Concept for Coordinated Activity to Provide Agricultural Land Use State and Change Information for the UNFCCC Global Stocktake

10 March 2021

Background

GEOGLAM is centrally positioned in this global effort, encompassing major agricultural producing countries along with food insecure least developed countries (LDCs). GEOGLAM is comprised of well over 100 national, regional, and international institutions working in a coordinated way to utilize open EO data, open analytical applications, and advances in computing systems to provide EO based information in support food commodity markets and food security early warning. Understanding the state and changes in agricultural land cover and land use is central to these tasks.

There has been considerable effort directed at the development of global land cover products over the last couple of decades. They have generally been of coarse scale created for one year or based on imagery accumulated over several years and are not optimized for agriculture. Due to the inability to address the diverse timing of growing seasons, coarse spatial scale, and limited agriculture legends, existing products are not suitable for an aggregated assessment under the Global Stocktake, or able to support individual Parties' targets set in NDC's, particularly in LDCs. Despite over 40 years of research and operational development, until now no effort has succeeded in providing timely information at field level on a global scale. Fortunately, open science is transforming the monitoring landscape and enabling new solutions, and the WorldCereal initiative promises to capitalize on this evolution to take the first step forward towards addressing agricultural LC/LU monitoring gaps. We also identify some of the steps to "elevate, escalate, accelerate" activities to fill agricultural monitoring gaps. GEOGLAM is a partner in the WorldCereal project.

Successful case studies on the use of EO data and tools are expected as contribution to the GST to provide good practice examples of what is available and possible to governments. Going forward, integrating EO, and particularly remote sensing data, into the M&E systems to track response indicators of national climate policies would pave the way for an aggregated assessment within the GST.

WorldCereal: A systematic Approach to Global Agricultural LC/LU Monitoring

WorldCereal is a consortium effort, funded by ESA, led by VITO and supported by the GEOGLAM community as a "Champion User". It aims to develop an efficient, agile, and robust EO based system for timely global crop monitoring at field scale. It will not only produce spatially and temporally appropriate information, but it embraces a systematic open-source approach that will make it useful for at the global and national scale. As summarised by the project, the WorldCereal system will be able to:

- Create local to global annual cropland extent maps at 10 m resolution, with cropland accuracies in excess of 80%
- Update the cropland maps on a seasonal basis
- Differentiate between actively irrigated and rainfed fields
- Produce global maps of maize and wheat

More specifically, the open-source WorldCereal system will offer:

- Access to open-and free in situ field data and enhanced access to satellite data, including Sentinel-1, -2 and Landsat 8
- Build and share a global in situ reference dataset for agriculture
- Developed and tested state-of-the-art classification algorithms
- The necessary platform agnostic cloud infrastructure
- visualization tools to derive useful information from the produced maps

WorldCereal was initiated in 2020. Phase 1, ending in June 2021, focuses on defining user requirements, bench marking algorithms, and large-scale testing on a diverse selection of 4-5 countries from different FAO agro-ecological zones (Argentina, Ukraine, Spain and Tanzania). Later this year Phase 2 will result in system development, and the production of demonstration global products. It is important to note the system is not static but linked to the seasonality of the crops.

The GEOGLAM community is fully supportive of the WorldCereal initiative in Phase 1 by providing detailed user requirements and supporting in situ data inventory and gap analysis. As we look forward, in situ data collection and sharing are likely one of the greatest challenges for the community, and GEOGLAM is creating an in situ working group to onboard, grow and sustain the in situ data inventory and management tool. GEOGLAM is also developing product inter-comparison (IC) guidelines for agriculture in partnership with the broader CEOS Land Product Validation IC activity. The IC will be used to assess multiple existing products, and eventually the WorldCereal products. Assessment will be against technical standards and user requirements, including UNFCCC IPCC guidance.

Gaps Going Forward

The current scope of work for WorldCereal will develop an initial system and associated products However several incremental activities that fall outside of currently funded WorldCereal project are required to ensure delivery to the GST and support for the NDC's. Ultimately a strategy is needed to ensure evolving needs can be met. These gaps include:

- Development of a reference network for in situ data
- ARD- Harmonized global data sets of Landsat 8 and Sentinel 2, including full archive
- Algorithms to address a wider range of crops important for global food security, carbon accounting and stocktaking including refined methods, incorporating machine learning towards AI approaches
- Standardized validated satellite-driven agricultural data products addressing the Essential Agriculture Variables
- Capacity (co)development for LDCs to collect and provide the information needed for their national mitigation and adaptation planning and response programs
- Development of statistically relevant state and change information at global and national scales
- Incorporation of new data streams as they become available
- Articulation of evolving user requirements for agricultural monitoring