Global Monitoring for Environment and Security & Africa

(GMES & Africa)

North Africa Consortium

CALL FOR TENDERS

FOR AFRICAN CONSULTING STARTUP

FOR THE DEVELOPMENT OF A CHATBOT FOR CROP DISEASE DETECTION AND PREDICTION IN NORTH AFRICA

[CT/OSS/GMES-Chatbot_CropDiseas/070325-14]

March 2025

1. Introduction

GMES & Africa is a cooperation framework for the development and implementation of Earth Observation (EO) based services that support sustainable development in Africa. The programme focuses on improving the sustainable management of natural, water, marine, and coastal resources through the use of EO technology. Its overall objective is to support decision-making in the sustainable management of water and natural resources through products and services based on EO data and techniques.

The Sahara and Sahel Observatory (OSS) is among the consortia of institutions selected by the African Union Commission (AUC) to serve as Regional Implementing Centres for the GMES&Africa Support Programme. OSS is thus leading the GMES North Africa Consortium which is implementing the project entitled **"Earth Observation for Sustainable Land and Water Management in North Africa" (EO4SLWM-NA)**. This project is conducted in partnership with North African key institutions involved in the promotion and development of EO: CNCT, DRC, LCRSSS, UN, and TENMIYA NGO[1] for the national level; CRTEAN and CRASTE-LF for the regional level.

As part of the implementation of the **GMES & Africa in North Africa**, 2 operational services are being consolidated:

- **Service 1 -** Water Abstraction and Seasonal Agriculture Monitoring.
- **Service 2 -** Land Degradation Monitoring and Assessment.

2. Context and rationale

Agriculture in **North Africa** plays a vital role within the North African countries. However, the agricultural sector faces significant challenges. Among these challenges, crop diseases and weeds are becoming more of a concern, causing significant yield and income losses and a major threat to food security. The diseases and weeds are often favored by specific climatic and environmental conditions (humidity, temperature, wind, radiation, etc.), that can be monitored using satellite imagery and agrometeorological data.

According to a widely cited FAO figure, **around 20-40% of the world's crops are lost due to pests alone**. The damage caused by weeds is seen in various ways and seriously affects various agricultural processes. Weeds cause problems due to competition with crops for nutrients, water, and light, the release of root exudates and foliar leachates toxic to crops, the creation of a favorable habitat for the proliferation of other pests (arthropods, mites, pathogens, and others), serving as hosts for them; and finally, interference with the normal harvesting process and contamination of produce. [2]

Like many regions in Africa, the smallholder farmers in **North Africa** often lack timely and accurate information on crops' health. To address this issue, digital surveillance and early and automated detection or prediction of weeds and diseases are essential, to issue alerts and precise recommendations to stem and treat this phenomenon, which helps to reduce efficient treatments cost, the use of chemical pesticides as well as yield losses. Furthermore, climate and climate forecast data could provide insights into the probability of dispersal of weeds and diseases.

[1] CNCT: Tunisian National Center of Mapping and Remote Sensing; LCRSSS: Libyan Centre for Remote Sensing and Space Sciences; DRC: Egyptian Desert Research Center; UNA: Mauritanian University of Nouakchott; CRASTE- LF: African Regional Centre for Space Science and Technology Education in French Language based in Morocco; CRTEAN: Regional Center for Remote Sensing of North Africa States, Tenmiya NGO.

[2] https://www.fao.org/4/a0884e/a0884e.pdf

In this regard, the use of digital technologies, especially Artificial Intelligence (AI) could help improve disease surveillance and management. Better still, the establishment of a chatbot-based solution leveraging AI could help provide real-time diagnosis, prediction, and advisory services for plant health management via mobile and web applications.

The current Terms of References (ToRs) aim to **guide the design, development, and implementation of this chatbot-based solution**, ensuring its accessibility and usability through a mobile application and a web platform. As input from the farmer/agricultural manager, this solution is expected to ingest photos of diseases and weeds, voice or text descriptions in the local dialect, and thus ask for agriculture advice, to translate these into actionable information (e.g. disease type, weed identification, and management, actions to be undertaken according to the agricultural itinerary provided by the technical institution, etc.). Indeed, the chatbot will act as a vulgarization agent that provides customized recommendations to farmers with localized advice on the appropriate treatments for weeds and diseases as well as agricultural best practices to be undertaken according to the crop type.

In this consultation, the expected chatbot can be described as an AI-powered virtual assistant that interacts with users through images, text, or voice-based communication. The chatbot developed for this project will assist farmers in North Africa by detecting and predicting weeds and crop/plant diseases using Artificial Intelligence (AI) technologies. As field data is entered and processed by the chatbot, the application will have to gradually compile it to enrich and update the database on plant diseases.

The chatbot must integrate Earth Observation (EO), remote sensing, and meteorological data to deliver accurate, data-driven recommendations. Its components and resources will be hosted on a compliant infrastructure within the OSS premises.

3. Objectives

The objective of the consultation is to **develop an intelligent chatbot capable of timely and efficiently detecting and predicting crop diseases, while identifying weeds, and providing the stakeholders (farmers, technical assistance teams, extension officers, agricultural experts, etc.) with recommendations** for their preliminary treatment and management.

Specifically, the chatbot must be able to:

- Identify weeds and crop diseases using AI-powered image recognition and symptom-based queries, by analyzing photos of stems and/or leaves, or voice messages describing the observed symptoms.

- Predict disease outbreaks by integrating EO-derived products, and environmental, climate, and agronomic data.

- Recommend treatments based on the identified diseases and weeds, including technical itinerary for specific crops.

The chatbot should support farmers in tracking disease and weed trends via an intuitive dashboard and applying corrective actions. It should be able to function seamlessly on mobile applications (Android/iOS) and a dedicated web portal and support the national vulgarization agencies for impactful actions on the ground.

4. Strategic crops

North Africa region is characterized by diverse climatic zones, ranging from hyper-arid deserts to Mediterranean coastal areas. The agricultural sector and the economies of these countries rely on strategic crops for which it is essential to ensure their health and resilience to weeds, pests, and diseases as well as recommendations from technical itineraries for major crops such as cereals where INGC will provide the technical references for cereals.

For this consultancy, 12 strategic crop and fruit tree families (table below) are proposed to be considered for the chatbot, and their selection is based on their economic importance, adaptability to climatic conditions, and vulnerability to weeds, pests, and diseases.

Family	Type	Importance	Major threats & diseases
Cereal and Grain Crops	Durum Wheat	Essential for bread and pasta production	Rust, smut, blight, Septoria tritici blotch tan spot
	Barley	Used for food, fodder, and brewing	Powdery mildew and root rot, Rhynchosporium secalis
	Maize (Corn)	A versatile crop	Fungal infections like maize lethal necrosis
Legumes and Pulses	Chickpeas	Rich in protein	Ascochyta blight and Fusarium wilt
	Fava Beans	Widely consumed in Egypt and Morocco	Chocolate spot disease and rust
	Olives	A major cash crop in Tunisia, Morocco, and Algeria	Olive knot, Verticillium wilt, Anthracnose
	Date Palm	Domestic consumption and export markets	Fusarium wilt and Bayoud disease
	Citrus Fruits (Oranges, Lemons, Mandarins)	A key export commodity	Citrus greening and black spot disease; Anthracnose
	Grapes	Important for both domestic consumption and export markets	Downy mildew, powdery mildew, and Botrytis bunch rot
	Tomatoes	A widely grown vegetable	Early/late blight, bacterial wilt, and nematodes
Other Key Crops	Potatoes	Important for food security	Late blight, bacterial wilt, and nematodes
	Onions & Garlic	Commercially grown	Downy mildew and onion white rot
	Weeds	Improve crop growth and related yield	-

The company that will be in charge of the development of the chatbot will have to compile and exploit consistent knowledge databases which they will have to provide on the above-mentioned crop types, in combination with other data sets judged relevant.

5. Scope of Work

The scope of this work to be performed by the selected company will be structured around 4 main sections. These aspects, as well as the tasks assigned to them, are detailed below.

5.1. System design and development

This section is fundamental, and the selected company will be responsible for the following tasks:

- Develop the chatbot with AI-driven Natural Language Processing (NLP) and image recognition capabilities that integrate a comprehensive database of weeds and plant diseases, symptoms, and treatments. The identification and prediction take into integration also agrometeorological variables derived from EO data. This takes into consideration also the vulgarization through a predefined technical itinerary of specific crops such as cereals;
- Develop AI models to predict potential weeds and disease outbreaks based on weather patterns and knowledge expert's field data (mainly photos and satellite images coupled with statistics);
- Ensure chatbot functionality across multiple digital platforms, namely a mobile and web application (specifications will be given regarding the development of the web applications), and evolution so that it can be used for other regions and crops.

5.2. User interface and experience (UI/UX)

This section will be developed based on a mockup and a graphical charter proposed by the Company and validated by OSS. The company will thus have to:

- Design an intuitive and user-friendly interface for farmers, extension officers, and agricultural experts.
- Ensure accessibility features for users with limited digital literacy.
- Implement multi-language support (Arabic, French, English) for diverse user engagement.

5.3. Data integration and management

To provide the required information on the 12 above-mentioned crop and fruit tree diseases as well as known weeds, the chatbot relies on a knowledge database and agricultural research made of a technical itinerary of specific crops as well as a repository of weeds and plant diseases, symptoms, and treatment methods. The Company will have to manage the collection and preparation/update of this database, which needs to be extensible to integrate additional diseases and treatments for missing crops and weeds/diseases. For cereals, INGC-Tunisia will be in charge of sharing the technical itinerary for cereals.

The chatbot is expected to enable the integration with North African countries' agricultural extension services, vulgarization agencies, and institutions databases for continuous knowledge updates, by ensuring data privacy and security following best practices. Also, for the weeds and crops disease outbreak prediction, it is expected that the chatbot integrates near-real-time data sources such as satellite imagery, weather/climate, environmental, agronomic data, etc.

5.4. Testing & Deployment

The company which will be in charge of the development of the chatbot will have to:

- Conduct and document rigorous testing to ensure the accuracy, reliability, and efficiency of chatbot responses. This includes information on error metrics.
- Pilot the solution with target users (farmers, agricultural experts, and extension officers) to gather their feedback. The chatbot must make it possible for the users to rate their satisfaction.
- Deploy the chatbot on mobile app stores (Google Play, Apple Store) and a dedicated web platform.

6. structured flowchart illustrating the chatbot workflow

Below is a structured flowchart illustrating the chatbot's proposed workflow.

7. Deliverables and duration of the Mission

The services have to be developed within **90 calendar days after the date of signature of the contract**. The key deliverables are mentioned in the table below for validation by the steering committee:

Expected deliverables	Number of days of the action
L-1: The scoping report (highlighting the chatbot's scientific background, architecture and components, the different data and indicators used, etc.) marking the start of work.	5 days
L-2: The functional prototype of the chatbot with disease detection and prediction capabilities, up and running, and accessible via a fully functional mobile application (Android and iOS) and Web platform integrating the chatbot deployed on the OSS server. The functional prototype is delivered with the database of weeds and plant diseases, symptoms, technical itinerary, and control measures.	40 days
L-3: The full technical documents of the solution as well as the capacity-building kit relating to the chatbot and the associated mobile and web applications.	60 days
L-4: Communication material including: (i) short demonstration videos summarizing the interfaces of its functionalities, and (ii) promotional videos on the use of chatbot, highlighting specific functionalities or outputs.	65 days
L-5: The training sessions on the administration and maintenance of the chatbot system along with the training kit. The training sessions will be conducted in virtual mode.	70 days
L-7: Training sessions on the use of the chatbot for the benefit of GMES project partners.	75 days
L-8: The final regional version of the chatbot (including the associated mobile and web applications), incorporating user feedback, deployed on the OSS server and made available for access and download (Google Play, App Store).	90 days
L-9: The full source code for the chatbot and related mobile and web applications, along with its documentation.	90 days
L-10: A maintenance and support service for bug fixing, updates, and versioning for at least 6 months post-deployment and approach for implementing periodic updates to improve chatbot functionality based on user feedback and new research findings.	Until 31 Dec. 2025

The time dedicated by OSS and its partners for the evaluation and validation of deliverables is not included in the above-mentioned deadlines. Parallel implementation of the different actions is encouraged.

The development will be made with the full involvement of a restricted committee including the OSS team and GMES partners. Regular virtual meetings are planned to monitor the overall progress and to provide feedback and recommendations based on past experiences and similar initiatives.

8. The chatbot system's ownership

The chatbot (app and web service) is the property of the GMES&Africa' North-African Consortium (OSS and its partners) and is meant to be used at a larger scale by the partners and end-users in the framework of GMES&Africa and beyond. The system and its components will be fully used, maintained, and upgraded by the GMES Consortium, without requiring any additional rights requests or payment of any extra rights.

The North-Africa Consortium, represented by its leader – the Sahara and Sahel Observatory (OSS) -, detains the full copyrights of the chatbot. It has full the right to copy or hand over the system components to third parties, to upgrade them, and to implement new algorithms and functionalities, without any prior permission or request.

9. Qualifications of the Company

The mission has to be carried out by a developing, composed at least of a project manager, agriculture expert, and AI developer:

- **The project manager** must have qualifications in agriculture, agricultural technology solutions, digital agriculture projects management, environment, and natural resources management, with preferably knowledge in remote sensing;

- **The Agriculture expert** must have strong qualifications in agricultural science, plant pathology, and weeds and disease detection and prediction;

- **The AI developer** must have solid experience in data science, artificial intelligence, and EO-derived application development. He must have strong experience in using Python for geospatial development and should be familiar with AI-based chatbot development.

Each of these individuals must have at least a bachelor's + 5 level of education. The team member should also possess the following skills:

- Good skills in web and mobile application development;
- Ability to develop web and mobile application development;
- Good knowledge of Natural Language Processing (NLP) is the backbone of modern chatbots;
- Excellent knowledge of image recognition and AI for crop disease detection;
- EO data processing and analysis, and geospatial applications development;
- Good knowledge of data secure handling with user privacy compliance;
- Fluency in French and/or English, knowledge of Arabic is a plus.

Documented experiences with government agencies, research institutions, or agritech companies is highly appreciated.

10. Key users and beneficiaries

The chatbot is designed for a wide range of users and beneficiaries across different levels of the agricultural ecosystem in North Africa, including:

- Single farmers (smallholder and commercial), cooperatives, and farmer organizations;
- Agricultural Extension Officers ;
- Agronomists and Agricultural Experts ;
- Agri-Tech Companies and Service Providers;
- Research Institutions and Universities ;
- Government and Agricultural Policy Makers, etc.

11. Remuneration and payment procedure

The budget allocated to this work is 35,000 Euros, payable in two installments.

The payment will be as follows:

- **50%** of the overall amount will be paid once the first functional prototype of the chatbot (including the associated mobile and web applications) delivered and validated by the steering committee.

- **50 %** of the overall amount will be provided once the final regional version of the chatbot, incorporating user feedback (including the associated mobile and web applications) has been delivered (Google Play, App Store) and correctly deployed on the OSS server.

12. Content of the offer

The Tenderer will have to submit his file containing the administrative file, the technical offer, and the financial offer, which must be provided separately.

a) The administrative file:

The legal proof of Company status;

- A recent extract from the trade register or any other equivalent document required by the law of the country of origin;
- The Company's reference form (according to the model attached in Annex 1).
- The sworn statement template (according to the model attached in Annex 2).
- A certificate of non-bankruptcy, judicial reorganization, or any other equivalent document provided for under the law of the country of origin.

b) The technical offer:

A detailed technical offer for carrying out the mission, detailing the approach proposed by the Tenderer for the conduct of the mission, and an accomplishment schedule through a detailed chronogram (prototype development and versioning). The offer must also describe how the technical aspects are handled: chatbot design and architecture, approaches of development, etc. This will include the literature to be used. The offer must give details on a portfolio of relevant past projects with references from previous clients.

The detailed and signed curriculum vitae of the Company (according to the standard OSS CV template downloadable at the following link: [**OSS CV Model**]

The list of the team members proposed by the Company and their curriculum vitae (according to the standard OSS CV template downloadable at the following link: [OSS CV Model]

c) The financial offer:

The financial offer should be valid for three months, starting from the day following the deadline submission. The financial offer must be presented in Euros.

13.Deadline and submission modalities

Tenderers are invited to send their offers by e-mail to: **procurement@oss.org.tn**
Mentioned in the subject line:

"GMES&Africa - Call for Tenders for the development of a chatbot for crop disease detection and prediction IN NORTH AFRICA [CT/OSS/GMES-Chatbot_CropDiseas/070325-14]".

The deadline for receiving offers is **March 30, 2025,** at 11:59 P.M. (Tunis time).

14.Evaluation procedure

Only applications having obtained a minimum of 70 points would be considered for the evaluation financial.

The Tenderer is rated according to the following grid:

Qualifications & Experiences (50 pts)	**Project manager** ***(20pts)*** • Diploma : **5pts** • Références : **15 pts** Références in agricultural technology solutions, digital agriculture projects management, environment and natural resources management, with preferably knowledge in remote sensing; Maîtrise de l'anglais et du français
	Agriculture expert ***(15pts)*** • Diploma : **5pts** • Références : **10 pts** Références in agricultural science, plant pathology and weeds and diseases detection and prediction, and management, and related database generation; Maîtrise de l'anglais et du français
	AI developer ***(15pts)*** • Diploma : **5pts** • Références : **10 pts** Références in data science, artificial intelligence, and in EO-derived application development, including AI-based chatbot development and utilization of python for geospatial development. Maîtrise de l'anglais et du français
Methodology (50 pts)	**Proposals** ***(20 pts)*** • Innovation and technology: **10 pts** • Data analytics and services: **10 pts**
	ToRs compliance ***(20 pts)***
	Organization, planning, and comments ***(10 pts)***

ANNEX 1 | Company reference

DETAILS OF THE DESIGN OFFICE		
Company name:		
Legal status: Tax ID number: Date of registration: Place of registration:	Tax registration number: Date of registration in the commercial register:	
Full name and nationality of the legal representative:	Position:	E-mail:
Full name and nationality of the contact person	Position:	E-mail:
Legal address in the country of activity:		
Zip Code:	City:	Country:
Phone:	Fax:	

Please return this document, duly completed and signed by the legal representative of the design office.

ANNEX 2 | SWORN STATEMENT TEMPLATE

Subject of the call for tenders: ……

I, the undersigned (full name): ……

Nationality: ……

Acting as: ……

Company name: ……

Address: ……

Registered in the trade register under umber……on……at……

Tax identification number: ……

- **Solemnly declare**:

1- Never having been in liquidation nor a legal proceedings for any reason whatsoever;
2- Not to resort, by myself or through a third-party, to practices that may be qualified as embezzlement, fraud or corruption in the different procurement, management and execution procedures of this contract;
3- Should my application be accepted, commit to observe the existing OSS procedures and the obligation of confidentiality and professional privacy for all facts and / or information that I may have to know;

- **Certify** the accuracy of the information hereinabove and in the documents provided in my application.
- **Certify** that I am not related to any person receiving any remuneration from the OSS.
- **Acknowledge** that I have understood that any inaccuracy or error and any breach in the content of my application as well as non-compliance with the conditions of participation, are causes of rejection of my application.

Done at……on……

Signature