GEOGLAM: an introduction

Joao Soares
On behalf of the GEO AG CoP
November 21st, 2013
GEO the Group on Earth Observations
an Intergovernmental Organization with 90 Members
and 67 Participating Organizations


Led to the Establishment of a

Global Earth Observing System of Systems (GEOSS)
The Vision for GEOSS...

...a world where decisions and actions are informed by coordinated, comprehensive and sustained Earth observations.

© GEO Secretariat
In-situ Systems
To foster the use of EO GEO must:

- Improve and Coordinate Observation Systems
- Advance Broad Open Data Policies/Practices
- Enhance Capacity
Created in 2005, to develop a coordinated and sustained Global Earth Observation System of Systems (GEOSS) to enhance decision making in nine Societal Benefit Areas (SBAs)

GEO today:
90 Members
67 Participating Organizations
67 Participating Organizations
GEO is focused on societal benefit

Agriculture is one of the GEO societal benefit areas

10 year implementation plan with targets for all SBAs
The Ag CoP - Who We Are
Open Community made up of international and national agencies concerned with agricultural monitoring including ministries of Ag, space agencies, universities, and industry
Context For GEOGLAM
Monthly Wheat Prices 1960-2011($/Metric Ton)

Source: World Bank

Landsat 1 Launched (1972)

2008 Price hikes
Droughts: Australia & Ukraine

1974/2’s price hike

2010/11 Price hikes
Drought: Russia USA

1996 price hike

Nominal wheat price in US $/metric Ton

2010/11 Price hikes

Drought:
Russia USA

1974/2’s price hike

1996 price hike
10 year Monthly Market Prices of Corn, Soybeans and Wheat

- **Corn Monthly Prices $/MT 2002-2012**: 140% Volatility
- **Soybeans Monthly Price $/MT 2002-2012**: 200% Price increase
- **Wheat Monthly Price$/MT 2002-2012**: 120%
Need for timely reliable production forecasts

Aggregation of Wheat Production Forecasts from Main Wheat Export Countries vs. International Market Price: 2010, 2012

Price ($/Ton)  Production Forecasts 1,000 MT

Final Estim

Critical period for EO

2010

2012
G20 Final Declaration

44. We commit to improve market information and transparency in order to make international markets for agricultural commodities more effective. To that end, we launched:

- The "Agricultural Market Information System" (AMIS) in Rome on September 15, 2011, to improve information on markets ...;

- The "Global Agricultural Geo-monitoring Initiative" (GEO-GLAM) in Geneva on September 22-23, 2011. This initiative will coordinate satellite monitoring observation systems in different regions of the world in order to enhance crop production projections and weather forecasting data.
GEOGLAM

2 initiatives to increase information availability, quality and transparency
GOAL AND SCOPE

• To strengthen the international community’s capacity to produce and disseminate relevant information on agricultural production at national, regional and global scales, through reinforced use of Earth Observations.

• GEOGLAM is a ‘coordination program’, aiming at:
  – supporting, strengthening and articulating existing efforts through the use of EO
  – developing capacities and awareness at national and global level
  – disseminating information
The GEOGLAM Components

1. GLOBAL/REGIONAL SYSTEM OF SYSTEMS
   Main producer countries, main crops

2. NATIONAL CAPACITY DEVELOPMENT
   for agricultural monitoring using Earth Observation

3. MONITORING COUNTRIES AT RISK
   Food security assessment

4. EO DATA COORDINATION

5. METHOD IMPROVEMENT through R&D coordination (JECAM)

6. Data, products and INFORMATION DISSEMINATION
GEOGLAM Monthly Crop Monitor for AMIS

- Objective: develop consensus crop condition and prospects assessment in primary agricultural production areas highlighting potential hotspots of stress/bumper crops

- inputs from international and national agencies, based on evidence from satellite, weather, agromet, and national expert assessments
GEOGLAM Outlooks: AMIS Market Monitor

GEOGLAM Prototype Global Crop Assessment
August 1, 2013

Market Monitor
No. 11 – September 2013

Contents
- Market Monitor
- AMIS Market Monitor
- Market Indicators
- Market Trends

Crop Monitor
(Wheat)

This is the first GEOGLAM Crop Monitor downloaded for AMIS. It represents the current conditions for AMIS crops for the region and includes crop yields, area, and production. The current conditions are based on satellite images and local reports. AMIS crop surveillance is a joint effort of FAO and AMIS, and is funded by the European Union.

Wheat

Wheat is the most important cereal crop in the world, accounting for about 20% of the global food supply. It is grown in many countries around the world, particularly in developing countries. Wheat is a vital crop for food security and economic development in many regions.

Wheat is grown in various regions around the world, including Europe, Asia, North America, and South America. The crop is highly sensitive to climate conditions, and its yields can be affected by factors such as temperature, precipitation, and soil conditions.

In this issue of the Market Monitor, we provide an overview of the current conditions for wheat in the global market. The report includes information on the current prices and trends, as well as projections for future conditions.

The report also highlights the current conditions for wheat in the global market, including the current prices and trends, as well as projections for future conditions. The report includes information on the current prices and trends, as well as projections for future conditions.

For more information on the current conditions for wheat in the global market, please visit the Market Monitor website at www.amis-outlook.com.
Enables comparison between relevant datasets (global, national and regional), by crop type and accounting for crop calendars; enables crop condition labeling and commenting to reflect national expert assessments.
Translating Information Needs into Observation Requirements

EO

Global – Regional scale
- Spatial resolution: 5km - 1km, 1km - 250m
- Revisiting capabilities
- Daily images, 2 to 3 images per 10 days

National - Sub-nat.
- Spatial resolution: 250m - 20m
- Revisiting capabilities
- 1 to 2 images per 10 days

Local - Parcel
- Spatial resolution: 20m - 5m, 5m - 1m
- Revisiting capabilities
- 1 image per month

Use

Meteo cond.

Area

Crop cond.

Crop Growth

Agriculture / veg. state

Crop specific conditions

Anomalies assessment
every 10 days

Crop type at parcel level

Crop stages
Crop variables

Sub-parcel variability

Crop growth model
every 5 to 10 days

Yield

Yield estimation
every 10 days

+ field report & socio-economic context by analyst

+ prod. quality, stocks & demand by info brokers

Area outlook

Area estimate

Monthly bulletin

Early warning

Precision farming

Yield forecast

Prod estimate

Vulnab. report

Int market report
AT WHAT LEVEL OF DETAIL (SPATIAL RESOLUTION)?
Average Start of Growing Season Date

Day of Year

365

Whitcraft et al. UMD
- Ad-hoc advisory group taking Earth observations requirements from science community

## GEOGLAM & CEOS Collaboration

### Requirements for Monitoring

<table>
<thead>
<tr>
<th>Req#</th>
<th>Spatial Resolution</th>
<th>Spectral Range</th>
<th>Effective observ. frequency (cloud free)*</th>
<th>Sample Type</th>
<th>Target Products</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Crop Mask</td>
<td>Crop Type</td>
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<td>Area and Growing Calendar</td>
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<td>Crop Condition</td>
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<td>Crop Yield</td>
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<td>Environment Variables</td>
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<td>Ag Practices / Cropping Systems</td>
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<tr>
<td>1</td>
<td>500 - 2000 m</td>
<td>thermal IR + optical</td>
<td>Daily</td>
<td>Cropland Extent</td>
<td>✓</td>
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<tr>
<td>2</td>
<td>100-500 m</td>
<td>optical + SWIR</td>
<td>2 to 5 per week</td>
<td>Cropland Extent</td>
<td>✓</td>
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<tr>
<td>3</td>
<td>10-50 km</td>
<td>microwave</td>
<td>Daily</td>
<td>Cropland Extent</td>
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<tr>
<td>4</td>
<td>20-70m</td>
<td>optical + SWIR + TIR</td>
<td>Monthly</td>
<td>Cropland Extent</td>
<td>L/M/S</td>
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<tr>
<td>5</td>
<td>20-70m</td>
<td>optical + SWIR + TIR</td>
<td>Weekly (min. 1 per 2 weeks)</td>
<td>s</td>
<td>L/M/S</td>
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<tr>
<td>6</td>
<td>10-100m</td>
<td>SAR</td>
<td>Monthly</td>
<td>s</td>
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<tr>
<td>7</td>
<td>5-10 m</td>
<td>optical + SWIR</td>
<td>Monthly (3 in season)</td>
<td>rs</td>
<td>L/M/S</td>
</tr>
<tr>
<td>8</td>
<td>5-10 m</td>
<td>optical + SWIR</td>
<td>Weekly (min. 1 per 2 weeks)</td>
<td>rs2</td>
<td>✓</td>
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<tr>
<td>9</td>
<td>&lt; 5 m</td>
<td>optical</td>
<td>1 to 2 per month</td>
<td>rs3</td>
<td>✓</td>
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</tbody>
</table>
GEOGLAM & CEOS Collaboration

Requirements to Data Streams

- Ad-hoc advisory group taking Earth observations requirements from science community

- ... and converting them into an acquisition strategy by linking requirements to data streams

<table>
<thead>
<tr>
<th>Req#</th>
<th>Proposed Core Missions</th>
<th>Proposed Contributing and Potential Missions</th>
<th>Spatial Resolution</th>
<th>Spectral Range</th>
<th>Sample Type</th>
<th>Effective observation frequency (cloud free)*</th>
<th>Growing Season Calendar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aqua/Terra (1000m) / NPP (750m)</td>
<td>SPOT-5 (1150m) / Proba-V (1000m)</td>
<td>500 - 2000 m</td>
<td>thermal IR + optical</td>
<td>Cropland Extent</td>
<td>Daily</td>
<td>all year</td>
</tr>
<tr>
<td>2</td>
<td>Aqua/Terra (250m) / NPP (375m)</td>
<td>Proba-V (350m) / Sentinel-3A (500m)</td>
<td>100-500 m</td>
<td>optical + SWIR</td>
<td>Cropland Extent</td>
<td>2 to 5 per week</td>
<td>all year</td>
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<tr>
<td>3</td>
<td>GCOM-W1/W2 / SMOS / SMAP</td>
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<td>10-50 km</td>
<td>microwave</td>
<td>Cropland Extent</td>
<td>Daily</td>
<td>all year</td>
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Coarse Resolution Sampling (>100m)

Moderate Resolution Sampling (10 to 100m)

<table>
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<th>Req#</th>
<th>Proposed Missions</th>
<th>Spatial Resolution</th>
<th>Spectral Range</th>
<th>Sample Type</th>
<th>Effective observation frequency (cloud free)*</th>
<th>Growing Season Calendar</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Landsat 7/8 (30m) / Sentinel-2A (20m)</td>
<td>20-70m</td>
<td>optical + SWIR + TIR</td>
<td>Cropland Extent</td>
<td>Monthly (min 2 out of season + 3 in season). Required every 3-5 years.</td>
<td>all year</td>
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<tr>
<td>5</td>
<td>Landsat 7/8 (30m) / Sentinel-2A (20m)</td>
<td>20-70m</td>
<td>optical + SWIR + TIR</td>
<td>s</td>
<td>Weekly (min. 1 per 2 weeks)</td>
<td>growing season</td>
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<tr>
<td>6</td>
<td>Sentinel-1A (C) / Radarsat-2 (C) TerraSAR-X (X) ALOS-2 (L)</td>
<td>10-100m</td>
<td>SAR Dual Polarization</td>
<td>s</td>
<td>Monthly (Asia-RICE only)</td>
<td>all year</td>
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Fine Resolution Sampling (5 to 10m)

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<th>Req#</th>
<th>Proposed Missions</th>
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<th>Spectral Range</th>
<th>Sample Type</th>
<th>Effective observation frequency (cloud free)*</th>
<th>Growing Season Calendar</th>
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<tbody>
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<td>7</td>
<td>RapidEye</td>
<td>SPOT-5</td>
<td>5-10 m</td>
<td>optical + SWIR</td>
<td>RS</td>
<td>Monthly (3 in season)</td>
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<tr>
<td>8</td>
<td>RapidEye</td>
<td>SPOT-5</td>
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<td>optical + SWIR</td>
<td>RS2</td>
<td>Weekly (min. 1 per 2 weeks)</td>
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Very Fine Resolution Sampling (<5m)

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<th>Proposed Missions</th>
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<th>Spectral Range</th>
<th>Sample Type</th>
<th>Growing Season Calendar</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Pleiades</td>
<td>&lt; 5 m</td>
<td>optical</td>
<td>RS3</td>
<td>1 to 2 per month</td>
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Pakistan Agricultural Information System
(Collaboration between USDA, FAO, SUPARCO, CRS, & UMD)
Phased Approach across all components

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<td>1 Foundation activities</td>
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<td>2 New starts with GEOGLAM funding</td>
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<td>3 Thematic / Geographic expansion</td>
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<tr>
<td>4 Operational</td>
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Phase 1 Activities: best effort, ongoing and realigned tasks and voluntary contributions

Phase 2 Activities: GEOGLAM funded tasks and contributory projects
Examples of Phase 1 Support: Current & Potential

- **US / NASA**
  - Global Soy Area Estimation
  - Crop Outlooks
  - Wheat Yield Forecasting prototype
  - Pakistan Capacity Building
  - GLAM Operation w. NASA

- **Japan, India, Thailand, Vietnam**
  - Asia RiCE Initiative (ADB)

- **China**
  - GEO Agriculture Task (MOST)

- **Canada**
  - JECAM office/coordination

- **EU FP 7**
  - -9 Million Euro SIGMA Project

- **Voluntary/In-kind Contributions**
  - JRC Workshops,
  - Canadian SA Workshop,
  - Argentina Regional Workshop

- **France**
  - GEOGLAM operations/secondment of P5 to Project Coordination Office

- **Gates Foundation**
  - RS Africa capacity building activities for smallholder farmers – Tanzania

- **Australia**
  - Coordination of Rangelands component

- **Germany**
  - Interest in supporting GEOGLAM

- **Argentina (Ministry of Ag)**
  - National capacity building initiative

- **China (MOST)**
  - Considering support GEOGLAM

- **US (USDA/NASA/USGEO)**
  - Global Component Office proposal

- **KSS International Program**
  - visualizing the global food system

- **RUSSIA ?**
Summary

• GEOGLAM has a good policy mandate - the global food problem will not go away!
• GEOGLAM has momentum in the Community of Practice
• International and national funding support exists and is growing
• National institutional participation growing
• Early successes demonstrate the progress
THANK YOU!

earthobservations.org

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