# GEOGLAM Global Agricultural Monitoring User Requirements

# Introduction

This document is the outcome of a working group meeting held at the Canadian Space Agency in Montreal, Canada, on July 10 and 11, 2012, to define the User Requirements for CEOS. These requirements are designed to meet the needs of the GEOGLAM program, which will be phased over six years. Meteorological parameters are not identified in this document and will be addressed in another forum. It was recognized that there is a need at a subsequent stage for the development of a global sampling strategy concerning very high resolution data acquisitions.

The objective of this exercise was to provide CEOS with an understanding of the agricultural monitoring observation requirements for GEOGLAM and initiate a process by which those requirements can be translated into operational data acquisition. The desired outcome was a document that could be subsequently used by the CEOS space agencies to identify specific EO sensors and data acquisition requirements to address GEOGLAM EO-related observation and information needs.

The agenda was structured to answer the following questions:

1. WHAT thematic information is needed? (crop type, yield estimates, soil moisture, others),
2. WHERE should the measurements be taken and at what level of detail? (spatial issues like geographical areas, minimum mapping units), and
3. WHEN should the measurements be taken? (temporal issues like crop calendar, frequency of acquisition).

# Required Observations

Table 1 shows the range of observations that were identified. The observations were classified by spatial resolution, spectral range, effective observation frequency (cloud-free), swath and primary/secondary source. For each category of observations, the information products that could be derived using this observation were identified. Some of the table entries depend on field size, where large /medium /small field size is defined in the table notes. Region specific acquisitions were addressed, specifically rice crop monitoring.

Table 2 shows the relevant satellite EO products for various required information products. Table 3 shows the spatial resolution and observation frequency for various satellite EO



Table 1: Required Observations

products.



Table 2: Relevant Satellite EO Products for Various Required Information



Table 3: Spatial Resolution and Observation Frequency for Various Satellite EO Products

# Spatial and Timing Components

This section contains the spatial and timing components required to qualify, characterize and develop a multi-scale/stratified observation scenario. It includes a series of multi-scale shape files (maps) and related crop calendars for the various cropping regions identified in the table. Specific area coverage maps and crop calendar information is provided at global and regional scales. Cloud cover maps are included, as are area maps and crop calendars.

To be provided

# Operational Considerations

Operational considerations such as data latency, data quality, need for high-level products, interoperability, etc. are addressed in this section.

Agricultural monitoring in the context of GEOGLAM covers a range of interdependent tasks including: mapping croplands and agricultural land use change and characterizing cropping systems, estimating area planted and crop type, monitoring crop growth and crop stage, forecasting and estimating crop production. While each of these monitoring tasks requires satellite observations, the spatial resolution is in part dictated by the field size and spatial complexity of the agricultural landscape. The tasks associated with monitoring crop growth and production is time-sensitive and the goal for data delivery is for near real-time data defined as no later than 48 hours from acquisition.

As the GEOGLAM initiative is targeted at operational users, there is a preference for delivery of useful information products rather than raw data. As the satellite data are increasingly used for quantitative analysis, it is essential that the underlying data are calibrated and geo-located with the appropriate documentation needed to use the data. Removing the burden of data pre-processing from the end-user facilitates data use and in this context, ortho-rectification and atmospheric correction for optical data are highly desirable for end users.

As no single sensing system can provide all the data that are needed, those undertaking monitoring will be dependent on data from multiple systems. This creates a number of challenges for users who have to ingest diverse data into their analysis and decision support systems. Data inter-use is an important aspect of utilizing a system of systems. Standard formats have been an elusive goal of CEOS for many years yet would help the user community. While the broader remote sensing community is moving towards generating standard data products for climate change studies (i.e. ECV’s), there has yet to be a similar initiative with an agricultural monitoring focus. The procedures for ordering data and data delivery need to facilitate data access and use. For operational monitoring at national to global scales, large volumes of data will be generated, and so procedures for automatic download need to be made available. Procedures will be needed for accessing and processing high volume data for example from both Very High Resolution (VHR) and Microwave systems. Special consideration is needed for the provision of data to monitoring groups in developing countries which may not have the benefit of high speed internet. Any steps that CEOS can make towards facilitating data inter-use in terms of formats, tools and functionality of delivery systems will enhance the utility of the data and reduce obstacles to the uptake of use of the data. In terms of data analysis, vendors are encouraged to provide the capability to ingest data from different sensing systems and data analysis tools which can be run on multiple sensors at different resolutions.

GEOGLAM recognizes that in responding to GEO data needs, CEOS is moving into a new endeavor and that while the first priority will be to make sure the required data are acquired for a given area at the appropriate time, ease of data access and timely delivery will also be critical to effective use of the data. However, rather than specifying stringent requirements on the CEOS ground segment, the approach adopted by GEOGLAM is to work in partnership with CEOS to establish the procedures necessary to make this agricultural monitoring program successful. In this sense, GEOGLAM provides CEOS with an opportunity to explore approaches to improving coordination on data acquisition, access and inter-use with the GEO Agricultural Monitoring Community of Practice.