GROUP ON EARTH OBSERVATIONS

The G20 GEO Global Agriculture Monitoring (GEOGLAM) Initiative: Supporting the GEOSS vision for an Agricultural Monitoring System of Systems

NASA Applied Sciences Supported Contributions

Inbal Becker-Reshef, Chris Justice, Alyssa Whitcraft, Brian Barker, Katie McGaughey, Mike Humber, Antonio Sanchez, Jon Nordling

University of Maryland, Center for Global Agricultural Monitoring Research,
Department of Geographical Sciences

GEOGLAM
Global Agricultural Monitoring

GEOGLAM: A GEO Initiative on Global Agricultural Monitoring through the use of earth observations

- Aim: Strengthen the international community's capacity to produce and disseminate relevant information on agricultural production at national, regional and global scales, through earth observations
- Building on existing monitoring systems
- Focus on producer countries and 'countries-at-risk'

http://www.earthobservations.org/geoglam.php

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GEOGLAM Global Agricultural Monitoring

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

Agriculture and Agri-Food Canada
CSIRO
European Commission
USDA
FAO
University of Maryland
World Meteorological Organization
USAID FROM THE AMERICAN PEOPLE
USGS
FEWS NET
isro
ИКИ
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
helping to build a world without hunger
vito vision on technology
UCL Université catholique de Louvain
Earth and Life Institute - Geomatics
esa
CILSS
IIASA
中国农业科学院 The Chinese Academy Of Agricultural Sciences
GMFS Global Monitoring for Food Security
CSA ASC
SAGARPA
SECRETARÍA DE AGRICULTURA, GANADERÍA, DESARROLLO RURAL, PESCA Y ALIMENTACIÓN
ИКД
Australian Government
Department of Agriculture, Fisheries and Forestry
ABARES
INTA Instituto Nacional de Tecnología Agropecuaria
sarmap
CGIAR
CNSA
RADI
AMESD
ARC • LNR Excellence in Research and Development
CEOS Committee on Earth Observation Satellites
MARS Monitoring Agricultural ResourceS
JAXA
Australian Government
Department of Agriculture, Fisheries and Forestry
ABARES
SIAP
SERVIR
Asia-RiCE
GLOBAL WATCH GIEWS
NASA
copernicus The European Earth Observation Programme
INPE
Conab
cirad
MINISTÈRE DE L'AGRICULTURE ET DE LA PÊCHE
GLAM GLobal Agriculture Monitoring

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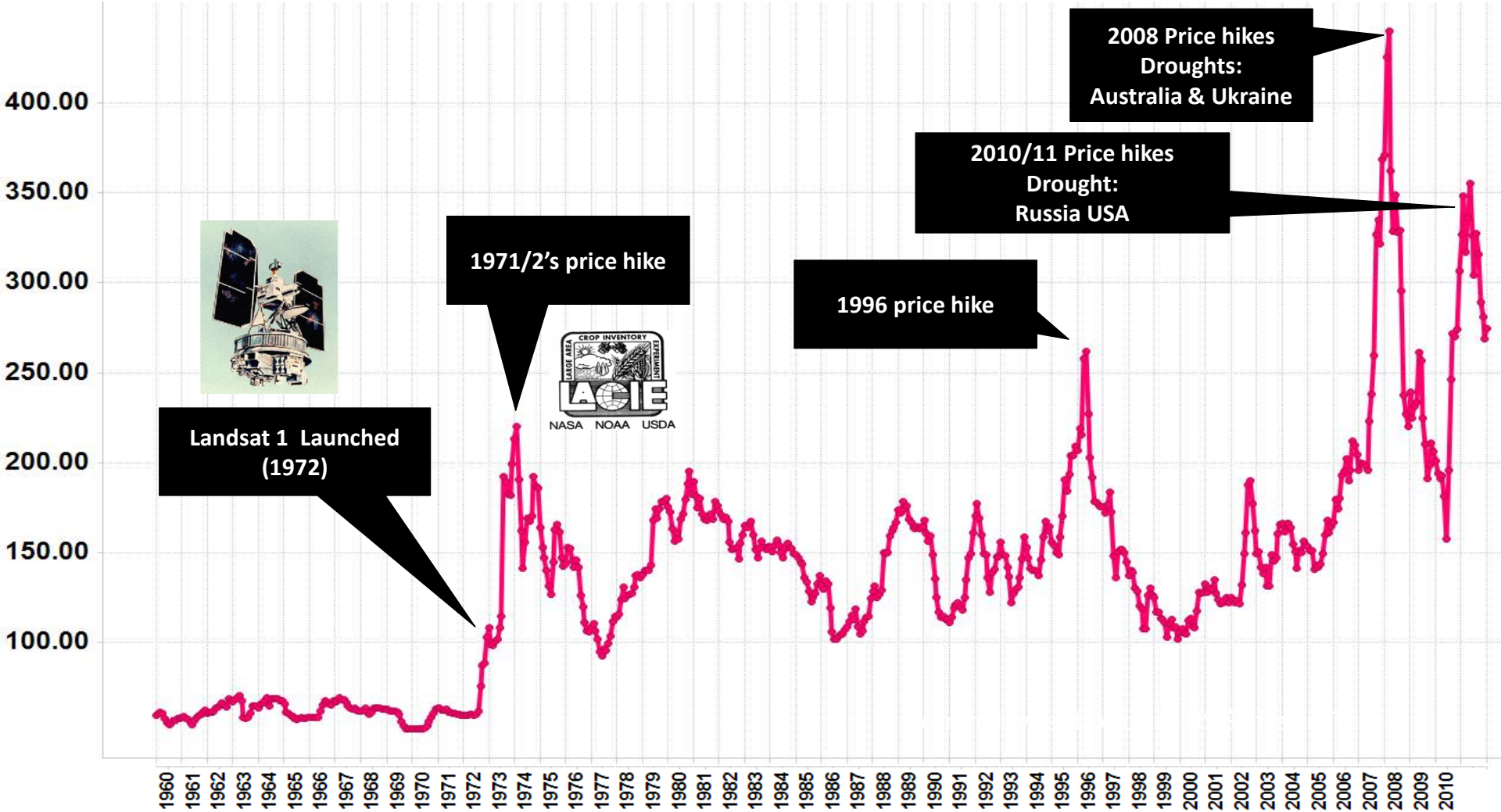
GEOGLAM Global Agricultural Monitoring

Context For GEOGLAM

Monthly Wheat Prices 1960-2011($/Metric Ton)

Source: World Bank



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GEOGLAM Global Agricultural Monitoring

The G20 Agriculture Mandate (2011)
G20 Final Declaration – Cannes, November 2011

- *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 and weather forecasting data.*

Two initiatives to increase information availability, quality and transparency :

GEOGLAM : improve information on supply

AMIS : improve information on markets

AMIS Agricultural Market Information System

GEOGLAM Global Agricultural Monitoring

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GEOGLAM Global Agricultural Monitoring

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

CEOS Committee on Earth Observation Satellites

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

6. DATA, PRODUCTS and INFORMATION DISSEMINATION

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GEOGLAM Global Agricultural Monitoring

GEOGLAM Component #1
Global and Regional Agricultural Monitoring

Focus on major export and producer countries

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GEOGLAM Global Agricultural Monitoring

GEOGLAM Crop Monitor

- Response to AMIS request
- End Users: AMIS (Economists & Policy)
- Objective: develop transparent, timely, crop condition assessments in primary agricultural production areas highlighting potential hotspots of stress/bumper crop
- Reflecting an international consensus of crop conditions
- http://www.geoglam-crop-monitor.org

Coordinated by UMD, Center for Global Agricultural Monitoring Research

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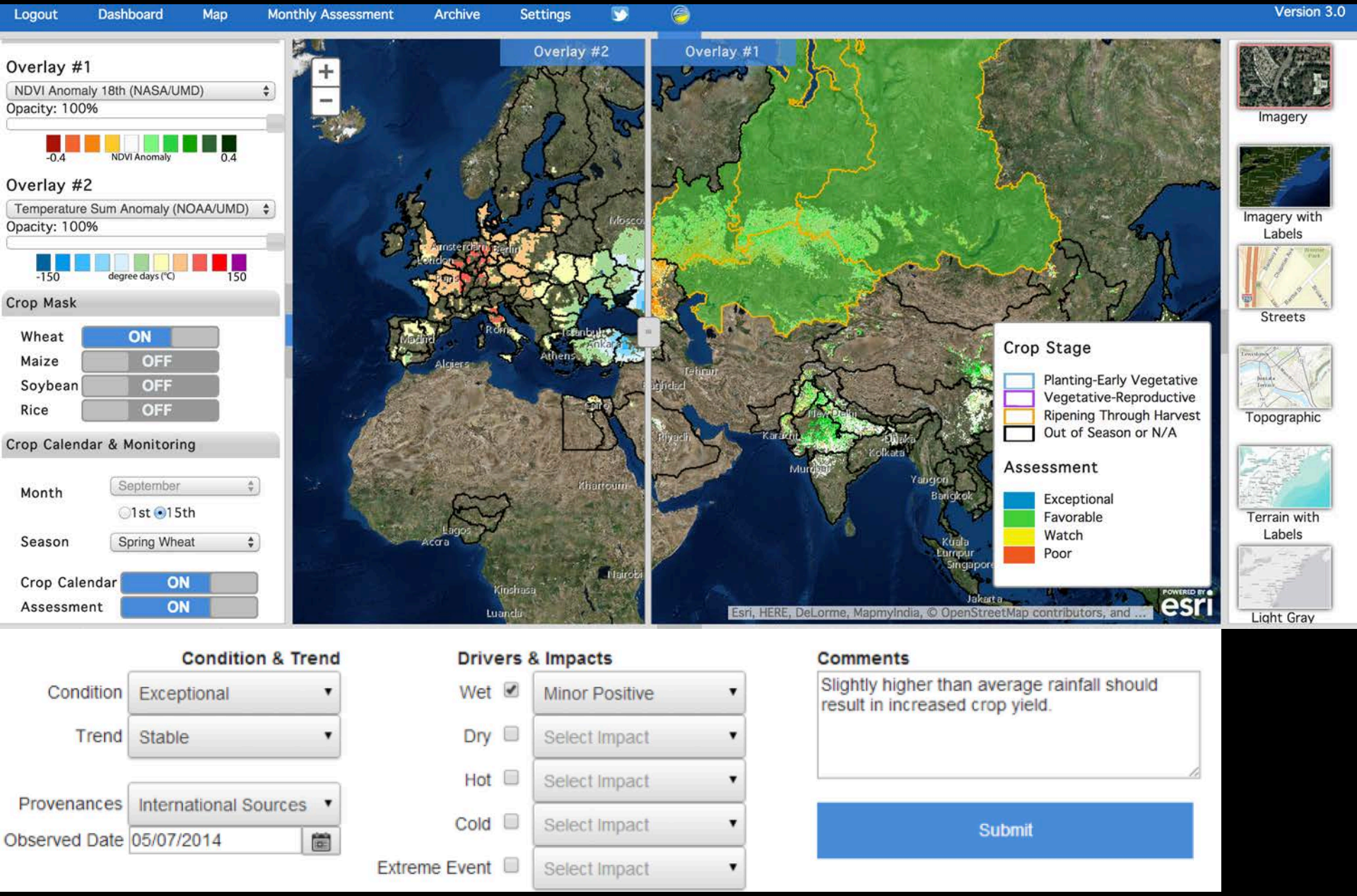
GEOGLAM Global Agricultural Monitoring

GEOGLAM Crop Monitor Partners

>30 partners & growing

Country	Organization/Agency	Country	Organization/Agency
Argentina	INTA	Japan	JAXA
Asian Rice Countries	AFSIS ASEAN +3	Mexico	SIAP
Asian Rice Countries	Asia RiCE	Russia	IKI
Australia	ABARES	South Africa	ARC
Australia	CSIRO	South Africa	GeoTerraImage
Brazil	CONAB	South Africa	SANSA
Brazil	INPE	Thailand	GISTDA
Canada	AAFC	Thailand	OAE
China	CAS	Ukraine	NASU-NSAU
EU	EC JRC MARS	Ukraine	UHMC
India	ISRO	Uruguay	MGAP
Indonesia	LAPAN	USA	NASA
Indonesia	MOA	USA	UMD
International	CIMMYT	USA	USDA (FAS, NASS)
International	FAO	USA	USGS - FEWSNET
International	IRRI	Vietnam	VAST
International	IFPRI	Vietnam	VIMHE-MARD
International	TU WIEN		

Crop Interface for Crop Condition Assessments



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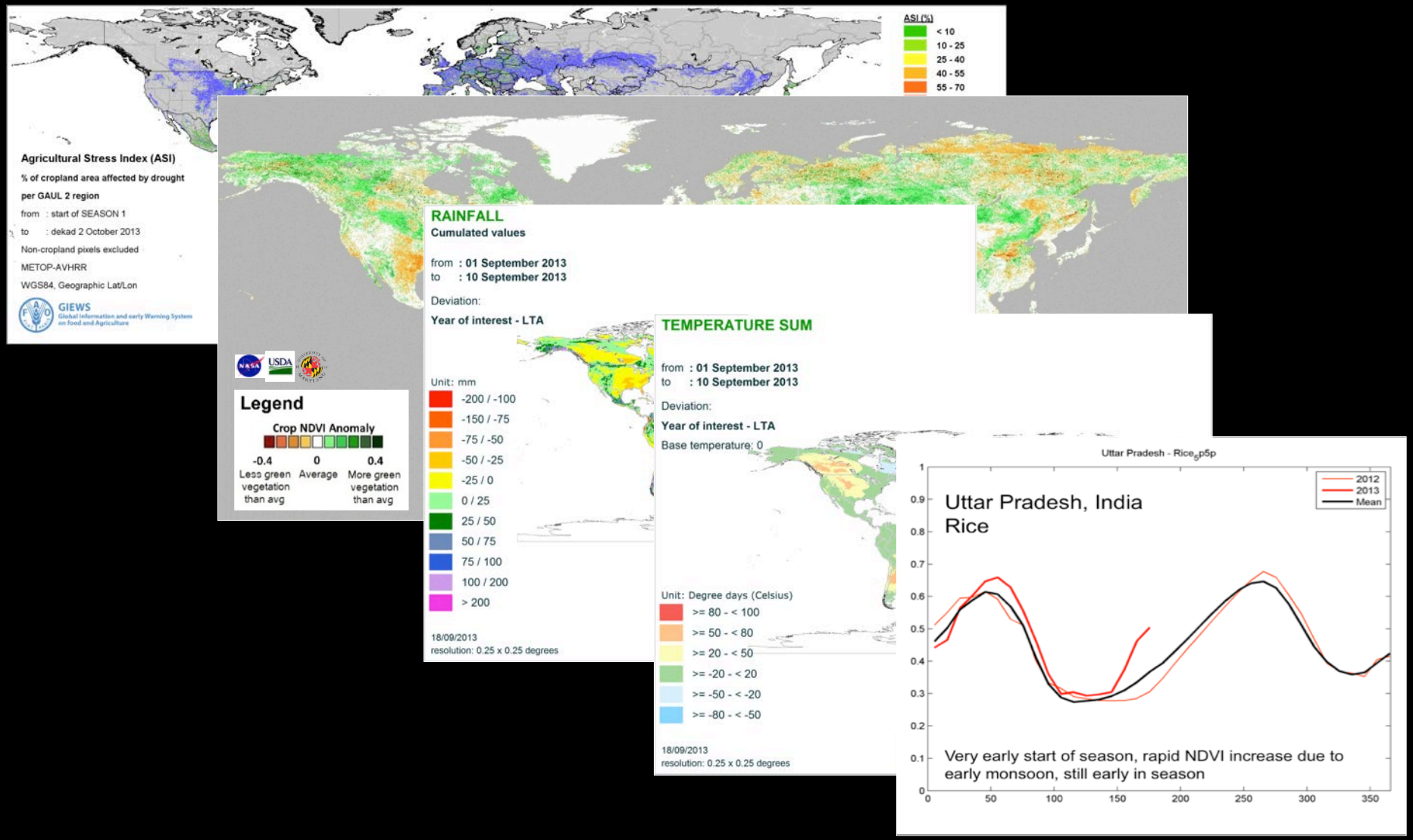
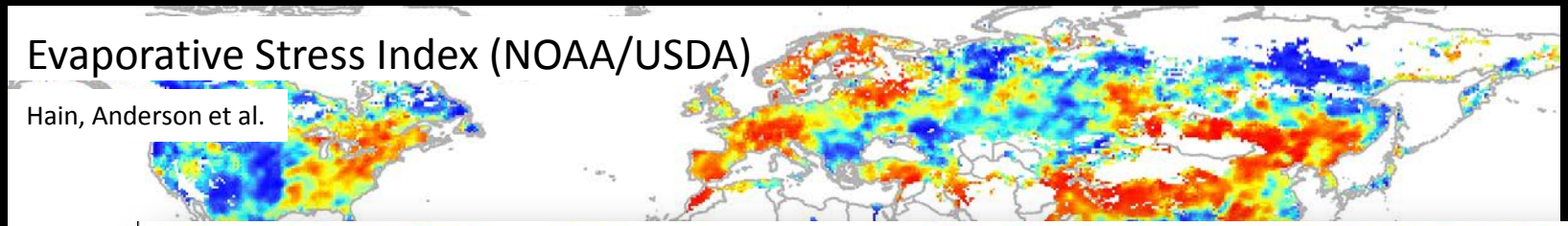
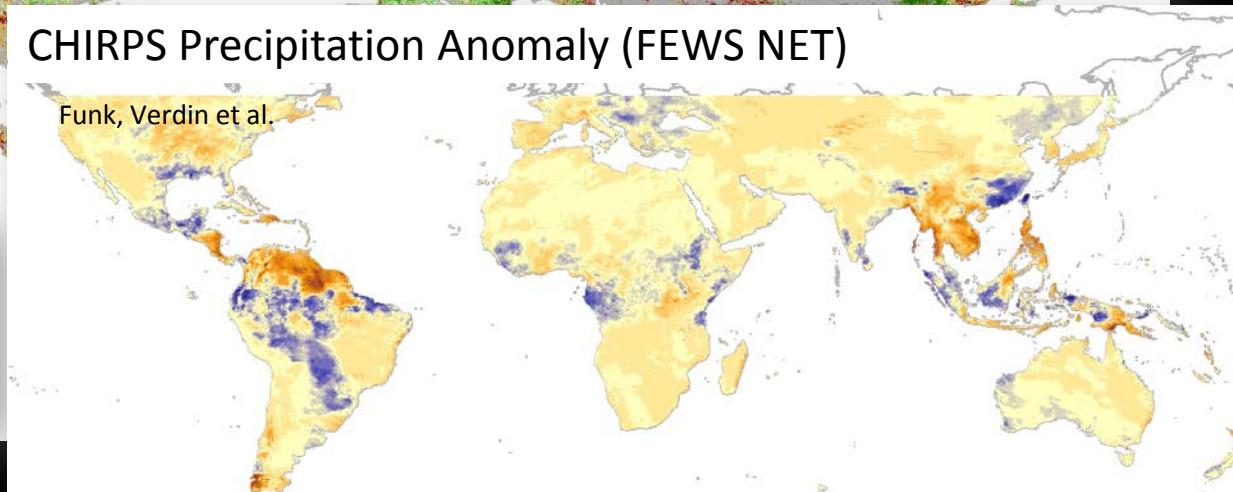
GEOGLAM Global Agricultural Monitoring

Current EO Data



Exploring Partner Datasets for Integration into Crop Monitor Interface





Legend

Surface Soi

0 - 5

5 - 10

10 - 1

15 - 2

20 - 2

ETa Anomaly (%)

< 50

50 - 70 } below average

70 - 90

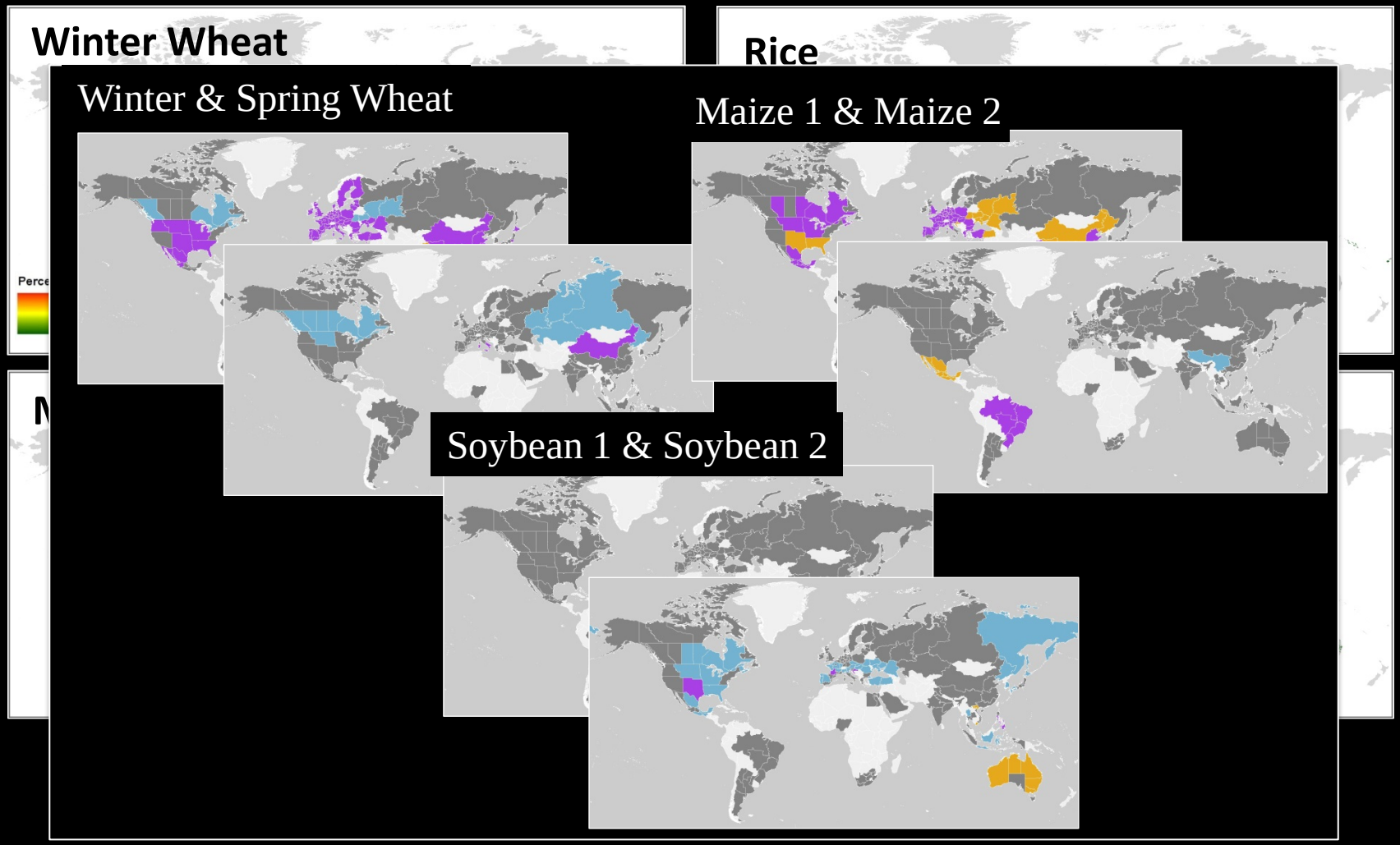
90 - 110 about average

110 - 130

130 - 150 } above average

> 150

Best Available Multi-Season Crop Type Masks & Crop Calendars Development Ongoing



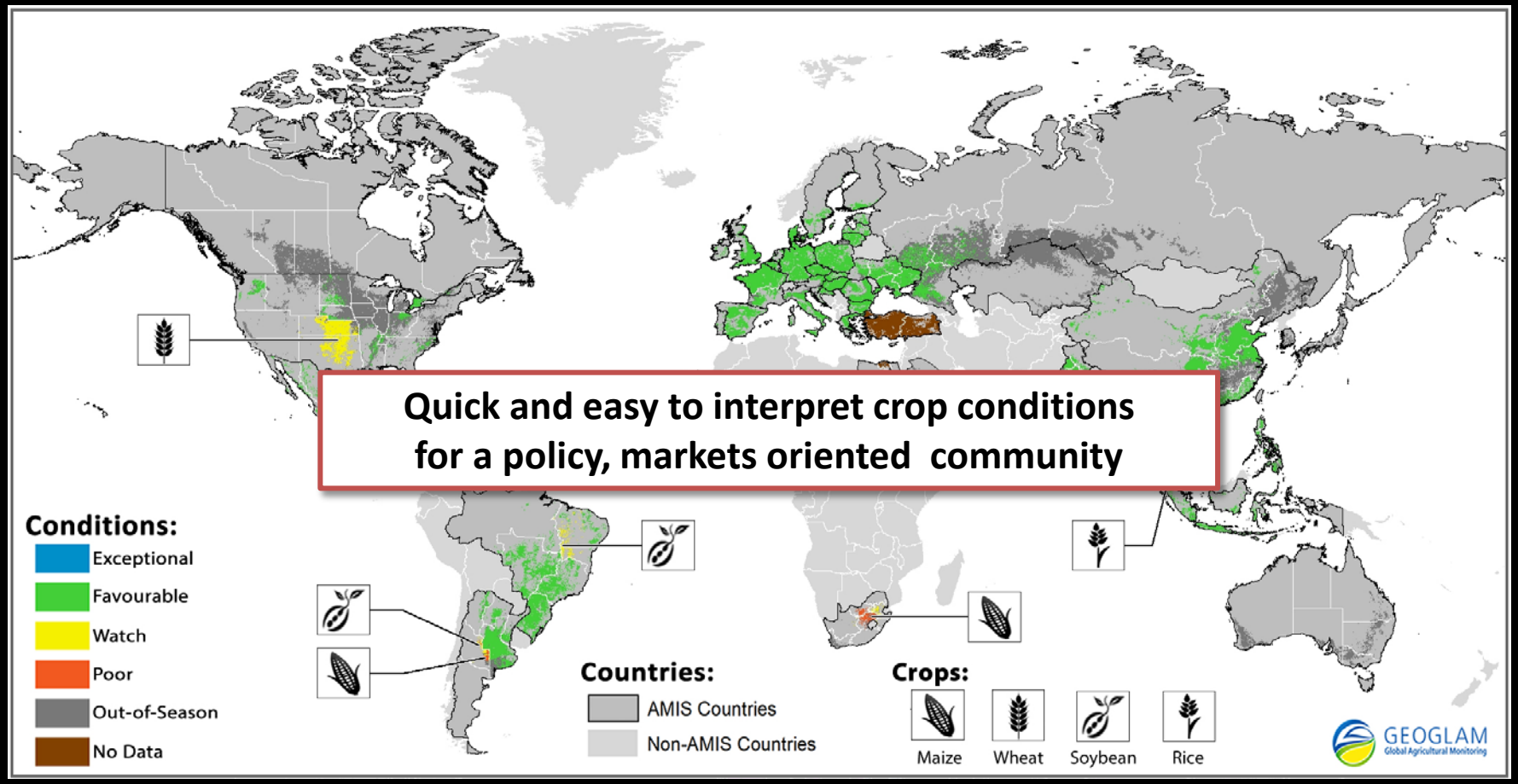
Based on GEOGLAM partner crop type masks- to be released in 2015

GEOGLAM
Global Agricultural Monitoring

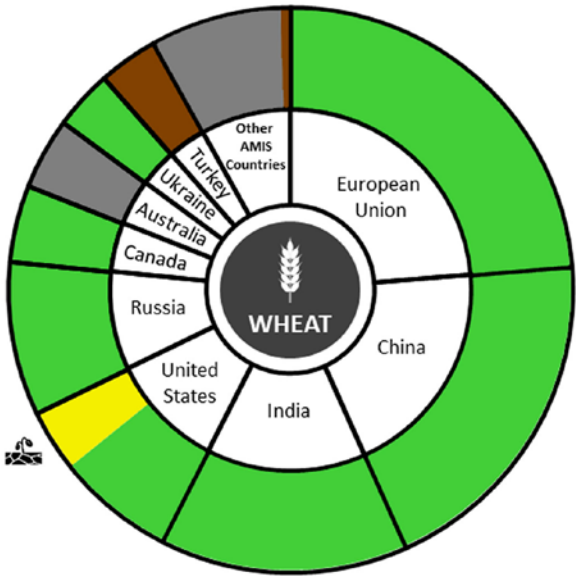
Synthesis Maps Covering All AMIS Crops

Crop Conditions as of February 28th, 2015

V1. with Crop Type



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)



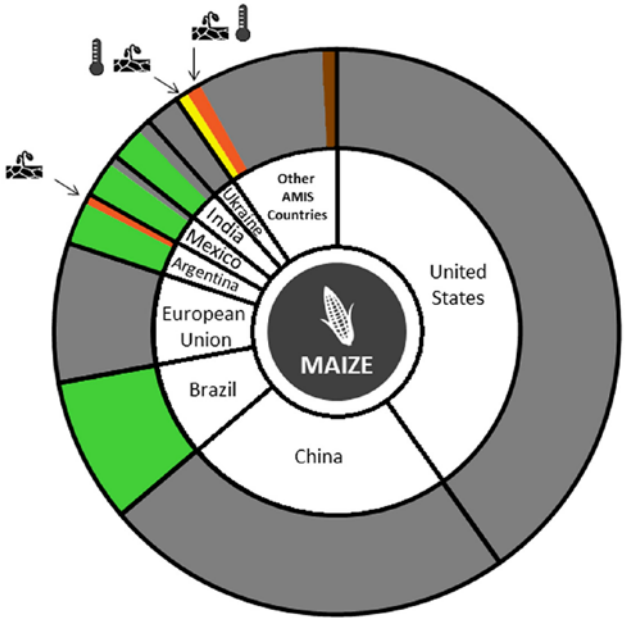
Conditions:

- Exceptional
- Favourable
- Watch
- Poor
- Out-of-Season
- No Data

Drivers:

- Wet
- Dry
- Hot
- Cool
- Extreme Event

GEOGLAM Global Agricultural Monitoring



Conditions:

- Exceptional
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- Watch
- Poor
- Out-of-Season
- No Data

Drivers:

- Wet
- Dry
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- Cool
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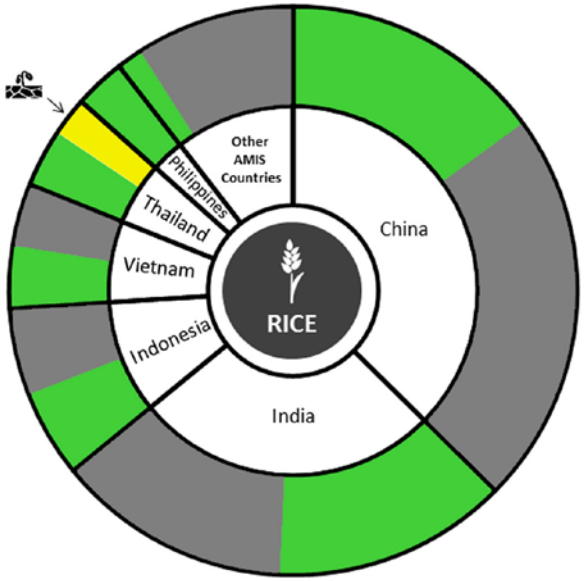
GEOGLAM Global Agricultural Monitoring



Conditions:

- Exceptional
- Favourable
- Watch
- Poor
- Out-of-Season
- No Data

Drivers:

- Wet
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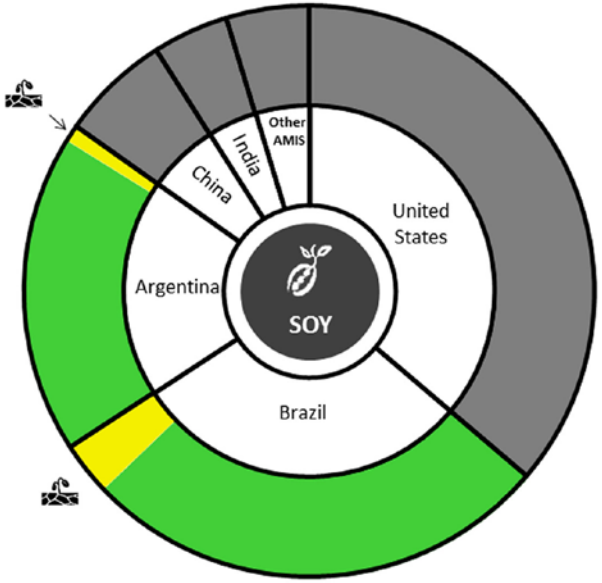
GEOGLAM Global Agricultural Monitoring



Conditions:

- Exceptional
- Favourable
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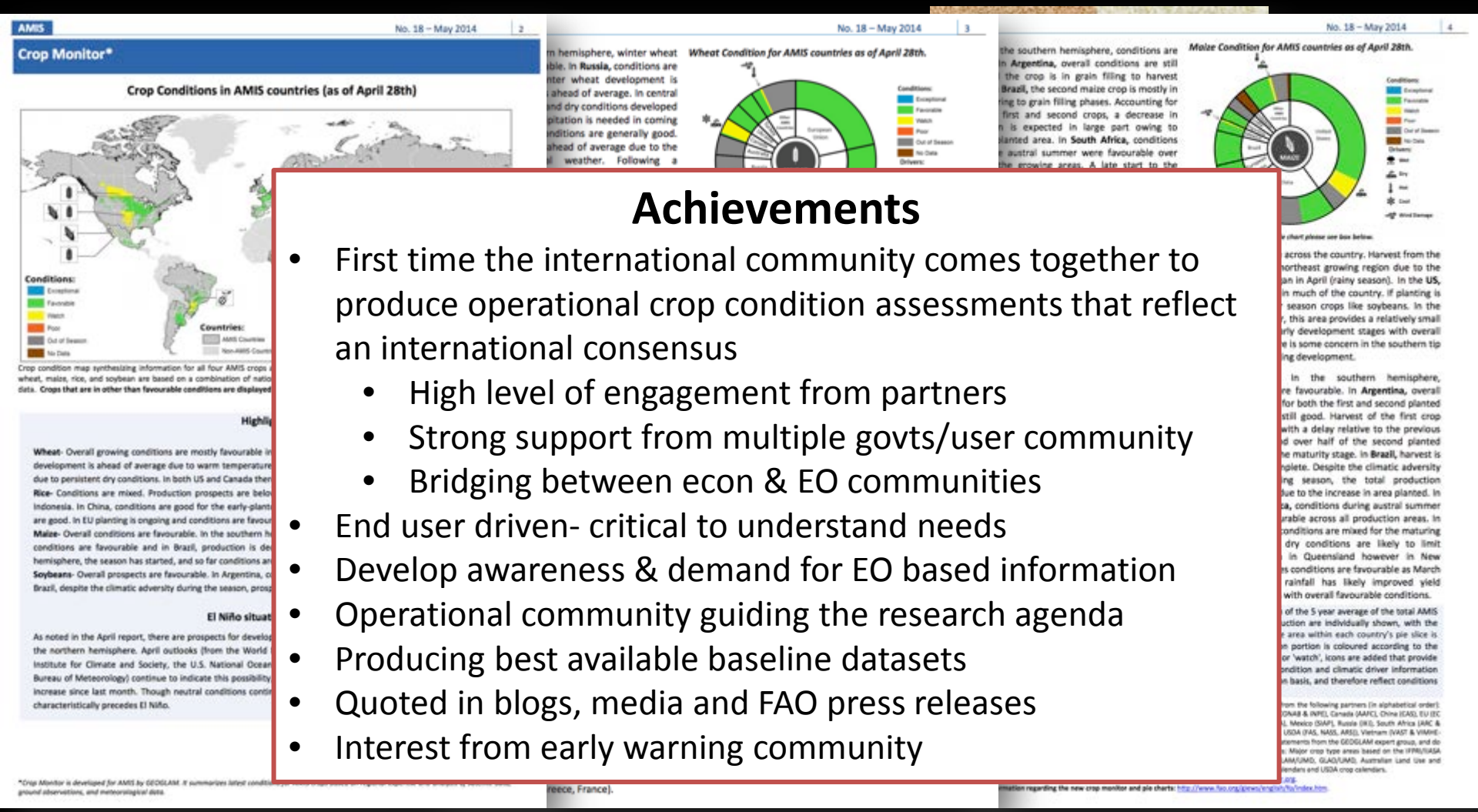
- No Data

Drivers:

- Wet
- Dry
- Hot
- Cool
- Extreme Event

GEOGLAM Global Agricultural Monitoring

Crop Monitor Bulletin:
Operational Since September 2013

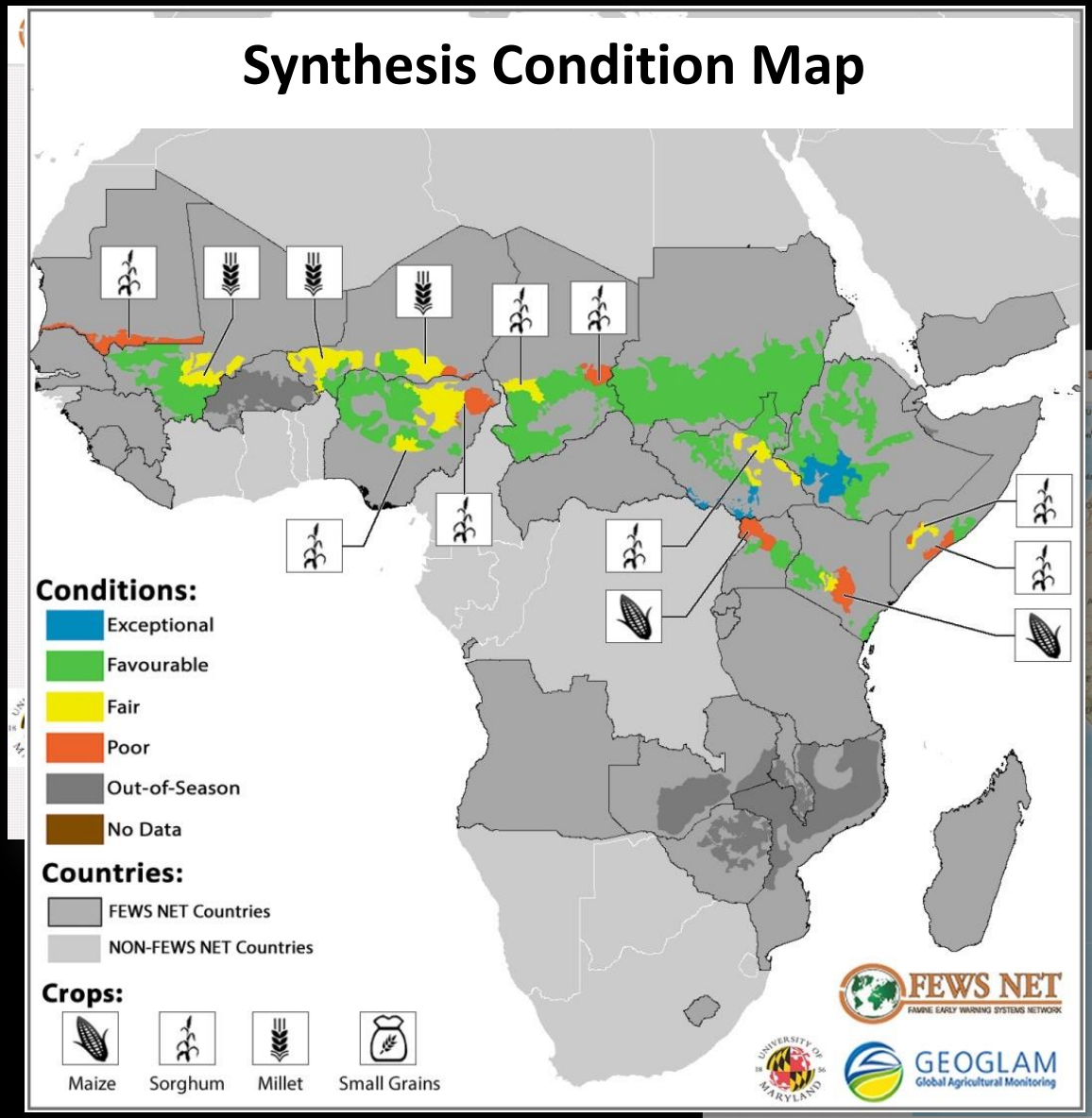


Achievements

- First time the international community comes together to produce operational crop condition assessments that reflect an international consensus
  - High level of engagement from partners
  - Strong support from multiple govts/user community
  - Bridging between econ & EO communities
- End user driven- critical to understand needs
- Develop awareness & demand for EO based information
- Operational community guiding the research agenda
- Producing best available baseline datasets
- Quoted in blogs, media and FAO press releases
- Interest from early warning community

Interest from Early Warning Community:

FEWS NET Prototype of Early Warning Crop Monitor



- Developed prototype with FEWS-NET
- Will hold a meeting at FAO in May to discuss international implementation

GROUP ON EARTH OBSERVATIONS

GEOGLAM Global Agricultural Monitoring

User Evaluation & Visibility

Feature Article in FAO Food Outlook (May 2014)

Special features

THE GEOGLAM CROP MONITOR

(Contributed by GEOGLAM)

The Group on Earth Observations developed the Global Agricultural Monitoring (GEOGLAM) initiative in response to the growing calls for improved agricultural information. GEOGLAM and the Agricultural Market Information System (AMIS) were endorsed by the G20 Heads of States' Declaration (Cannes, November, 2011) as part of the Action Plan on Food Price Volatility and Agriculture. The goal of GEOGLAM is to strengthen the international community's capacity to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional and global scales through the use of Earth observations. Within this framework, GEOGLAM developed the Crop Monitor reports. The objective of the Crop Monitor 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. These are monthly assessments that have been produced operationally since September 2013 and are published in the AMIS Market Monitor Bulletin. The Crop Monitor reports provide cartographic and textual summaries of crop, according to crop type.

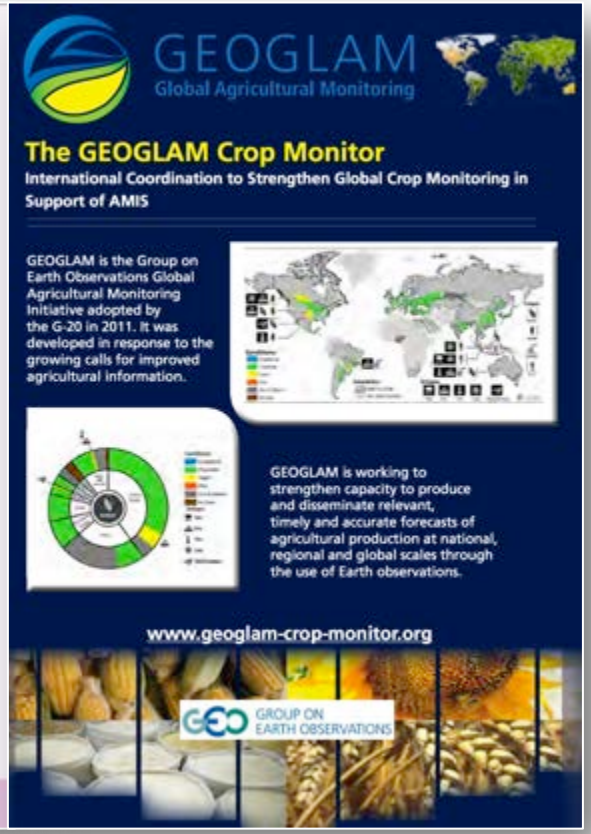
The GEOGLAM approach is to bring together international experts from national, regional, and global monitoring systems, space agencies, agriculture organizations and universities, that can share and discuss information from a variety of independent yet complementary sources, enabling them to reach a consensus on global crop conditions. In order to facilitate this process, monthly crop assessment telecons are held and an online crop assessment interface was developed, where the crop analysts log-in on a monthly basis to fill out crop condition information for their regions. Representatives from 30 different agencies and organizations are participating in the Crop Monitor assessments, which are coordinated by the Global Agricultural Monitoring Center, in the Department of Geographical Sciences at the University of Maryland (UMD). The current Crop Monitor contributors are listed in the table below (in alphabetical order by country).

Crop Condition Maps

At the request of AMIS partners the GEOGLAM Crop Monitor developed a series of customized crop condition maps and chart products. These include synthesis maps that provide information on all four crops within a single map, as well as crop specific condition maps and pie charts. These new GEOGLAM products are being released starting in the May 2014 issue of the Market Monitor.

The synthesis maps were developed to provide a simplified overview of current global crop conditions for the four AMIS crops. Three versions of these maps were developed providing varying levels of information including

COUNTRY	ORGANIZATION/AGENCY	COUNTRY	ORGANIZATION/AGENCY
Argentina	NTA	Japan	JAXA
Asian Rice Countries	NTIS ASEAN +3	Mexico	SIAP
Asian Rice Countries	Asia RICE	Russia	RI
Australia	ABARES	South Africa	ARC
Australia	CSIRO	South Africa	GeoTerraImage
Brazil	CONAB	South Africa	SANSA
Brazil	INPE	Thailand	GISTDA
Canada	AAFC	Thailand	GAE
China	CAS	Ukraine	NASU-NDAU
EU	EC JRC MARS	Ukraine	UHMC
India	ISRO	USA	NASA
Indonesia	LAPAN	USA	USAID
Indonesia	MOA	USA	USDA (FAS, NASS, ARS)
International	CIMMYT	Vietnam	VNSC
International	FAO	Vietnam	VNMR-MARD
International	IRRI		



AMIS Agricultural Market Information System

GEOGLAM Crop Monitor

Global Agricultural Monitoring

GEO GROUP ON EARTH OBSERVATIONS

www.geoglam-crop-monitor.org

HOME | ABOUT | MONTHLY REPORTS | ASSESSMENT TOOL | PARTNERS | COORDINATION TEAM | CONTACT US

Home / About GEOGLAM Crop Monitor

About GEOGLAM Crop Monitor

Click the icons below to jump down to the different sections.

Framework | Objective | Approach & Process | Online Portal

Crop Classification System | Maps and Charts | Summary & Next Steps

Framework: GEOGLAM

The Group on Earth Observations (a partnership of governments and international organizations) developed the Global Agricultural Monitoring (GEOGLAM) initiative in response to the growing calls for improved agricultural information. The goal of GEOGLAM is to strengthen the international community's capacity to produce and disseminate relevant, timely and accurate forecasts of agricultural production at national, regional and global scales through the use of Earth Observations (EO), which include satellite and ground-based observations. This initiative is designed to build on existing agricultural monitoring programs and initiatives at national, regional and global levels and to enhance and strengthen them through international networking, operationally focused research, and data/method sharing.

Both GEOGLAM and AMIS were endorsed by the G20 Heads of States' Declaration (Cannes, November, 2011), when GEOGLAM was tasked to "coordinate satellite monitoring observation systems in different regions of the world in order to enhance crop production projections and weather forecasting data." Within this framework, GEOGLAM developed the Crop Monitor reports, which provide global crop condition assessments in support of the AMIS market monitoring activities. The first issue of the Crop Monitor appeared in the September 2013 issue of the AMIS Market Monitor.

Home / May Maps and Charts

May Maps and Charts

Click the icons bellow to jump down to individual map and chart sections.

Synthesis Maps | Wheat | Rice | Maize | Soybean

Synthesis Maps:

Crop Conditions for AMIS Countries (As of April 28th):

Home / Crop Monitor Partners

Crop Monitor Partners

The Crop Monitor assessment is conducted by GEOGLAM with inputs from the following partners (in alphabetical order): Argentina (INTA), Asia Rice Countries (AFSIS, ASEAN+3 & Asia RICE), Australia (ABARES & CSIRO), Brazil (CONAB & INPE), Canada (AAFC), China (CAS), EU (EC JRC MARS), India (ISRO), Indonesia (LAPAN & MOA), International (CIMMYT, FAO, IFPRI & IRRI), Japan (JAXA), Mexico (SIAP), Russia (IKI), South Africa (ARC & GeoTerralmage & SANSA), Thailand (GISTDA & OAE), Ukraine (NASU-NSAU & UHMC), USA (NASA, UMD, USDA (FAS, NASS, ARS)), Vietnam (VAST STI & VIMHE-MARD). The findings and conclusions found in this joint multiple-agency reporting are only consensual statements from the GEOGLAM expert group, and do not necessarily reflect those of the individual agencies represented by these experts.

INTA	INTA	Instituto Nacional de Tecnologia Agropecuaria	http://climayagua.inta.gob.ar/ http://www.sis.gov.ar/informes
Asia RICE	Asia-RICE	Asia RICE	http://asia-rice.org/index.php http://asia-rice.org/contacts.php
AFSIS		ASEAN Food Security Information System	http://www.afsisnc.org/
ASEAN+3	ASEAN	ASEAN Plus Three cooperation	http://www.asean.org/
CSIRO	CSIRO	Commonwealth Scientific and Industrial Research Organisation	http://www.csiro.au/

Crop Monitor Assessments

The Crop Monitor provides 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. These assessments have been produced operationally since September 2013 and are published in the AMIS Market Monitor Bulletin. The Crop Monitor reports provide cartographic and textual summaries of crop conditions as of the 28th of each month, according to crop type.

Available Assessment Reports:

Month	Crop Monitor Reports	Maps and Charts
May 2014	May Crop Monitor Report	Maps and Charts
April 2014	April Crop Monitor Report	
March 2014	March Crop Monitor Report	
February 2014	February Crop Monitor Report	
December 2013	December Crop Monitor Report	

1 2 next › last »

Sources & Disclaimer

The Crop Monitor assessment is conducted by GEOGLAM with inputs from the following partners (in alphabetical order): Argentina (INTA), Asia Rice Countries (AFSIS, ASEAN+3 & Asia RICE), Australia (ABARES & CSIRO), Brazil (CONAB & INPE), Canada (AAFC), China (CAS), EU (EC JRC MARS), India (ISRO), Indonesia (LAPAN & MOA), International (CIMMYT, FAO, IFPRI & IRRI), Japan (JAXA), Mexico (SIAP), Russia (IKI), South Africa (ARC & GeoTerralmage & SANSA), Thailand (GISTDA & OAE), Ukraine (NASU-NSAU & UHMC), USA (NASA, UMD, USDA (FAS, NASS, ARS)), Vietnam (VAST STI & VIMHE-MARD).

UMD Coordination & Development Team

The Crop Monitor Assessments are coordinated by the Global Agricultural Monitoring Center, in the Department of Geographical Sciences at the University of Maryland (UMD).

Coordinators:

Interface Design & Development Team:

Mike Humber

Jon Nordling

Product Design & Implementation Team:

Brian Barker

Katie McGaughey

Data Integration & R&D:

Dr. Eric Vermote

Dr. Martin Claverie

Dr. Alyssa Whitcraft

Interns:

Heather Lam

Taylor Robey

GEOGLAM Ini

Framework: G

The Group on Ea ... and ... oring (GEOGLAM) initiat ... agri ... ional community's capa ... and ... lobal scales through th ... satellite and ground-based observations. This initiative is designed to build on existing agricultu ... nal, regional and global levels and to enhance and strengthen them through international netw ... method sharing.

GROUP ON EARTH OBSERVATIONS

GEOGLAM Global Agricultural Monitoring

GEOGLAM Component #4
EO Data Coordination

Developing the EO Data Requirements for GEOGLAM: Through a CEOS GEOGLAM *Ad Hoc* Working Group

Goals of the EO Data Coordination Component:

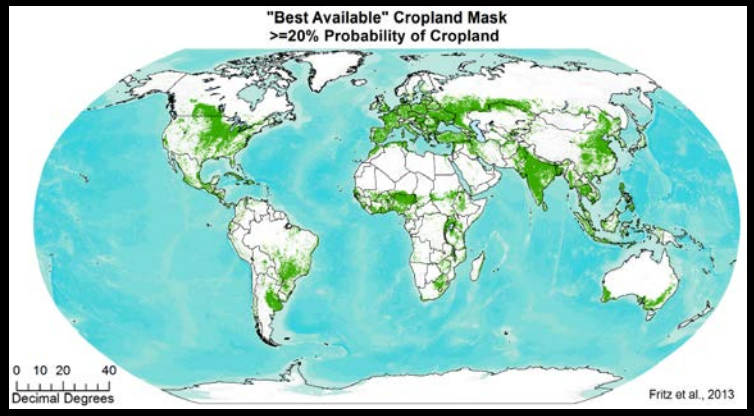
1. Articulated data requirements for agricultural monitoring
2. Coordinated international satellite acquisition over agricultural areas during the growing season
3. Promote near-real time data availability
4. Standardized processing of data, facilitating data interoperability
5. Easy data access for operational users
6. Facilitating baseline dataset development and testing of new data streams (with JECAM)
7. Continuity of critical data and products

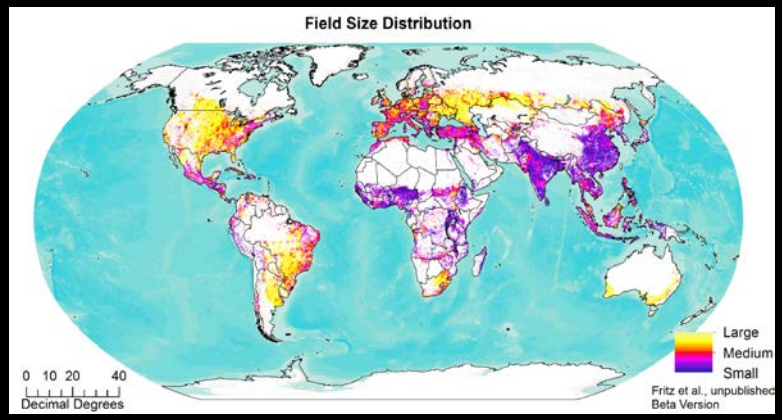
A	B	C	D	E	F	G	H	I	J	K	L	M
						Target Products						
Req #	Spatial Resolution	Spectral Range	Effective observ. frequency (cloud free)	Extent	Field Size	Crop Mask	Crop Type Area and Growing Calendar	Crop Condition Indicators	Crop Yield	Crop Biophys. Variables	Environ. Variables	Ag Practices / Cropping Systems
	Coarse Resolution Sampling (>100m)											
1	500 - 2000m	optical	Daily	Wall-to-Wall	All			X		L		
2	100-500m	optical	2 to 5 per week	Cropland extent	All	X	X	X	L	L	X	L
3	5-50 km	microwave	Daily	Cropland extent	All			X	X	X	X	
	Moderate Resolution Sampling (10 to 100m)											
4	10-70m	optical	Monthly (min 3 in season + 2 out of season); Required every 1-3 years	Cropland extent (if #5 = sample, else skip)	All	X	L/M					X
5	10-70m	optical	8 days; min. 1 per 16 days	Sample (pref. Cropland extent)	All	X	X	X	X	X	X	X
6	10-100m	SAR	8 days; min. 1 per 16 days	Cropland extent of persistantly cloudy and rice areas	All	X	X	X	X	X	X	X
	Fine Resolution Sampling (5 to 10m)											
7	5-10m	VIS NIR + SWIR	Monthly (min. 3 in season)	Cropland extent	M/S	M/S	M/S					
8	5-10m	VIS NIR + SWIR	Approx. weekly; min. 5 per season	Sample	All		M/S	X		X	X	X
9	5-10m	SAR	Monthly	Cropland extent of persistantly cloudy and rice areas	M/S	M/S	M/S					M/S
	Very Fine Resolution Sampling (<5m)											
10	< 5m	VIS NIR	3 per year (2 in season + 1 out of season); Every 3 years	Cropland extent of small fields	S	S	S					
11	< 5m	VIS NIR	1 to 2 per month	Refined Sample (Demo)	All		X		X			X

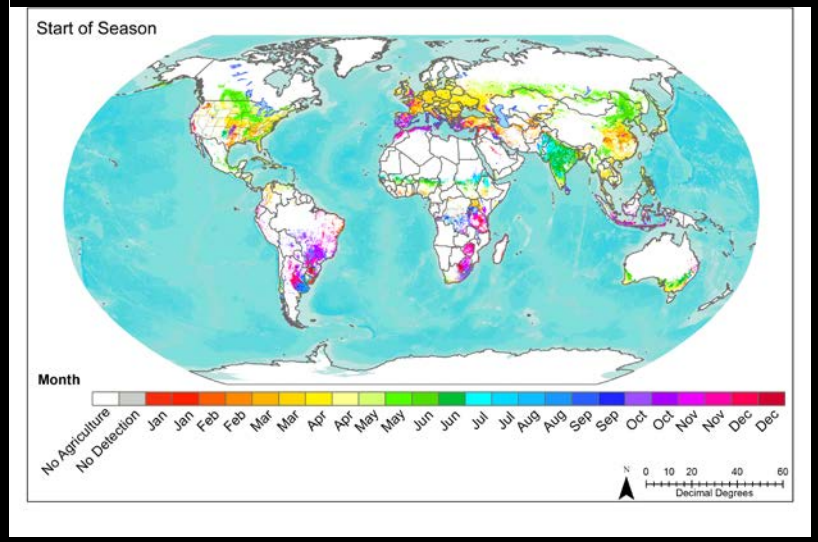
Recognition that cropping systems are inherently diverse which dictates the monitoring observations and methods

No one system can meet ag monitoring needs

2012-Present: Baseline Dataset Development





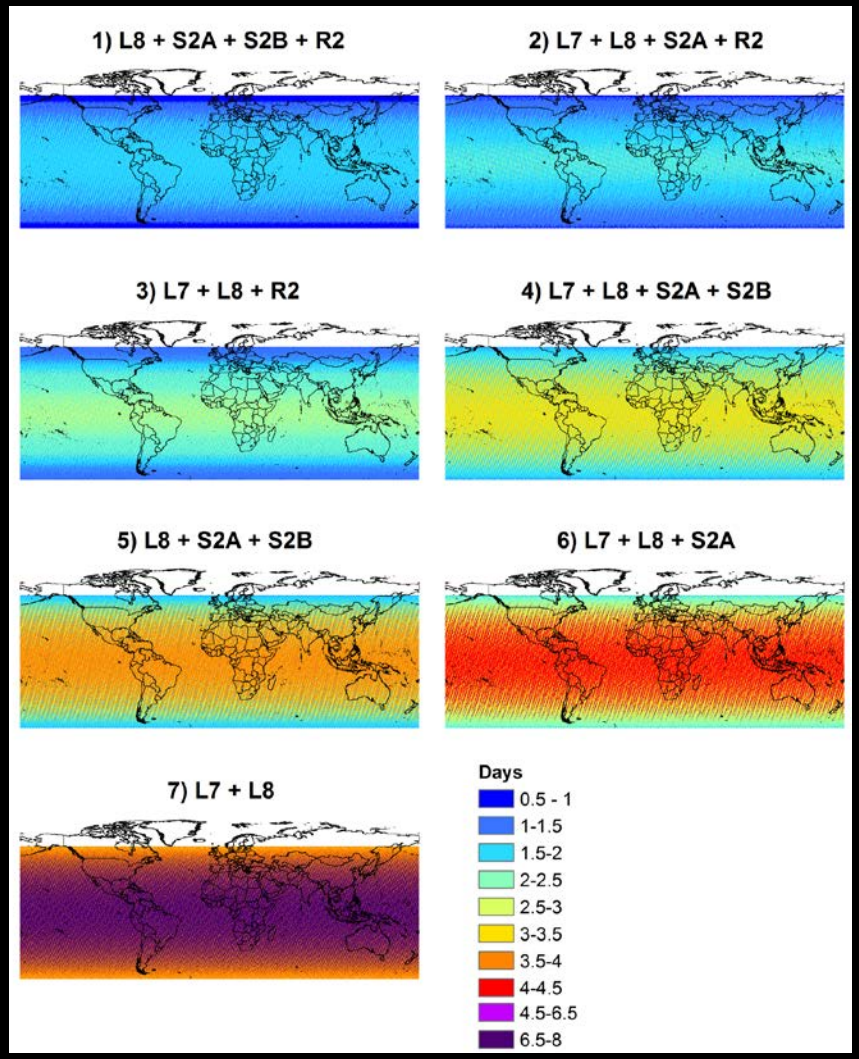


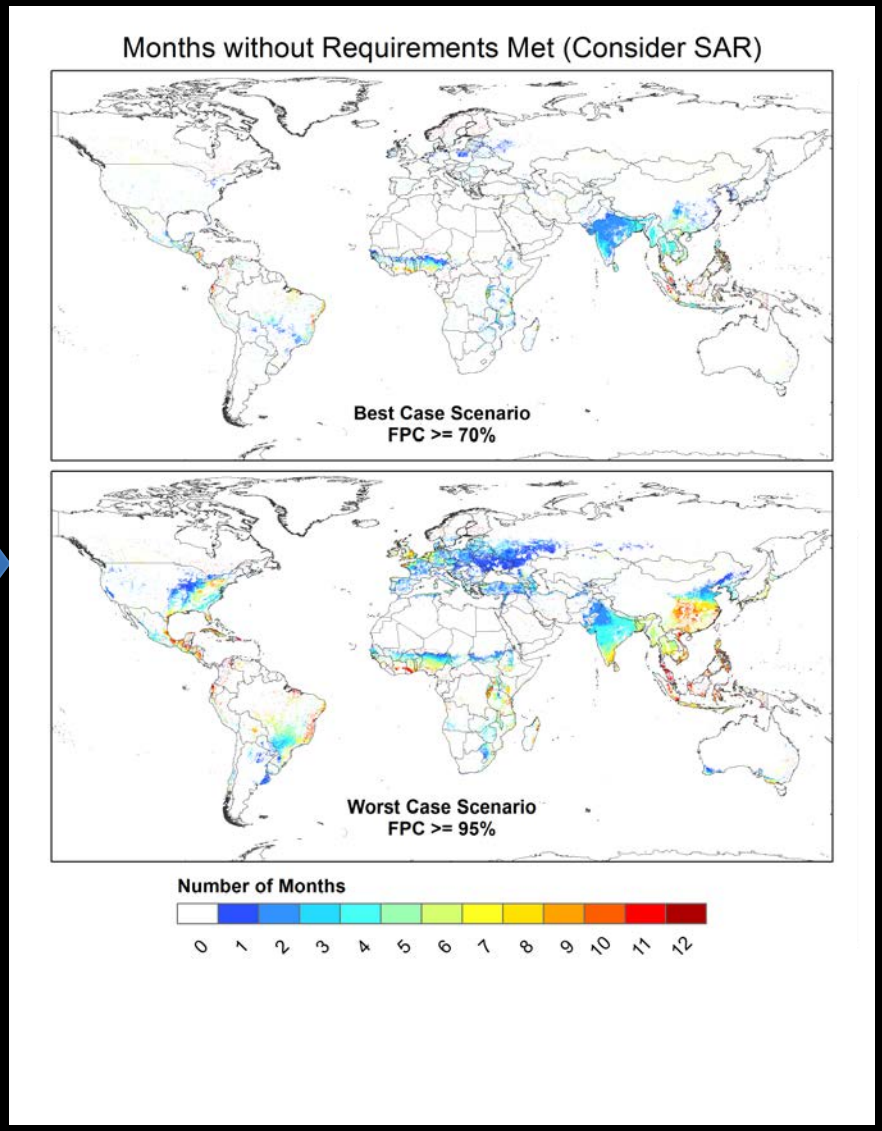
These + cloud cover = spatially explicit EO requirements for GEOGLAM

In Progress/Upcoming:

- Crop specific calendars;
- Crop type masks;
- Arable land;
- Cropping systems;
- Rangeland extent/distribution;
- Ag Met data (soil moisture, PAR, LST…); etc.

Can we meet the requirements with current/planned missions?





Revisit Capabilities
of the 7 Hypothetical Constellations

vs.

Revisit Frequency Required
For Reasonably (70%; 95%) Clear View

Whitcraft et al., 2015

Summary

- NASA Applied Sciences program supporting two core initiatives under GEOGLAM initiative
  - Working closely with the USDA led US GEOGLAM office
- Developed operational international crop assessments, bridging between the EO and Economics communities
- Developed a set of baseline datasets with ongoing improvement
- CEOS endorsed GEOGLAM Implementation
  - Developed close working relationship with Space Agencies which are stepping up for planned acquisition
  - Developed EO data requirements assessments
  - Piloting data services prototypes for cloud based computing and distribution of large datasets (NASA Langely)
- Engaged national governments in developing capacity for incorporating EO into their crop projections system (Argentina, Brazil, Tanzania, Mexico, Pakistan)
- GEOGLAM- AgMIP Workshop (next week)

Thank You!