AfriCultuReS - Enhancing Food Security in AFRIcan AgriCULTUral Systems with the support of Remote Sensing

1. Executive Summary (1 page)

Full title: Enhancing Food Security in African AgriCultural Systems with the support of Remote Sensing

Acronym: AfriCultuReS

Category: Community Activity

AfriCultuReS – Enhancing Food Security in AFRIcan AgriCULTUral Systems with the Support of REmote Sensing - aims to design, implement and demonstrate an integrated agricultural monitoring and early warning system that will support decision making in the field of food security. AfriCultuReS will deliver a broad range of climatic, production, biophysical and economic information, for various regions in Africa. AfriCultuReS will apply geospatial science to sustainable agricultural development, natural resource management, biodiversity conservation, and poverty alleviation in Africa.

AfriCultuReS will deliver services at the national, district/county/province and local level with a focus on the categories of climate, crop, drought, land, livestock, water and weather. The services will be delivered to the public sector, the agribusiness sector, the financial sector and the academic sector.

A sequence of definition of methodology, identification of users requirements, identification of services, definition of framework, development of services, internal test phase, pre-operational test phase, operational test phase and exploitation phase will result in technically mature services that can be prepared for market readiness at the end of 2021.

AfriCultuReS will push forward the services provided by current systems, with innovative fusion of data from multiple sources (EO, in-situ, citizen-based crowdsourcing, climate services and weather, crop models) in a vertical manner. Crop yield and biomass prediction models will be enhanced through the fusion of EO data and climate models, emphasizing the use of the complementary sensors of the EU Sentinels constellation.

Geospatial products will be combined in a spatial Decision Support System (DSS) to enrich decision making and risk assessment. The geo component of the DSS will be compliant with the GEO's interoperability standards, allowing its integration with the current services of the GEOSS Common Infrastructure.

The African partners and collaborating networks will be essential for local training and promoting further use of the project tools. Social innovation will be used to increase the number of involved stakeholders and to boost the flow of information in a user-friendly manner. The final target will be to produce a web tool that will support early decision-making for the stakeholders of African food production.

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2. Purpose

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3. Background and Previous Achievements

AfriCultuReS will provide a contribution to GEOGLAM by providing crop monitoring information at national, regional and local scale in its priority regions. As AfriCultuReS is a cooperation of European and African partners, it will also contribute to AfriGEO and EuroGEO.

4. Key Activities

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Seven main service categories were identified:

- On climate: to improve climate predictions, seasonal climate early warning and climate adaptation advice;
- On crops: to improve crop condition monitoring and yield forecasts;
- On droughts: to improve drought early warning and forecasts;

- On land: to provide advice on avoiding land degradation and to improve soil condition assessment;
- On livestock: to improve grazing and rangeland monitoring, browsing capacity assessment and identification of available water sources for livestock;
- On water: to improve monitoring of water availability and productivity, crop water requirements assessment and soil moisture monitoring.
- On weather: to improve (local) weather forecasts and extreme weather early warning.

Although it is already complicated to develop these services technically, bringing solutions to the market takes even more time: needing a period of ten years to do this is not uncommon. That's why the AfriCultuReS partners started the discussion of teaming up with potential clients right away. If solutions are created not only for, but also with clients, market readiness can be achieved quicker and more easily.

Developing services for and with regional governments, such as county, provincial or district governments is an interesting option. Fulfilling the agricultural potential is a priority for local government and by improving the analysis and prediction of potential yields and monitoring of actual yields, useful intelligence for improving agricultural policy can be delivered.

The private sector is another good partner. Working with input suppliers, buyers, sellers and the processing industry can lead to an interesting bundling of services that benefit farmers and that are economically feasible. With financial institutions products can be developed that reduce the risks of providing (micro-)credit, possibly coupled with the delivery of index insurance products that are based on satellite information.

The focus will be mainly on eight crops: maize, wheat, potatoes, sorghum, cassava, millet, rice and sugarcane. Grassland for livestock farming will also be included in the portfolio and room will be made for crops that are locally relevant.

5. Relationship to GEO Engagement Priorities and to other Work Programme Activities

AfriCultuReS is complementary to GEOGLAM. Although there is an overlap with respect to national crop monitoring, where AfriCultuReS can contribute directly to GEOGLAM, the focus of AfriCultuReS is more on the middle segment in terms of scale, with district/county/provincial governments and agribusinesses and NGOs as clients. Another difference is that the focus of AfriCultuReS is exclusively on Africa. At the other end of the scale AfriCultuReS has an overlap with and is complementary to the Geodata for Agriculture and Water Facility (G4AW), which is a contribution of the Netherlands to GEO that is directed at small farmers.

AfriCultuReS has a direct relation with the TWIGA initiative on innovation and improvement of in situ networks on water, weather, climate and disasters in Africa, which is part of GEOGLOWS. There are many links with other GEO activities, such as EO4SDGs.

AfriCultuReS contributes mainly to SDG 2 'Zero Hunger', SDG 1 'End Poverty' and SDG 6 'Clean Water and Sanitation' by increasing agricultural production and productivity in a sustainable way. Although not an explicit goal, AfriCultuReS can provide the tools to improve monitoring of performance in the agricultural sector in Africa and developments over time. Improving climate information is an important goal of AfriCultuReS. The main focus here is on capacity building and the increase of

resilience with respect to climate adaptation. With respect to the Sendai Framework, AfriCultuReS addresses the key aspects of reducing economic loss and damage to critical infrastructure, while reducing financial risk for the main stakeholders through cooperation with the financial sector. The priority disasters are those that affect the agricultural sector most: floods, droughts and fires.

6. Governance

AfriCultuReS has a management structure that consists of a project board, an advisory board and a users' board. GMV is responsible for overall coordination and management of the community activity. Scientific and technical coordination is done by the Aristotle University of Thessaloniki. Each participant is represented in the project board with one member. The project board takes the most important management decisions. The advisory board consists of external experts, including a representative from the GEO Secretariat and provides advice the on strategy and scientific issues, and evaluates the work done and results achieved. The users' board provides the perspective of the users and consists of representatives of different categories of users. The users' board advises on and reviews the definition of the users' needs and requirements of the envisaged services and the evaluation of the results of the demonstrations carried out.

After the finalisation of the design and the testing of the products and services (envisaged for the end of 2021), the governance structure of the community activity will be redesigned into a structure that is better suited for implementation and scaling up.

7. Data Policy

AfriCultuReS will produce EO-based geo-information that will be coupled, through data fusion techniques, with in-situ and/or ancillary (non-EO) data in order to feed an integrated agricultural monitoring and early warning system that will support decision making in the field of food security.

The AfriCultuReS data will be registered in the GEOSS Portal as described In the AfriCultuReS Data Management Plan. AfriCultuReS metadata for geospatial data will follow the ISO 19115 Standard to ensure the discoverability of data, boosting this manner the data sharing strategy set for the project. The data sharing strategy of AfriCultuReS entails the registry of the AfriCultuReS data into the GEOSS Platform and long term archiving in the PANGAEA Repository.

If AfriCultuReS geospatial services are published, they will be compliant with the Open Geospatial Consortium (OGC) standards. AfriCultuReS will promote re-use of data by publicizing the availability of data in the proposed repositories and data catalogues to ensure that awareness about them reached the widest possible audience. Data re-use will be endorsed by the licensing policy of AfriCultuReS (under the Creative Commons Attribution ShareAlike 4.0 International licensing schema).

In AfriCultuReS products/services validation and verification is based on multiple detection by independent methods of geographically consistent events, with weight driven by geographic precision of detection and completeness of information. Ranking is based on the statistical and geographical reliability of individual detections.

Tables (use downloadable spreadsheet for data entry) Individual Participants

1 GMV AEROSPACE AND DEFENCE SA (GMV) Spain

2 ARISTOTELIO PANEPISTIMIO THESSALONIKIS (AUTH) Greece

3 CENTRE FOR REMOTE SENSING AND GEOGRAPHIC INFORMATION SERVICES LBG (CERSGIS) Ghana

4 CENTRE REGIONAL AGRHYMET (CRA)Niger

5 DRAXIS ENVIRONMENTAL S.A.(DRAXIS) Greece

6 UNIVERSIDADE EDUARDO MONDLANE (UEM) Mozambique

7 GEOSAS CONSULTING SERVICE PLC (GEOSAS) Ethiopia

8 HCP international (HCP) Netherlands

9 LOCATE IT LIMITED (LocateIT) Kenya

10 OBSERVATOIRE DU SAHARA ET DU SAHEL (OSS) Tunisia

11 UNIVERSITA DEGLI STUDI DI ROMA LA SAPIENZA (SIA) Italy

12 SOUTH AFRICA NATIONAL SPACE AGENCY (SANSA) South Africa

13 SVERIGES METEOROLOGISKA OCH HYDROLOGISKA INSTITUT (SMHI) Sweden

14 UNIVERSIDAD DE CANTABRIA (UC) Spain

15 UNIVERSITY OF LEEDS (UNIVLEEDS) United Kingdom

16 THE UNIVERSITY OF SHEFFIELD (USFD) United Kingdom

17 UNIVERSITY OF RWANDA (CGIS) Rwanda

    A. Confirmed Contributions

€ 8,531,533 through the EU H2020 programme