- h. Conduct data quality assurance and quality control, standardising and synchronising spatial & non-spatial databases;
- i. Automate the system, including backup and recovery of the virtual machine that will host geo node to be mirrored in two server sites; ICPAC & ICPALD
- j. In-house training and user manual preparation and training sub-manuals;
- k. Provide technical expertise to create, manage and update content in the portal 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 variable indicators, with the possibility of peer review
- c. Produce base land cover maps of the two clusters spatially depicted climate and environmental parameters using national, continental and global data,
- d. Develop/operationalise customised rangeland monitoring and forecasting tool that will include impact-based forecasting
- e. Design/improve, and set up a dedicated web interface and interactive visualisation dashboard for the rangeland with full analytical and reporting capabilities;
- f. Automate the entire process of the rangeland biomass forecasting system, also including backup and recovery of the virtual machine that will host the system; and
- g. Undertake training for ICPALD and ICPAC staff and member states, as required.
- h. Produce detailed user Manuals for maintenance and training.

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

The consultant will be closely working with assigned technical staff from ICPAC and ICPALD by regularly holding physical and virtual meetings and visit.

### **Equipment**

The consultant will use his/her office accommodation and facilities. ICPAC will provide data and necessary software for this work. During the visit, the consultant will access photocopying, telephone and Internet facilities from ICPALD/ICPAC.

### **Consultancy Duration and Fees**



- The consultancy work shall start within 15 (fifteen) days after signing of the work contract with IGAD,
- The consultancy is fixed at a maximum of 60 person-day spread over a period of 4 months, and
- Validation of the work will be a continuous process based on the 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 a related field from a recognised university.

### **Work Experience and Competencies**

- At least three years of working experience in geospatial application development and programming,
- Strong analytical skills and environmental modelling 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,
- Experience in GIS Programming, Web Development & Design,
- Application Development and Programming skills in Python, R, & JavaScript,
- Knowledge of GIS Analysis, GIS Modelling, Data Integration & Conversion, Data Analysis, Geocoding,
- Experience in database management: GIS database design and management using ESRI and open-source technologies.
- Development and documentation of preferred code in English is required and
- Good IT technical skills

### **Other Experience/ Knowledge / Abilities**

- Self-starter with the ability to strategically plan information and knowledge management work.
- Strong interpersonal skills and experience working with regional and international organisation (s).
- 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 similar assignments, the experience of



working in the IGAD region and familiarity with Pastoralism and rangeland context.

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

The Consultant will work under the direction and guidance of the ICPALD Livestock Health Officer and the Technical Team comprising of ICPAC's DRM GIS Specialist, ICPALD GIS & Remote sensing Expert and Livestock/rangeland specialists. The outputs indicated above will be approved by the Project Coordinator (PC), and any payment will be subject to this approval. The reports referenced herein will conform to a format approved by ICPALD. 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), and all software submitted with source code.

### **Payment Schedule**

<b>Output/ activity completed.</b>	<b>Payment in percent of the contract amount</b>	<b>Estimated date of completion</b>
The signing of contract and approval of inception report	30%	Inception report within 15 days of signing the contract
Base land cover maps and develop a methodology (peer review) and Pilot the system and produce the product	50%	After three months
Validation of final product	20%	Approved

### **Insurance cover**

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

### **Taxes**

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

### **How to Apply**

Interested candidates should submit their applications accompanied by a detailed CV, copies of both academic and professional certificates and testimonials, names and addresses of three reputable referees, contact details (e-mail, telephone) by email to: [beverlyne.nyanchera@igad.int](mailto:beverlyne.nyanchera@igad.int)

All applications should be received not later than 7<sup>th</sup> April 2023

***IGAD shall only respond to shortlisted candidates***