Research to Operations in Agricultural Monitoring

Chris Justice
The Center for Agricultural Monitoring Research,
Department of Geographical Sciences,
University of Maryland, USA
- c. 2005 UMD/NASA working with USDA to transition crop analysis from AVHRR to MODIS.
- Developed the Global Agricultural Monitoring (GLAM) System crop condition interface
- Provided to other countries e.g. Australia, Mexico, Argentina, Brazil, Colombia
GEO is the international program focused on the use of Earth Observations for societal benefit

- GEO was initiated in 2005
- Agriculture is one of the GEO societal benefit areas
- GEOGLAM is GEO’s Agricultural initiative
Initial GEOSS/IGOL Agricultural Monitoring Workshop July 2007, UN-FAO

- IGOL/GEO workshop to develop a strategy for global agricultural monitoring in the framework of GEO
- 47 participants representing 25 national and international organizations attended and established the ‘GEOSS/IGOL Agricultural Monitoring Community of Practice’
- Reviewed the current state of agricultural monitoring identified gaps and developed a set of priorities and recommendations
- Recognized that international and national programs faced the same obstacles and challenges and that the full potential of EO had yet to be realized

Today the Community of Practice has over 300 members representing over 40 countries and organizations
Thematic Workshop Series to Identify “Community of Practice” Priorities and Best Practices

- November 2009, Kananaskis, Canada: SAR data for Agricultural Monitoring
- May 2011, Curitiba, Brazil (SBSR): JECAM South America Workshop
- September 2011, Nairobi, Kenya: CRAM Agricultural Capacity Building Workshop
- October 2012, Beijing, China: Workshop on Agricultural Water Availability
- November 2012, Buenos Aires, Argentina: Regional Workshop on Agricultural Monitoring
- October 2013, Moscow, Russia: Workshop on Agriculture in Northern Eurasia
Building a Community Agenda: Identifying and Addressing Common Issues facing Agricultural Monitoring

- Timeliness in obtaining EO data (satellite and in-situ)
- Accessibility to international satellite data
- Continuity of satellite data for operational monitoring
- Robustness of methods for national, regional to global application – lack of field level validation data, absence of best practices for different cropping systems and regions
- Difficulty in transitioning research methods into operational use
- Need for capacity building and support to use EO data in many operational monitoring institutions - including new sensors
- Quality and timeliness of global/national agricultural data and statistics
- Decline and privatization of in-situ weather data
- Accuracy of seasonal forecast data
- In general a low investment in agricultural research and agricultural extension services
GEOGLAM Actors
GEOGLAM Community of Practice

Open Community made up of individuals from international and national agencies concerned with agricultural monitoring including Ministries of Ag, Space Agencies, Universities, & Industry
Context For GEOGLAM
Monthly Wheat Prices 1960-2011($/Metric Ton)
Source: World Bank

- 1970s price hike
- 1996 price hike
- 2008 Price hikes
  Droughts: Australia & Ukraine
- 2010/11 Price hikes
  Drought: Russia USA

Landsat 1 Launched (1972)
International recognition of critical need for improved real-time, reliable, open information on global agricultural production prospects.

Critical for agricultural policies, stabilizing markets, averting food crises and needs.

Need to increase food production by 50%-70% by 2050 to meet demands (FAO).
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: a GEO Initiative

• Vision: the use of coordinated, comprehensive and sustained Earth Observations to inform decisions and actions in agriculture... through a system of agricultural monitoring systems

• Aim: Strengthen the international community’s capacity to utilize Earth Observations to produce and disseminate relevant information on agricultural production at national, regional and global scales

• Approach: Building on existing monitoring systems – strengthening international and national capacity

• Emphasis on: producer countries (G20+), countries-at-risk and national capacity building

The GEOGLAM Components

1. Global / Regional Monitoring Systems
   International/Global

2. National Monitoring Systems
   National / Subnational

3. Monitoring Countries at Risk
   Food Insecure and Most Vulnerable

4. EO Data Acquisition & Dissemination Coordination

5. Research & Development toward Operations

6. Capacity Development for EO
AMIS: Agricultural Market Information System

Improve market information and transparency

inter-Agency Platform to enhance food market transparency and encourage coordination of policy action in response to market uncertainty

www.amisoutlook.org
AMIS requested GEOGLAM to generate a monthly international consensus of crop conditions, from the various international/national monitoring systems.

- Four major crops: wheat, maize, soybean, rice (9 total seasons)
- Focus: stabilizing/calming markets, avoid unexpected food price shocks
- [http://www.geoglaml-crop-monitor.org](http://www.geoglaml-crop-monitor.org)
- Consensus process, interface, submissions, telecons
- Summary information only
AMIS COUNTRIES
GEOGLAM Best Available Multi-Season Crop Masks

20 contributors and counting w. on going improvements

Winter Wheat  Spring Wheat

Rice

Maize  Soybeans
Best Available Multi-Season Crop Calendars

Winter & Spring Wheat

Maize 1 & Maize 2

Rice 1, Rice 2 & Rice 3

Soybean 1 & Soybean 2

Calendars reflecting multiple cycles of the same crop
Crop condition map synthesizing information for all four AMIS crops. Crops that are in other than favorable conditions are displayed on the map with their crop symbol. (Cropland area shown is an aggregation of all cropland areas)
Crop Conditions as of October 28th, 2015
G20 Agricultural Ministers

2011 Action Plan on Food Price Volatility and Agriculture

AMIS – Markets/Stocks

http://www.amis-outlook.org/amis-monitoring

GEOGLAM – Condition/Supply

https://cropmonitor.org/

NO. 38
April 2017

The Group on Earth Observations’ Global Agricultural Monitoring (GEOGLAM) initiative developed the Crop Monitor whose objective is to provide AMIS with an international and transparent multi-source, consensus assessment of crop growing conditions, status, and agro-climatic conditions, likely to impact global production. This activity covers the four primary crop types (wheat, maize, rice, and soy) within the main agricultural producing regions of the AMIS countries (G20+7). The Crop Monitor reports provide cartographic and textual summaries of crop conditions as of the 20th of each month, according to crop type. There is another Crop Monitoring initiative called the Early Warning Crop Monitor (geoglarm-crop-monitor.org), which has grown out of this initiative.
GEOGLAM AMIS Crop Monitor Partners

> 35 Partners and Growing
Next Steps for GEOGLAM /AMIS collaboration

• Develop more quantitative indicators of crop growing condition and production
• Broaden national and sub-national (state) participation in the Crop Monitor providing monthly updates on crop condition
• Strengthen linkages between the EO-based ag monitoring community and the AMIS community at the national level
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Early Warning Crop Monitor Countries
Crop Monitor for Early Warning Bulletin
www.cropmonitor.org

CROP MONITOR FOR EARLY WARNING

NO. 19
August 2017

The Crop Monitor for Early Warning brings together international, regional, and national organizations monitoring crop conditions within countries at risk of food insecurity. The focus is on developing timely, consensus assessments of crop conditions, recognizing that reaching a consensus will help to strengthen confidence in decision making. The Early Warning Crop Monitor grew out of a successful collaborative relationship, the AMIS Crop Monitor (www.amis-outlook.org), which monitors the main producing countries.
The reporting process is carried out globally every month on the web-based Crop Assessment Tool.
Example discrepancy map

- Hashed areas show conflicting crop condition entries from different agencies.

July assessment had **710 entries** over **61 countries** and **39 sub national regions** with crop condition discrepancies that were discussed and ultimately we reached a full consensus.
Map Products

Crop specific & regional synthesis map

- Synthesis maps provide an overview of regional conditions
- Crop specific maps convey the drivers behind those conditions

Quick and easy to interpret crop conditions oriented for policy communities
Already informing agricultural decisions

ARC, South Africa

Financial Times

Joint Statement
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Example: Development of National Crop Monitors, Facilitating National Food Security Reports


The Inter-Ministerial/Agencies Monthly National Integrated Multi-Hazard Early Warning Bulletin, published by the Uganda Office of the Prime Minister
Informing Decisions in Uganda: September 2015

“Karamoja Food Security Situation” report used to justify mobilization of food aid in the Karamoja region.

Report applied remote sensing for timely, accurate, actionable in-season monitoring of crop conditions.
Example: Pakistan Agricultural Information System
(Collaboration among CRS, USDA, FAO, SUPARCO & UMD)

EO Wheat Production Forecasting

Crop condition

Crop type classification

Province Bulletins

Project information
Asia-RiCE Regional 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
Vietnam Rice Crop Area Estimates/Maps

Setinel-1a rice crop monitoring in Vietnam

Rice Phenological Stages Classification using Radarsat-2 Data (VH_VV)
29 July 2014 (Subang Area, West Java) by MOA, LAPAN with JAXA
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6. Capacity Development for EO
Recognition that cropping systems are inherently diverse which dictates the monitoring observations and methods. No one system can meet agricultural monitoring needs.

Developing the EO Data Requirements for GEOGLAM: through a CEOS/GEOGLAM Ad Hoc Working Group

Goals of the EO Data Coordination Component.
• Articulate data requirements for agricultural monitoring
• Coordinate international satellite acquisition over agricultural areas during the growing season
• Promote near-real time data availability
• Increase the frequency of moderate resolution data
• Standardize processing of data, facilitating data interoperability
• Promote easy data access for operational users
• Advocate for continuity of critical data streams/products
GEOGLAM CEOS: EO Data Requirements Table

developed taking into consideration the observation needs, the derived products they will serve, and regional specificities; CEOS-GEOGLAM July 2012 Montreal

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>MODIS ( Aqua/Terra, VISIR)</td>
<td>2000 - 500 m</td>
<td>thermal IR + optical</td>
<td>few per day</td>
<td>global</td>
<td>NRT products (PS)</td>
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<tr>
<td>MODIS (optical not SWIR)</td>
<td>100 - 300 m</td>
<td>optical + SWIR</td>
<td>2 to 5 per week</td>
<td>global</td>
<td>NRT products (PS)</td>
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<td>Sentinel 3 (Future)</td>
<td>30 - 150 m</td>
<td>passive microwave</td>
<td>daily</td>
<td>main crops</td>
<td>NRT products (IP)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>5 - 20 m</td>
<td>SAR dual pol. (H,C)</td>
<td>5 per season</td>
<td>rice area</td>
<td>NRT products (PS/PSI)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>5 - 20 m</td>
<td>RADAR Altimetry</td>
<td>thermal</td>
<td>entire growing season</td>
<td>NRT products (PS/PSI)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>20 - 70 m</td>
<td>optical + SWIR</td>
<td>1 per week (min. 1 to 2 per weeks)</td>
<td>croplands</td>
<td>NRT products (PS)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>20 - 70 m</td>
<td>optical + SWIR</td>
<td>1 per week (min. 1 to 2 per weeks)</td>
<td>croplands</td>
<td>NRT products (PS)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>5 - 10 m</td>
<td>optical (SWIR)**</td>
<td>1 per week (min. 1 to 3 season in season)</td>
<td>main crops</td>
<td>NRT products (PS)</td>
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<tr>
<td>Sentinel 3 (Future)</td>
<td>5 - 10 m</td>
<td>optical (SWIR)**</td>
<td>1 per week (min. 1 to 3 season in season)</td>
<td>main crops</td>
<td>NRT products (PS)</td>
</tr>
<tr>
<td>Sentinel 3 (Future)</td>
<td>&lt; 5 m</td>
<td>optical</td>
<td>1 to 2 per month</td>
<td>croplands</td>
<td>NRT products (PS)</td>
</tr>
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GEOGLAM data plan submitted to the CEOS plenary in 2013
Access Summary

- Open (no registration) = 36%
- Open (simple registration) = 21%
- Open (advanced approval) = 5%
- Restricted = 33%
- Unknown = 5%

Comments

- This summary includes **205 missions** launched since 1990 and 615 mission-instrument combinations.
- **62%** of CEOS mission data is OPEN and accessible.

**Are the data acquired for Ag areas during the growing season?**

**Are they easily accessible?**
Requirement for Near Real Time Data for Agricultural Monitoring

Timely data are critical for crop monitoring

- NASA EOS near-real-time daily observations are processed and provided < 3 hours from observation
- VIIRS now available
A time series of NDVI values derived from MODIS/Aqua (MYD09CMG) and VIIRS/SNPP (VNP09CMG) daily products at 0.05° resolution for Harper County, Kansas, USA. Shown also are final winter wheat yields derived from USDA NASS statistics. The figure shows that the yield values co-vary with the maximum NDVI values from each season.

MODIS and VIIRS NDVI data can be used interchangeably for applications with an uncertainty of less than 0.02 to 0.05 (NDVI units), depending on the scale of spatial aggregation, which is typically the uncertainty of the individual dataset.
There is a good both **temporal** and **spatial consistency** between MODIS and VIIRS derived surface reflectance and NDVI products.
Transitioning from MODIS to VIIRS: an analysis of inter-consistency of NDVI data sets for agricultural monitoring

Sergii Skakun, Christopher O. Justice, Eric Vermote & Jean-Claude Roger


To link to this article: http://dx.doi.org/10.1080/01431161.2017.1395970
### Sentinel contribution to JECAM & GEOGLAM

**Primary missions for all targets**

<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>Field Size</th>
<th>Target Products</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Crop Mask</td>
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<td>Crop Type Area and Growing Calendar</td>
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<td></td>
<td>Crop Condition Indicators</td>
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<td>Crop Yield</td>
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<td>Crop Biophysical Variables</td>
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<td>Environ. Variables</td>
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<td></td>
<td>Ag Practices / Cropping Systems</td>
</tr>
</tbody>
</table>

#### Coarse Resolution Sampling (>100m)

<table>
<thead>
<tr>
<th>1</th>
<th>500 - 2000 m</th>
<th>thermal IR + optical</th>
<th>Daily</th>
<th>Wall-to-Wall</th>
<th>All</th>
<th>X</th>
<th>X</th>
<th>L</th>
<th>L</th>
<th>L</th>
</tr>
</thead>
<tbody>
<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>All</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>L</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>5-50 km</td>
<td>microwave</td>
<td>Daily</td>
<td>Cropland Extent</td>
<td>All</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

#### Moderate Resolution Sampling (10 to 100m)

| 4   | 10-70m             | optical + SWIR + TIR | Monthly (min 2 out of season + 3 in season). Required every 1-3 years. | Cropland Extent | All | X | L/M
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10-70m</td>
<td>optical + SWIR + TIR</td>
<td>Weekly (min. 1 per 16 days)</td>
<td>Sample</td>
<td>All</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6</td>
<td>10-100m</td>
<td>SAR</td>
<td>Weekly (min. 1 per 2 weeks)</td>
<td>Cropland Extent of persistant cloudy areas/Rice</td>
<td>All</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Source:** CEOS ACQUISITION STRATEGY FOR GEOGLAM PHASE 1
Toolbox for 4 S2-based products in line with the GEOGLAM core products

- **Cloud free surface reflectance composites**: Monthly cloud free surface reflectance composite at 10-20m
- **Binary map**: Identifying annually cultivated land at 10m, updated every month
- **Dynamic cropland mask**: Open source toolbox, capacity building, and training
- **Vegetation status**: Vegetation status map at 20m delivered every 10 days (NDVI, LAI, pheno index)
- **Cultivated crop type map**: Crop type map at 10m for the main regional crops including irrigated/rainfed discrimination
First S2-based prototype product
Toulouse area (France) - Sentinel-2 – 06 July 2015

New red-edge band to discriminate summer crops: maize vs sunflower

New red-edge color composite
orange versus yellow

Summer Crops Map – 6 July 2015

Contains Copernicus data (2015)
Harmonized Landsat Sentinel-2 (HLS) Project

- Merging Sentinel-2 and Landsat data streams can provide 2-3 day global coverage
- Goal is “seamless” near-daily 30m surface reflectance record including atmospheric corrections, spectral and BRDF adjustments, regridding
- Project initiated as collaboration among GSFC, UMD, NASA Ames
HLS Algorithms overview and status

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Current (V1.2)</th>
<th>Other Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geographic registration</td>
<td>AROP (Gao et al. 2009, JARS)</td>
<td></td>
</tr>
<tr>
<td>Atmospheric Correction</td>
<td>OLI and MSI: Landsat-8 6S algorithm</td>
<td>CNES MACCS</td>
</tr>
<tr>
<td>Cloud/Shadow Mask</td>
<td>OLI: Landsat-8 6S algorithm output</td>
<td>CNES MACCS</td>
</tr>
<tr>
<td></td>
<td>MSI: BU MSI Fmask</td>
<td></td>
</tr>
<tr>
<td>BRDF Adjustment</td>
<td>Fixed BRDF (Roy et al. 2016, RSE)</td>
<td>Downscaling MODIS BRDF + Fixed BRDF as Backup</td>
</tr>
<tr>
<td>Band Pass Adjustment</td>
<td>Fixed, per-band linear regression</td>
<td>Regression-tree (based on spectral shape)</td>
</tr>
<tr>
<td>Temporal Compositing</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>

L30 (OLI SR 30m) → Atmospheric Correction → Geometric Resampling → BRDF Adjustment → Temporal Compositing

S10 (MSI SR 10m) → Atmospheric Correction → Geometric Resampling → BRDF Adjustment

S30 (MSI NBAR 30m) → Band Pass Adjustment

M30 (5-day composite NBAR)
Harmonized Landsat / Sentinel-2 Products
Laramie County, WY

Seasonal phenology (greening) for natural grassland (blue line) and irrigated alfalfa fields (red line) near Cheyenne Wyoming observed from Harmonized Landsat/Sentinel-2 data products. The high temporal density of observations allows individual mowing events to be detected within alfalfa fields. HLS Products available from https://hls.gsfc.nasa.gov
HLS Websites and Public Interface

- [https://hls.gsfc.nasa.gov](https://hls.gsfc.nasa.gov)
- Public access
- Sample data available (via FTP)
- Algorithm & Product descriptions

- [https://nex.nasa.gov/nex/projects/1371](https://nex.nasa.gov/nex/projects/1371)
- Registered user access
- All HLS data available
- Documents (slides, user guides)
Canada’s Annual Crop Inventory: Integration of Optical and Synthetic Aperture Radar Data

Image Data

- Multispectral optical data can adequately classify crop if available during critical time periods
- Accuracies decrease significantly when gaps in data collection occur
- Operational burden of cloud masking
- Accuracy increases with SAR; magnitude depends on crop, timing of acquisitions and amount of optical data available

Courtesy Thierry Fisette and Leander Campbell, AAFC
In Development: Early Season Crop Identification

End of season TerraSAR-X crop classification: Ottawa 2012
Overall accuracy: 97.2%

Early season: Corn can be identified at V6 or 6\textsuperscript{th} leaf collar stage (about 6 weeks after planting)

RADARSAT Constellation Mission

• Evolution of the RADARSAT Program → 3 satellites – 600 km orbit, 32 minutes separation
• Multi-pol and fully polarimetric, high-resolution
• 15 min/orbit imaging (avg) x 3 satellites
• Average daily global access; 4-day exact repeat
• Focus on Marine Surveillance, Disaster Management and Ecosystem Monitoring (*including Agriculture*)
• Open data policy?
Seeing a Changing Playing Field – Small Sat optical systems

Very Fine Resolution Systems (m)
- Ikonos: .8
- Quickbird: .6
- WorldView-1: .5
- Geoeye: .4
- WorldView-2: .5
- WorldView-3: .3
- Cartosat 3: .3
- Pleiades 2A, 2B: .7
- Kompsat 3: 70cm

Fine Resolution Systems (m)
- SPOT 1-3: 5, 10
- Rapideye: 7
- Planet Labs (Dove): 5
- IRS 1C, 1D: 6
- CBERS 2: 3
- THEOS: 2
- SPOT 5/6: 2.5
- SkySat 1: 1
- Cartosat 1/2: 2.5
- Ziyuan 2: 3
- THEOS: 2

Questions of Acquisition Frequency, Cloud Cover, Data Availability

Affordability

Operational demonstrations needed

In the US alone - 70 Companies, 50 Univ.’s and 15 Govt. Agencies involved w. SmallSat development
Some requirements (high temporal and/or spatial resolution) are for entire cropland extent; others are on a sampled basis.

Sampling strategy in development.

For Phase 1A (e.g. Argentina):

- **Argentina Sample Strata**
- **Derived Rapid Eye Sample Blocks**
  - 40 km x 40 km; n = 75

(Matt Hansen, Carlos Di Bella, et al.)
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Agricultural Monitoring: EO data and Final products

Spatial resolution / Revisiting capacities

- 5km - 1km: hourly images
- 1km - 250m: daily images
- 250m - 60m: 1-3 images / 15 days
- 60m - 10m: 1-2 images / month
- 10m - 1m: 1-2 images / season

Agricultural Monitoring:
- Croplands mask
- Crop type area
- Crop type at parcel level
- Sample point interpretation
- Regression estimate

Crop growth model
- Crop stages
- Crop variables
- Intra.Parcel variability

Yield estimates
- + in situ obs.

Precise farming
- Early warning
- Monthly bulletin
- Vulnerability report

Food Security
- Yield forecast
- Prod estimate
- Int market report

Agric. map
- Area outlook
- Area estimate

Agriculture / veg. conditions
- Anomalies detection

Crop Growth
- Crop specific conditions

Meteo cond.
- Area

Yield
- + field report & socio-economic context by analyst
- + prod. quality, stocks & demand by info brokers
Research Foci at the Joint Experiment for Crop Assessment and Monitoring (JECAM) Sites

Developing Methods for:
- Crop Type mapping
- Crop Condition monitoring
- Yield Estimation modeling
- Soil Moisture estimation
- Residue and Tillage monitoring

- EC SIGMA Project, Sentinel 2 Agri and BMGF STARS are strengthening the JECAM field data collection protocols and intercomparison

JECAM.org
JECAM – SIGMA methods benchmarking results

→ Similar cropland mapping accuracy performances of all methods for a site
→ Different performances according the site: ag.landscape impact
→ Influence of the satellite data quality used as input
So in Summary
What is GEOGLAM doing?

- Increasing communication and sharing experience amongst the Ag Monitoring Community of Practice and with related programs
- Helping improve national agricultural monitoring systems
- Translating EO data into policy relevant information
- Promoting EO-based approaches to agricultural monitoring and raising the importance of agricultural remote sensing
- Articulating and advocating for community requirements to the EO data providers
- Increasing the awareness of EO by the econ/policy community
- Method testing and inter-comparison, developing best practices
- Developing new monitoring capabilities and products
The NASA Food Security and Agriculture Consortium (FSAC)

Inbal Becker-Reshef, Chris Justice et al.,
University of Maryland,
Center for Global Agricultural Monitoring Research
The NASA Roses A.51 Call For Proposals

**Broad, comprehensive call for developing NASA’s program on Food Security and Agriculture**

- Pilot a program of activities for applying RS to improve food security & agriculture
- Transdisciplinary, multi-sectoral team interacting as a Consortium
- Advance uses of EO data and models through:
  - Applied R&D and applications development
  - End user characterization and engagement
  - Innovative communications work
  - Socioeconomic impact assessment
- International & domestic food security
- Understanding the value of EO applications
- Focus on adoption and sustained use of EO based on solid business models
- NASA contribution to the GEOGLAM flagship
- Agility in responding to changing priorities
FSAC key objectives and approach

- **Objective**: develop a coordinated program to enhance decision support (domestically & internationally) through utilization of EO
  - Working closely from the start with a range of stakeholder communities
- Leveraging successful domestic and international activities
- Utilizing public & private EO data alongside socioeconomic, agmet. & ground data to develop information products
  - In support of a range of management and decisions, planning, investments, assessments, and policy at scale
- Foundation in user-driven operational R&D
- Emphasis on transitioning applications to operations & capacity building
- Implemented through a large multi-sectoral, multi disciplinary consortium
  - 45 partners, over 70 participants
  - UMD Hub
  - Partnership with the NASA GSFC Food Security Office (FSO)
- In final negotiations with NASA HQ and GSFC FSO, expect to launch at AGU
The Consortium

• Leading individuals/institutions from public, private NGO, intergovernmental, humanitarian sectors working in Agriculture and Food Security

• Consortium Partners named explicitly
  – Have both experience and on-going funded activities in the agricultural application of EO data
  – Represent a range of end-user communities, & includes socio-economic, outreach and communication expertise
  – Link to wide range of networks, key organizations, service providers, & end users

• Seed Starter Program, to engage new users and partners

• Advisory Committee, advise & facilitate new partnerships, review progress & provide guidance

• Work in close partnership with the new GSFC Food Security Office
End Users

• Range of end users included in Consortium, & involved in its development:
  – From farmers to national agricultural ministries, international food security agencies, domestic market and trade sectors, NGOs, agribusiness, insurance and financial sector stakeholders

• Areas of focus for End User Engagement
  – International Crop Production Forecasts, Markets, and Trade
  – Domestic Commercial Agriculture and Farm Management
  – Regional and National Level Food Security, Early Warning, and Policy
  – Smallholder Agriculture Farm Management and Resilience Micro-Insurance
  – Strategic Targeting of New, Non-traditional End Users