GEOGLAM
Global Agricultural Monitoring

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Recent volatility of Agricultural Prices (1/2)

Monthly Wheat Prices 1960-2011($/Metric Ton)
Source: World Bank

- 2008 Price hikes
  Droughts: Australia & Ukraine

- 2010/11 Price hikes
  Drought: Russia

- 1971/2’s price hike
  Drought: Russia

- Landsat 1
  Launched (1972)

Nominal wheat price in US $/metric Ton
The G20 Agriculture Priority (2011)

Food price dynamics is not crop specific

Maize
Corn monthly Prices $/MT 2002-2012

Soybeans
Soybeans Monthly Price $/MT 2002-2012

Wheat
Wheat monthly Price $/MT 2002-2012

Societal impact is worldwide
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**" (GEOGLAM) 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**…
2011: The G20 Agriculture Priority
GEOGLAM & AMIS

- Two initiatives to increase information availability, quality and transparency:
  - GEOGLAM: improve information on supply (GEO)
  - AMIS: improve information on markets (FAO)
GEOGLAM is a « coordination programme », aiming at
- supporting, strengthening and articulating existing efforts
- developing capacities and awareness at national and global level
- disseminating information

GEOGLAM Objectives

• To strengthen the international community’s capacity to produce & disseminate relevant, timely and accurate information and forecasts on agricultural production at national, regional and global scales, through reinforced use of Earth Observations
GEOGLAM Initiative Structure

1. Global / Regional Agricultural Monitoring
   main producer countries, main commodities

2. National Capacity Building
   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 (eg. JECAM)

6. Data products and information dissemination
GEOGLAM Actors
GEOGLAM Community of Practice

Open Community made up of international and national agencies concerned with agricultural monitoring including Ministries of Ag, space agencies, universities, & industry
GEOGLAM Component #1
Global Agricultural Monitoring
Objective

- to develop a transparent, timely, international, qualitative crop condition assessment in primary agricultural production areas highlighting potential hotspots of stress/bumper crops

GEOGLAM Crop Monitor:

- an international community process, with international and national agencies, coordinated by UMD, supported by NASA
- based on evidence from near real time satellite, weather, agromet, and national expert assessments
- for synthesizing and reviewing data and information
- and establishing the consensus assessment
- Results: a monthly 2-page synthesis note for AMIS Market Monitor + detailed information and maps on GEOGLAM Crop Monitor Website
GEOGLAM Crop Monitor Current Status

- June-July 2013: Prototyped crop outlooks for review by AMIS
- Sept. 2013: Started provision of routine Crop Monitor to AMIS
- Since Sept. 2013: Regular monthly reporting and refining tools and processes for information collection, maps and synthesis
Operational GEOGLAM Global Crop Condition Assessments published monthly within the G-20 AMIS Market Monitor Bulletin
Enables comparison among relevant datasets (global, regional and national), by crop type and accounting for crop calendars; enables crop condition labeling and commenting to reflect national expert assessments.
Asia-RiCE – Asian Rice Monitoring

- **A multi-national project** led by Japan (JAXA), with collaborations in ASEAN+3 countries and India
- **A regional view** using agro-meteorological data derived from low resolution optical satellite imagery (MODIS, GCOM-W, TRMM and others)
- **A local view** to estimate rice crop area and production using available **radar** and other satellite data with ground observation data and statistical information (test-sites in Indonesia, Thailand and Vietnam)

http://www.asia-rice.org
GEOGLAM Component #2
Capacities Building
GEOGLAM Capacity Building Component

Ex: Pakistan Agricultural Information System
(Collaboration among CRS, FAO, SUPARCO, UMD & USDA)

Crop condition

EO Estimated vs Reported Wheat Production
GEOGLAM Component #3
Countries at risk
Countries at risk

- Subsistence agriculture & Pastoralism
  - basis of livelihood systems in many countries
  - highly climate-sensitive
- Climate station networks not well working (sparse, bad or late reporting)
- Satellite remote sensing & models can fill the gap
  - and provide the basis for early detection of agricultural droughts
- On all continents:
  - Africa: Senegal, Mauritania, Mali, Burkina, Niger, Chad, Somalia, Sudan, Eritrea, Ethiopia, Djibouti, Somalia, Kenya, Uganda, Rwanda, Tanzania, Zambia, Mozambique, Zimbabwe, Botswana, South Africa, Lesotho, Swaziland...
  - Central America: Guatemala, Honduras, El Salvador, Nicaragua
  - Caribbean: Haiti
  - Central Asia: Afghanistan
Satellite Information for Crop Monitoring

- Evapotranspiration Yearly Anomaly 2009
- Water Requirement Satisfaction Index
- Daily Rainfall estimate for 6 Apr., 2003
- Satellite Vegetation Index (NDVI) Difference 2009
GEOGLAM Component #4
Cooperation with Space Agencies

CEOS – Committee on Earth Observation Satellites
GEOGLAM & CEOS Collaboration

Ag Requirements to EO Requirements

- Ad-hoc advisory group translating requirements from science community to Earth observation requirements
GEOGLAM & CEOS Collaboration

EO Requirements to Data Streams

- Ad-hoc advisory group translating requirements from science community → Earth observation requirements

... and converting them into an acquisition strategy by linking EO requirements → Data streams

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<th>Spatial Resolution</th>
<th>Spectral Range</th>
<th>Sample Type</th>
<th>Field Size</th>
<th>Effective observ. frequency (cloud free)*</th>
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<td>thermal IR + optical</td>
<td>Wall-to-Wall</td>
<td>All</td>
<td>Daily</td>
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<tr>
<th>Req#</th>
<th>Proposed Primary Missions</th>
<th>Proposed Secondary Missions</th>
<th>Proposed Potential Missions</th>
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<td>SPOT-5 (1150m)</td>
<td>Proba-V (1000m)</td>
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<td>NPP (750m)</td>
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<td></td>
<td>Sentinel-3A (500m)</td>
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GEOGLAM Component #5
Research & Development
JECAM: Joint Experiment for Crop Assessment and Monitoring

- A network of sites representative of the world’s cropping systems
- A focus for international satellite data acquisition by CEOS
- R&D to support enhancements for operational agricultural monitoring systems
- JECAM Program Office coordinated by AAFC-Canada and UCL-Belgium
- Developing linkages with AgMIP sites and modeling community

www.jecam.org
GEOGLAM
Research Needs & Challenges
Needs for Baseline Datasets as inputs to Agricultural Monitoring Strategy

Cropland Distribution  
(Fritz et al., IIASA)

Field Size Distribution  
(Fritz et al., IIASA)

When are the crops growing?  
(Whitcraft et al., UMD)

How do clouds impact clear views?  
(Whitcraft et al., UMD)
Agricultural Monitoring: EO data and Final products

EO

Spatial resolution / Revisiting capacities
5km - 1km 1km - 250m 250m - 60m 60m - 10m 10m - 1m
hourly images daily images 1-3 images / 15 days 1-2 images / month 1-2 images / season

Meteo cond.
Area
Croplands mask
Crop type
Crop type at parcel level
Sample point interpretation Regression estimate
Area outlook
Agric. map
Area estimate
Monthly bulletin
Early warning
Precision farming
Yield forecast
Prod estimate
Vulnerab. report
Int market report

Crop Growth

Agriculture / veg. conditions
Crop specific conditions
Anomalies detection
Crop stages
Crop variables
Intra-parcel variability
Crop growth model + in situ obs.

Crop Growth

Crop stages
Crop variables
Intra-parcel variability
Crop growth model + in situ obs.

Yield

Yield estimates
+ field report & socio-economic context by analyst

Food Security
Ag Prod Trade

+ prod. quality, stocks & demand by info brokers
Research Challenges: Adaptation to Regional Agrosystems

• ex. Mixed crops – Rungbe, Tanzania

• Agroforestry systems based on:
  – Crops: perennial (coffee, banana, cocoa, fruit trees, tea) and annual (corn, rice).
  – Small fields: 0.03-0.15 ha
  – « CBM »: Coffee, Banana, and Maize

• Trends
  – Upper zone: CBM progressing, tea-cropping areas and Afromontane forest regressing.
  – Lower areas: CBM being abandoned, cocoa and rice monoculture progressing, supported by significant investments (irrigation).
Implementation Challenges

• Training – Capacity building
  – Need to adjust Tools & Methods to local agrosystems
  – Transfer Research → Min. Agriculture Depts (Statistics, Food)
  – Huge needs in Training / Capacity building in new User-countries
    (Learning engineering: Skills to be acquired, Pre-requisites, Online-presence.. TurnOver)
  – Prerequisite. Dialog with stakeholders (needs time and expertise)

• Great funding needs
  – GEO overall voluntary nature great, but institutionalizing require firm commitments (research, capacity building)
  – Identification of new funds: an issue in many member countries
  – Need for leadership: member countries** to lead the early phases of GEOGLAM implementation
http://www.earthobservations.org/geoglam

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