GEOGLAM,
Global Agricultural Monitoring

Michel Deshayes, GEO, GEOGLAM Coordinator for the Agricultural Community of Practice
GEO, Group on Earth Observations

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
A Global, Coordinated, Comprehensive and Sustained System of Observing Systems

GEOSS

INFORMATION FOR THE BENEFIT OF SOCIETY
GEO Objectives

- Improve and Coordinate Observation Systems
- Foster Increased Use of EO Data & Information
- Build Capacity
- Advance Broad Open Data Policies/Practices
GEOGLAM - Global Agricultural Monitoring
Why?
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
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)
AMIS Participating Countries

- G20 Members & Spain
- Other EU Members*
- Invited Countries

* Not participating in AMIS as individual countries, but collectively represented by the European Union
Production & Exports of AMIS members

- Wheat production (2012–2014 average)
  - AMIS: 86%
  - Non-AMIS: 14%

- Maize production (2012–2014 average)
  - AMIS: 89%
  - Non-AMIS: 11%

- Soybean production (2012–2014 average)
  - AMIS: 94%
  - Non-AMIS: 6%

- Rice (milled) production (2012–2014 average)
  - AMIS: 80%
  - Non-AMIS: 20%

- Wheat exports (2012–2014 average)
  - AMIS: 97%
  - Non-AMIS: 3%

- Maize exports (2012–2014 average)
  - AMIS: 91%
  - Non-AMIS: 9%

- Soybean exports (2012–2014 average)
  - AMIS: 92%
  - Non-AMIS: 8%

- Rice (milled) exports (2012–2014 average)
  - AMIS: 81%
  - Non-AMIS: 19%
GEOGLAM Activities

3 Pillars + 3 Cross Cutting 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

Agricultural Expertise (GEO CoP, FAO)
Meteorological Expertise (WMO)
Earth Observation Expertise (CEOS: Satellite, ground data, models)
GEOGLAM Component #1
Global Agricultural Monitoring
Main Pillar #1 activities

- **Crop Monitor: Coordinated Global Crop Assessments** (4 main crops, ~30 main producers)
  - *Monthly operational report to AMIS* (G-20 Agricultural Market Information System, with secretariat hosted at FAO)
  - Synthesizes monitoring activities and provides consensus global crop assessments (Coordinated by UMD with NASA support)
  - **Participating Agencies** include:
    - USDA NASS *(National Agricultural Statistics Service)* & FAS *(Foreign Agricultural Service)*
    - EC-JRC MARS *(Monitoring Agricultural Resources)* & Agri4Cast *(Agricultural Forecasts)*
    - China: RADI-CAS CropWatch
    - Russia IKI-VEGA *(Satellite based service for vegetation monitoring)*
    - India: NCFC-FASAL *(Forecasting Agriculture using Space, Agro-met. & Land based observations)* & NADAMS *(National Agricultural Drought Assessment & Monitoring System)*
    - Canada: NCMS *(National Crop Monitoring System)*...
    - Brazil: CONAB GeoSafras
    - Japan + ASEAN + China + India: ASIA-RiCE project
    - Other countries: Australia, Mexico, Argentina, South Africa...
Example of Crop Crisis Situation: 2012 (1/4)

2012 Northern Hemisphere Crop NDVI Anomalies (UMD)
Example of Crop Crisis Situation: 2012 (3/4)
Northern Hemisphere Crop NDVI Anomalies - August 13th 2012

- Current season crop development (2012)
- Average season development (2000-2011)
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 Crop Monitor in AMIS Market Monitor

September

October

November

December

Operational GEOGLAM Global Crop Condition Assessments published monthly within the G-20 AMIS Market Monitor Bulletin
GEOGLAM activities

• Main Pillar #2 – Capacity Building
  – On-going national projects
    • Argentina (INTA - UMD - NASA)
    • Pakistan (CRS – SUPARCO – FAO - UMD – NASA)
    • Ukraine (IKD – HydroMet - EC)
    • South Africa (NEOSS – ARS)...

• Main Pillar #3 – Countries at Risk
  – On-going international monitoring Projects
    • FAO GIEWS (Global Information & Early Warning System)
    • US FEWSNET (Famine Early Warning System)
    • EC MARS Food Security Bulletins
    • China CropWatch Drought & Food security activities...

• Cross Cutting Component R&D – JECAM
  – Objective: to reach a convergence of approaches, develop monitoring & reporting protocols and best practices for a variety of global agricultural systems
  – About 40 test-sites on all continents!
GEOGLAM Component #2
Capacities Building
Component#2-Capacity Building
ex. Pakistan: Strengthening Provincial Capacity
(collaboration between USDA, FAO, SUPARCO, CRS Pakistan, & UMD)

Training Workshops
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
Gaps in Rainfall Station Reporting

- For one year, systematic sample on the 1\textsuperscript{st}, 11\textsuperscript{th} & 21\textsuperscript{st} of month (3\times12=36 samples)
- 1232 African GTS stations:
  - 40% did not report on any of the 36 days of the sample
  - only 25% sent all reports or missed only one

GTS = Global Telecommunication System
Changes in rainfall
Precipitation changes in Kenya, 1980 - 2008

Average Rainfall for 4 consecutive seasons

Decrease in Rainfall
Average of last 4 rainy seasons is ranked lowest

Change in distribution of rainfall in year
- Decrease in rainfall of main season
- Increase in rainfall of second season

Since 1980 almost 20% drop in main season rainfall
Rainfall in second season is increasing
Satellite Information for Crop Monitoring

Evapotranspiration Yearly Anomaly 2009

Legend
- Eta Anomaly(%)  
  - < 50  
  - 50 - 70  
  - 70 - 90  
  - 90 - 110  
  - 110 - 130  
  - 130 - 150  
  - > 150  
  - Not data

Daily Rainfall estimate for 6 Apr., 2003
GEOGLAM Component #4
R&D - JECAM
Component #5 – R&D - JECAM

• JECAM
  – Joint Experiment of Crop Assessment and Monitoring
  – pre-existing to GEOGLAM, now the R&D component of GEOGLAM

• Objective:
  – to reach a convergence of approaches, develop monitoring & reporting
  protocols and best practices for a variety of global agricultural systems

• Present status
  – about 40 test-sites on all continents!
  – 2013 Annual Report just published
  – 2014 JECAM Science workshop, Ottawa, 21-23 July
Differences in Cropland Extent MODIS - GlobCover

Reds: More croplands in MODIS
Blues: More croplands in GlobCover

Percent more cropland in MODIS v. 6
- 40 - 60
- 30 - 40
- 20 - 30
- 10 - 20
- 5 - 20
- 0 - 5

Percent more cropland in GlobCover 2005

Fritz and See, 2008