GEOGLAM Crop Assessment Tool

Supporting Evidence for the Crop Monitor

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GEOGLAM
Global Agricultural Monitoring

UNIVERSITY OF MARYLAND

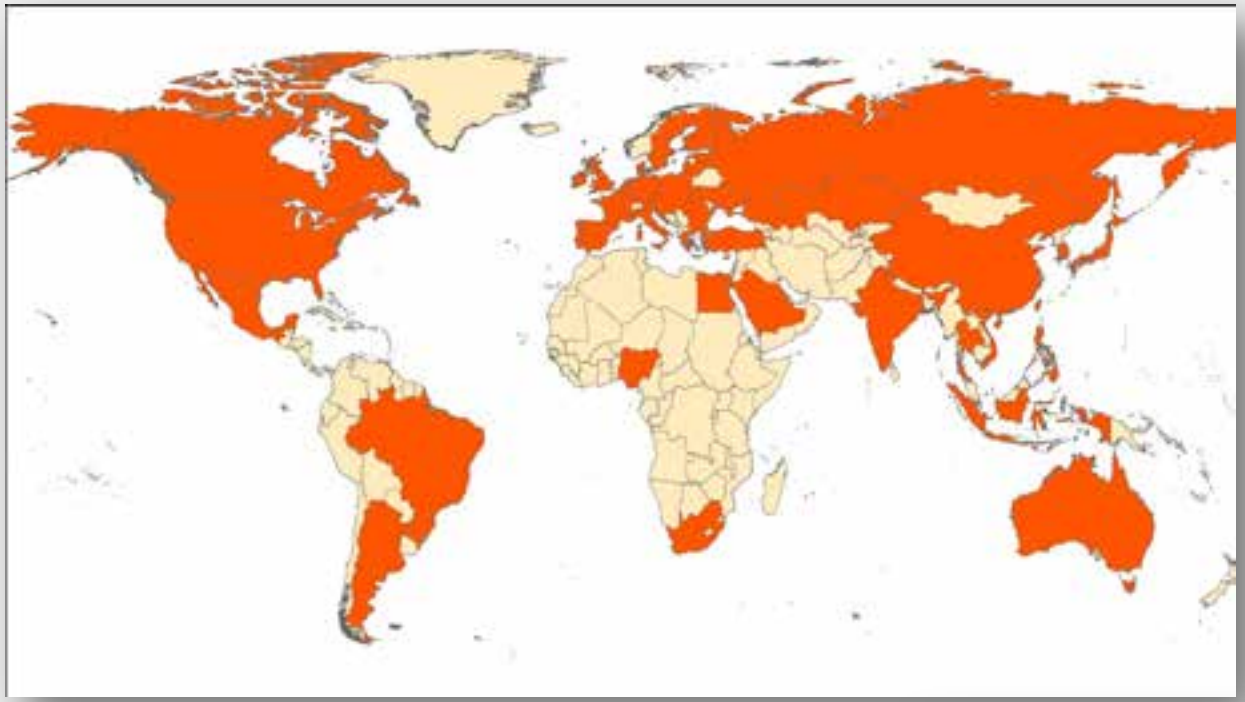
About GEOGLAM

- Group on Earth Observations (GEO) Global Agricultural Monitoring Initiative
- **Objective**: Strengthen the international community's capacity to produce and disseminate relevant information on agricultural production at national, regional and global scales, through earth observations (EO)
- Adopted by the G-20 in 2011 as part of the Action Plan on Food Price Volatility & Agriculture along with the AMIS (Agricultural Market Information System)
- http://www.earthobservations.org/geoglam.php

About GEOGLAM Crop Monitor

- **Objective**: develop transparent, timely, crop condition assessments in primary agricultural production areas highlighting potential hotspots of stress/bumper crop
- These assessments reflect an international consensus of crop conditions
- Crop Monitor assessments are published monthly in the AMIS Market Monitor, with supplemental information available on the GEOGLAM Crop Monitor website
- http://www.geoglam-crop-monitor.org

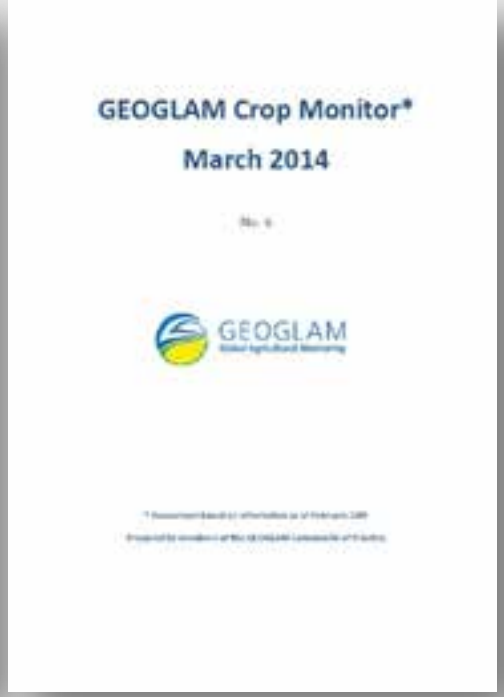
Coordinated by Inbal Becker-Reshef and Chris Justice, Center for Global Agricultural Monitoring Research, UMD



The GEOGLAM Crop Monitor and AMIS report on the G20 + 8 additional countries, representing the major producers, exporters, and consumers of wheat, maize, soybeans, and rice

Monthly Crop Monitor assessments published in the AMIS Market Monitor reflect crop conditions as of the 28th day of the month

More detailed reports containing additional maps and charts are available at www.geoglam-crop-monitor.org



GEOGLAM Crop Monitor Partners

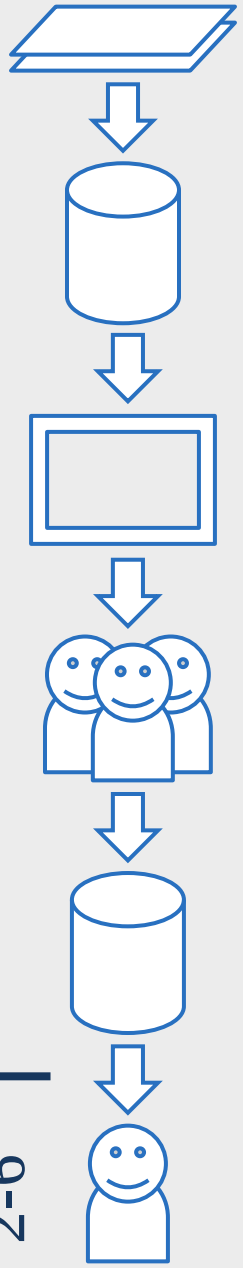
>30 partners & growing

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 - FEWS NET
International	IRRI	Vietnam	VAST
International	IFPRI	Vietnam	VIMHE-MARD

Process

1. Agencies submit crop condition information, data and fill out information on the Crop Assessment Tool
2. Compile submitted information into a report and integrate datasets into crop monitor interface
3. Review and discuss report over partner telecon
   - Opportunity to air issues and discrepancies
4. Update assessment and send out for GEOGLAM review
5. Submit draft for AMIS review
6. Update if new information becomes available prior to release

Step 1: Crop Assessment Tool



Data submitted to the Crop Monitor group by partners

(Data processed by the Crop Monitor team)

Processed data is stored in a PostgreSQL/ArcSDE database

(Layers made accessible via ArcGIS for Server)

Layers are visualized on the Crop Monitor Map

Partners (users) interpret the data and combine with expert knowledge, field reports, models, official reports

(Information summarized in crop condition entries)

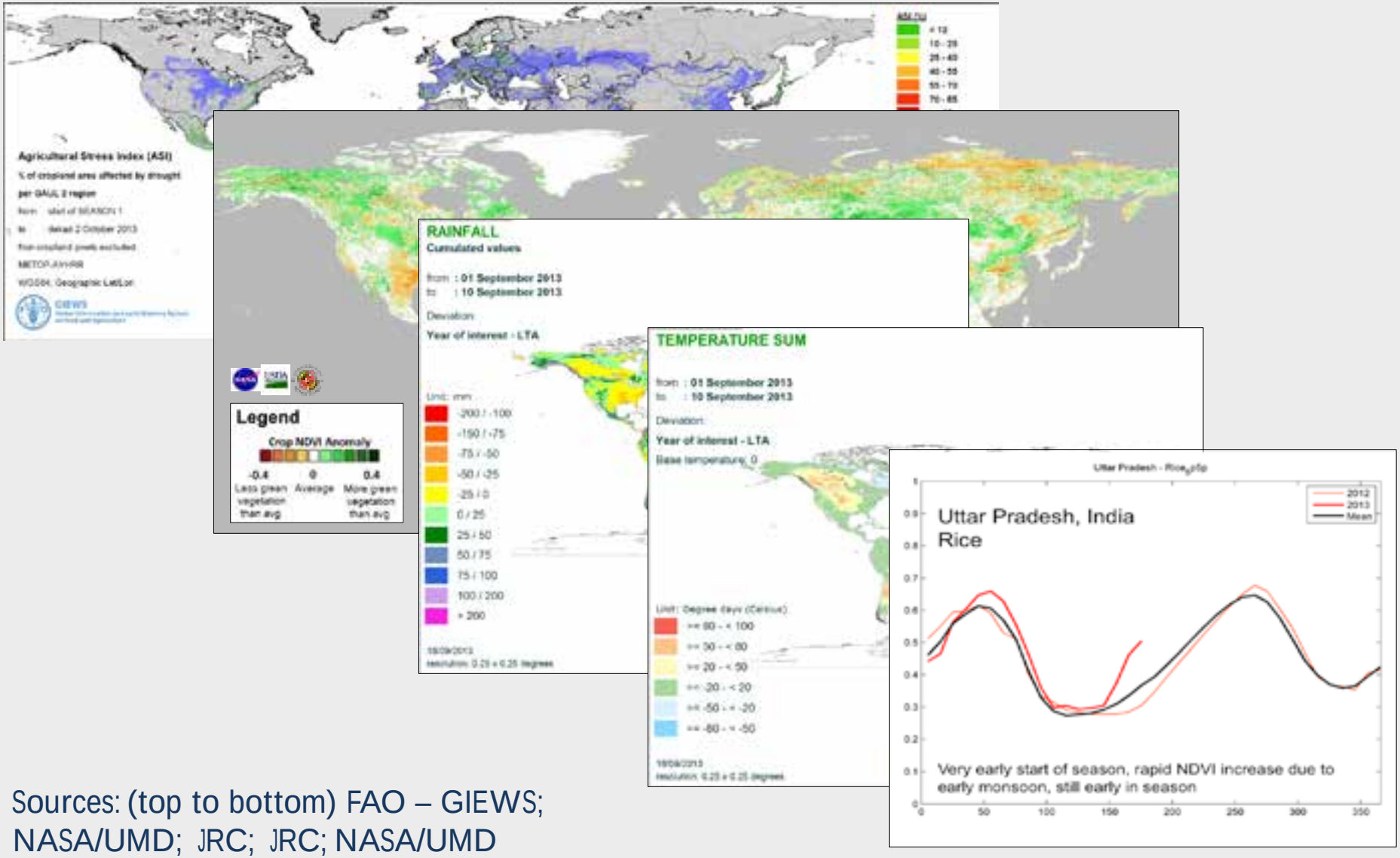
Crop condition entries are stored in the PostgreSQL archive

(Crop condition entries processed and exported)

Steps 2-6

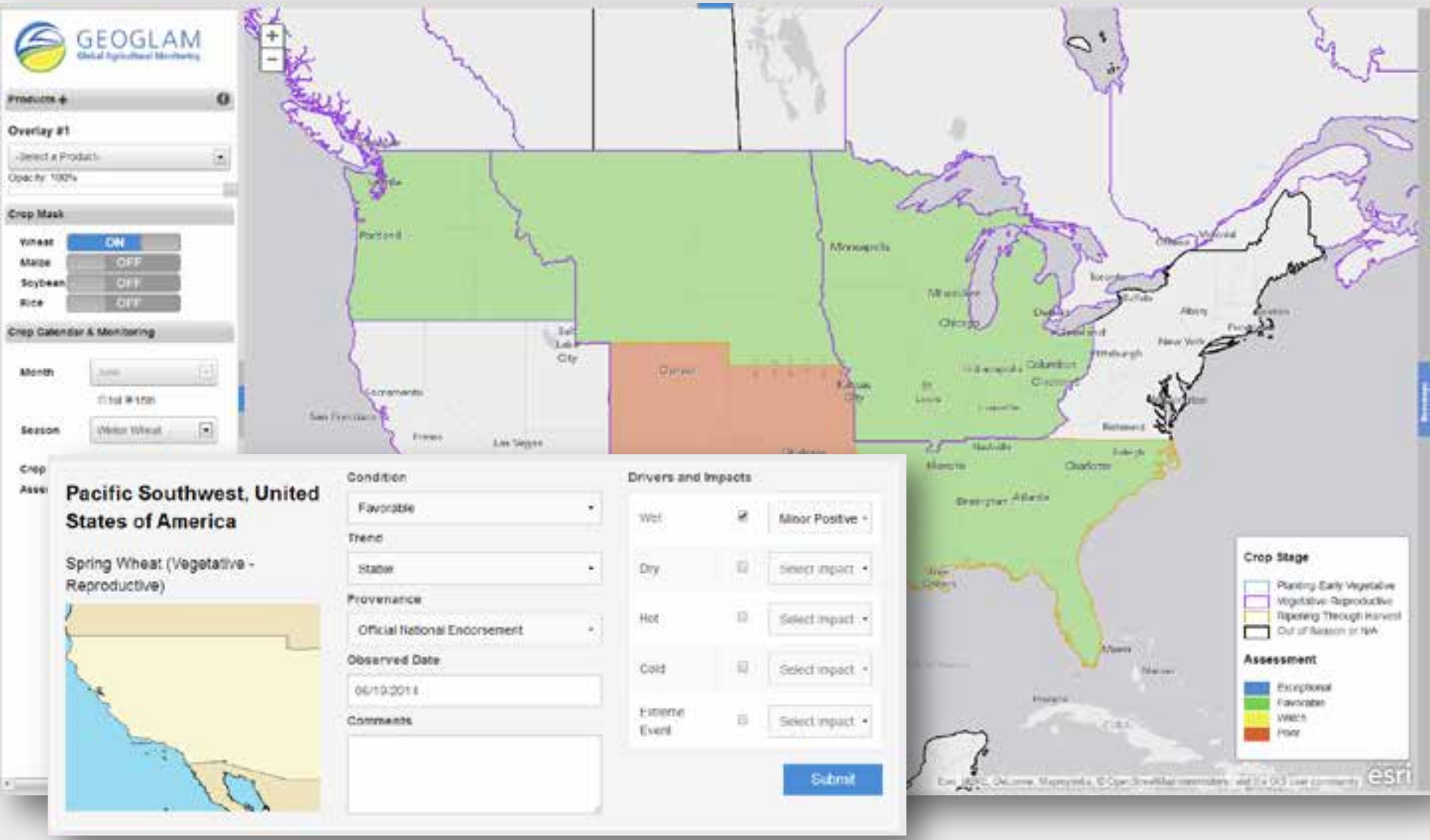
At the end of the month, crop condition entries are compiled. Synthesis maps, pie charts, and a the monthly report are submitted to AMIS according to the review process (steps 2-6)

EO Data

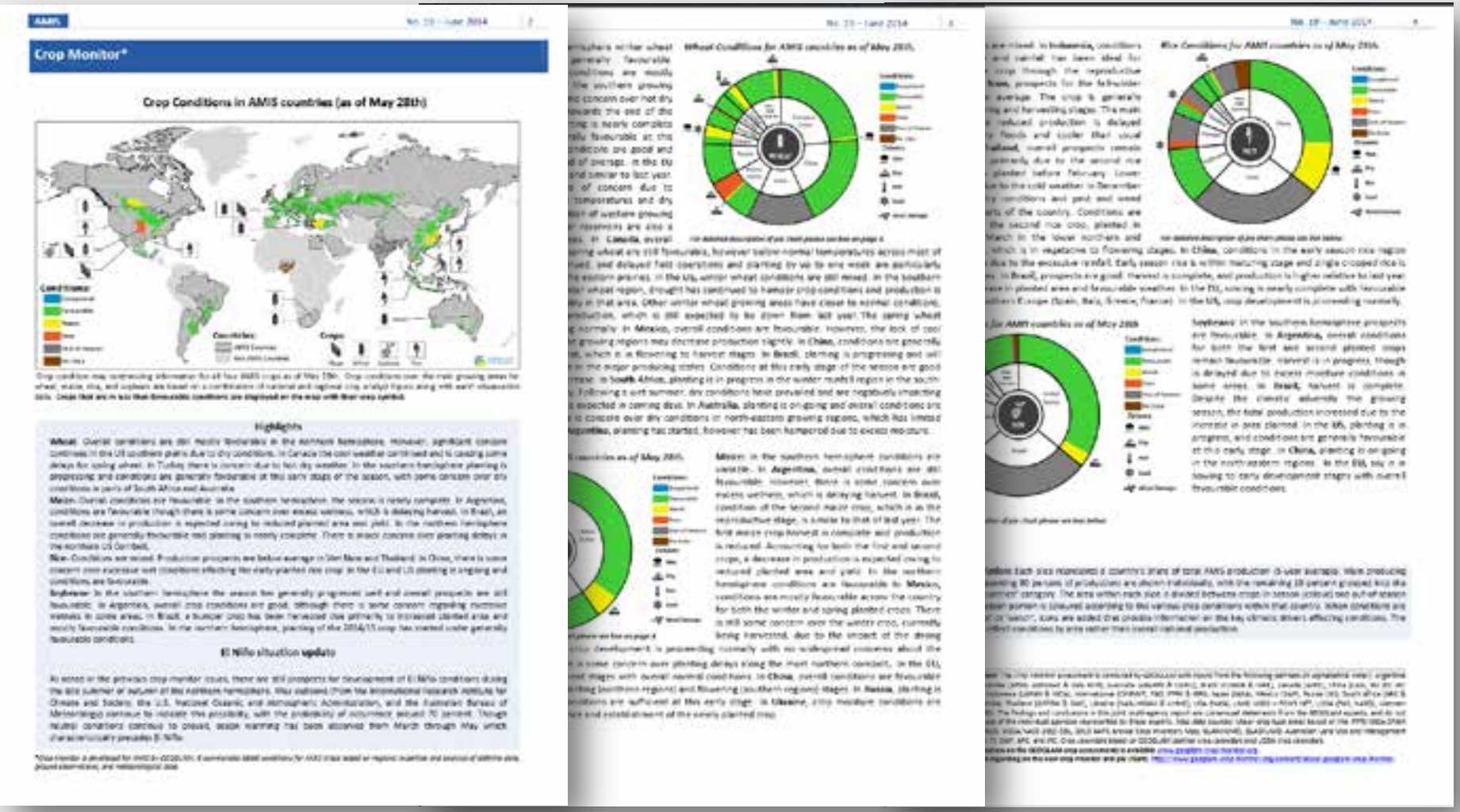


Sources: (top to bottom) FAO – GIEWS; NASA/UMD; JRC; JRC; NASA/UMD

Crop Condition Entries

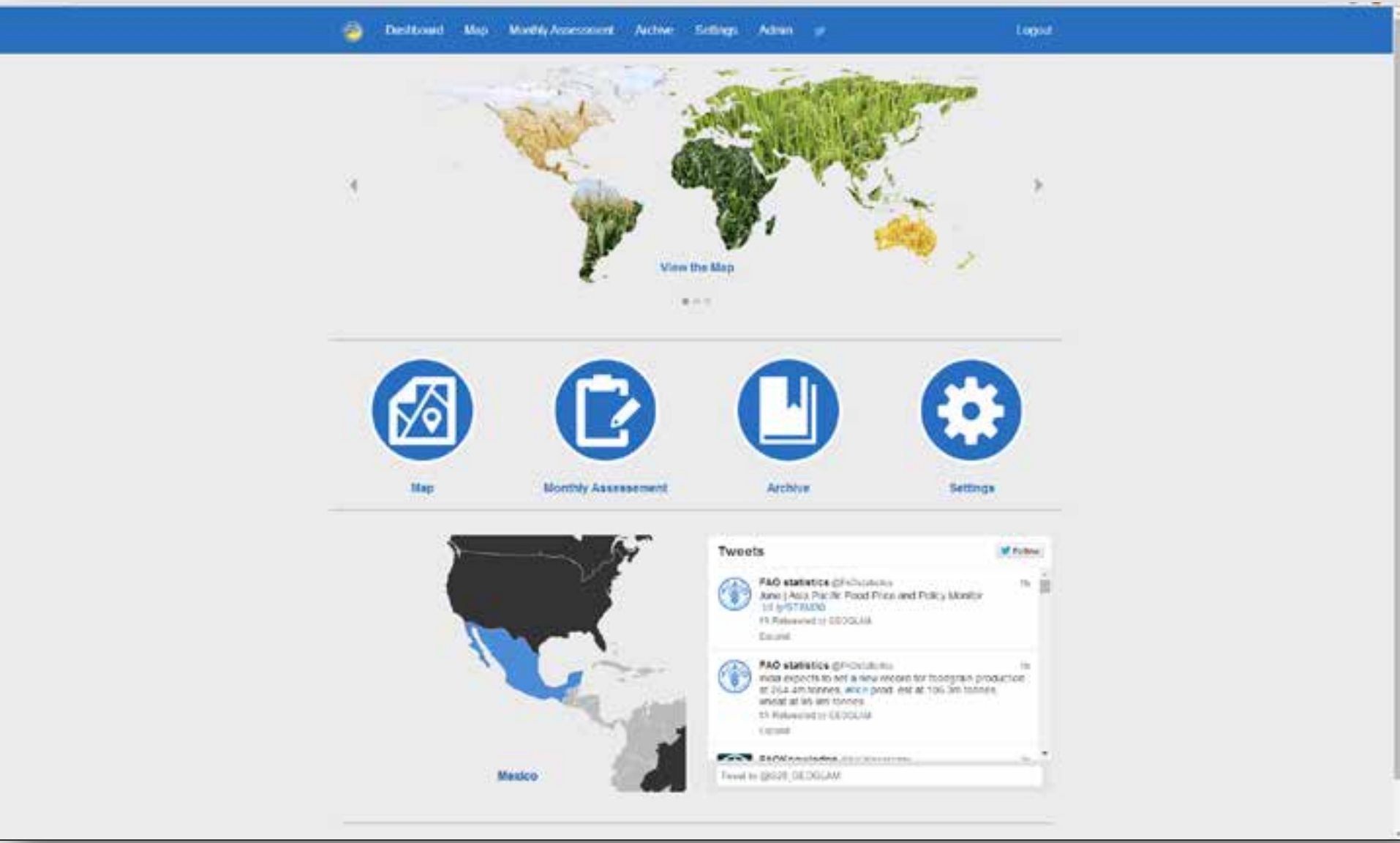


Crop Monitor Bulletin



What is the Crop Assessment Tool?

- Two main roles
  1. Supply users with EO data, crop calendars, and crop masks to provide the Crop Monitor with crop condition entries
  2. Allow users to submit crop condition entries
- Custom, enterprise level database-driven web application
  - Scalable, adaptable, customizable user accounts
  - Pages: Dashboard, Map, Monthly Assessment, Archive, Settings, Administrative Tools
  - For more information about the Crop Assessment Tool system, please see our presentation "Database-driven web mapping using jQuery, PHP, PostgreSQL & SDE"


Dashboard
Map
Monthly Assessment
Archive
Settings
Admin
Logout
View the Map
Map
Monthly Assessment
Archive
Settings
Mexico
Tweets
FAO statistics

Crop Assessment Tool

For the users (300+):

- Visualize and compare data products
  - Crop Stages (GEOGLAM Partners)
  - NDVI Anomaly (NASA/UMD)
  - Temperature and Rainfall Sum Anomalies (JRC, NOAA/NASA/UMD)
- Submit and view individual crop condition entries
  - Customize reporting regions and reporting crop types
- View an archive of past crop condition entries
- Responsive Design

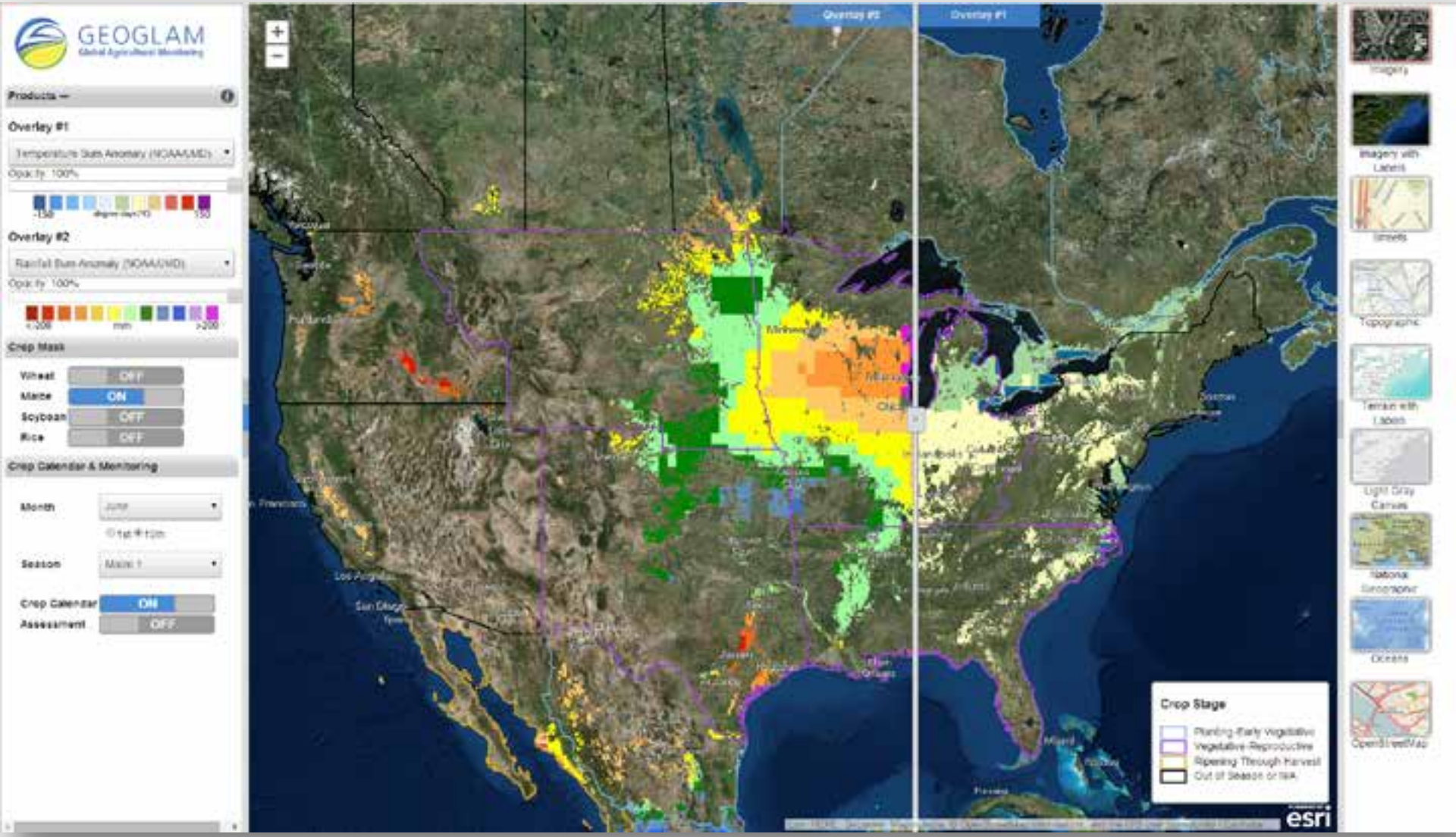
Crop Assessment Tool

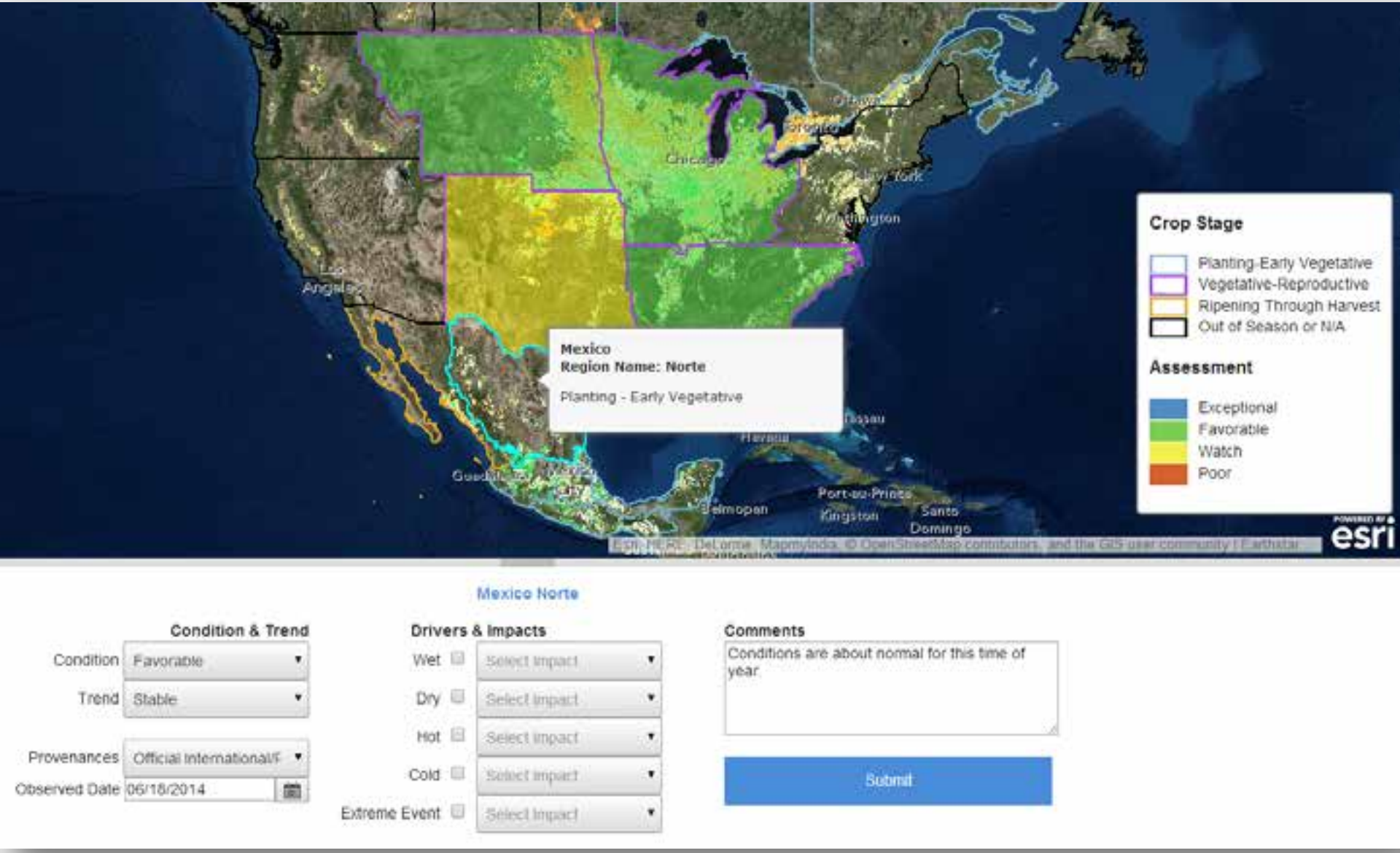
For the administrators:

- Set of web admin tools
  - Update user access levels
  - Assist partners in filling in crop conditions reports when necessary
- Python scripts
  - Publish new data products to ArcGIS Server with one script
  - Export results of the monthly crop assessment to shapefiles for creating the global synthesis maps (available from the web via geoprocessing service)

Crop Assessment Tool Dashboard page on desktop (top-left), Galaxy S4 (top-right), and iPad 4 (bottom-right)

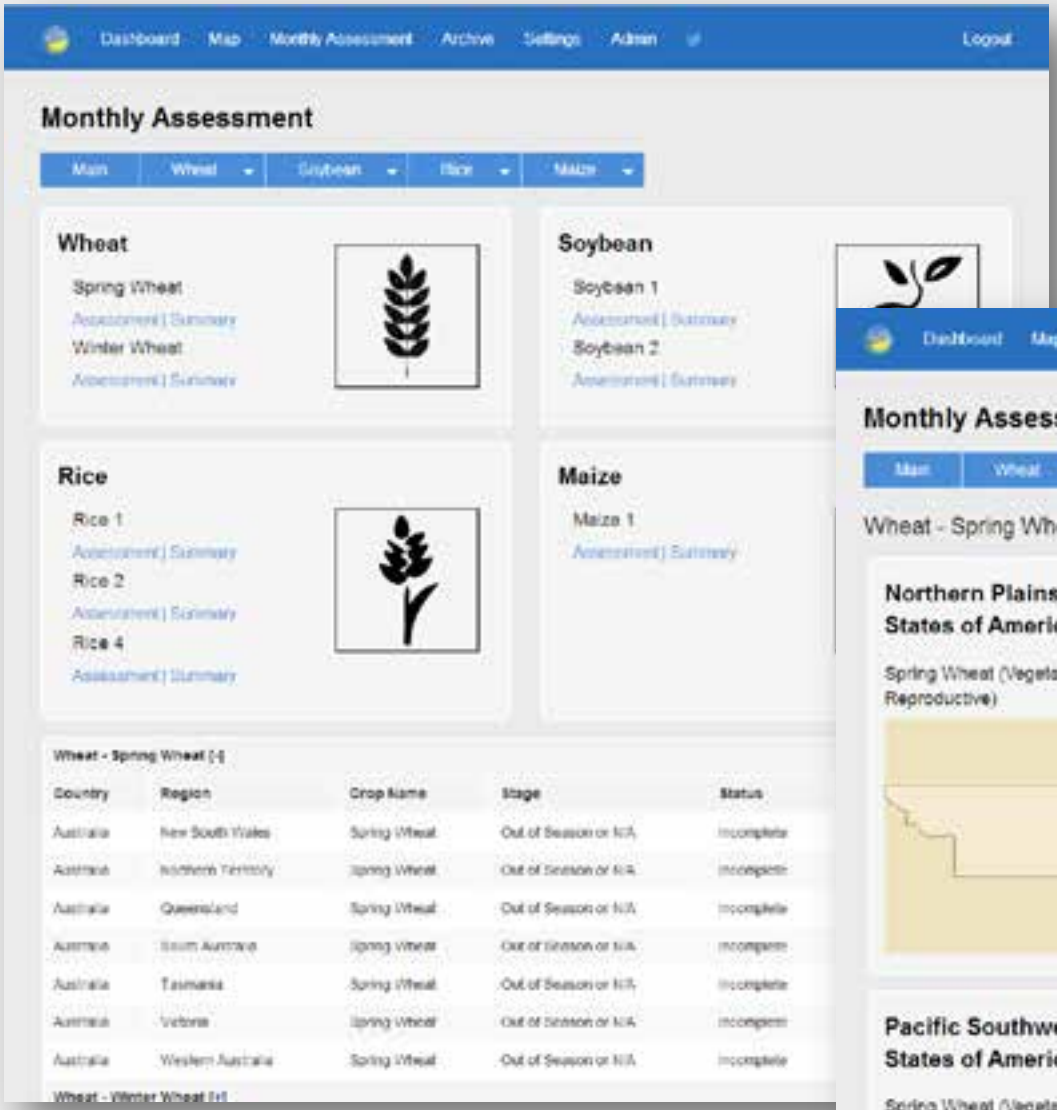
(Below) Crop Monitor Map: Allows users to visualize and compare data products. Main features include the Swipe widget for comparing data products, the Esri Basemap Gallery widget, and the GEOGLAM Crop Monitor Assessment widget for entering crop condition entries.

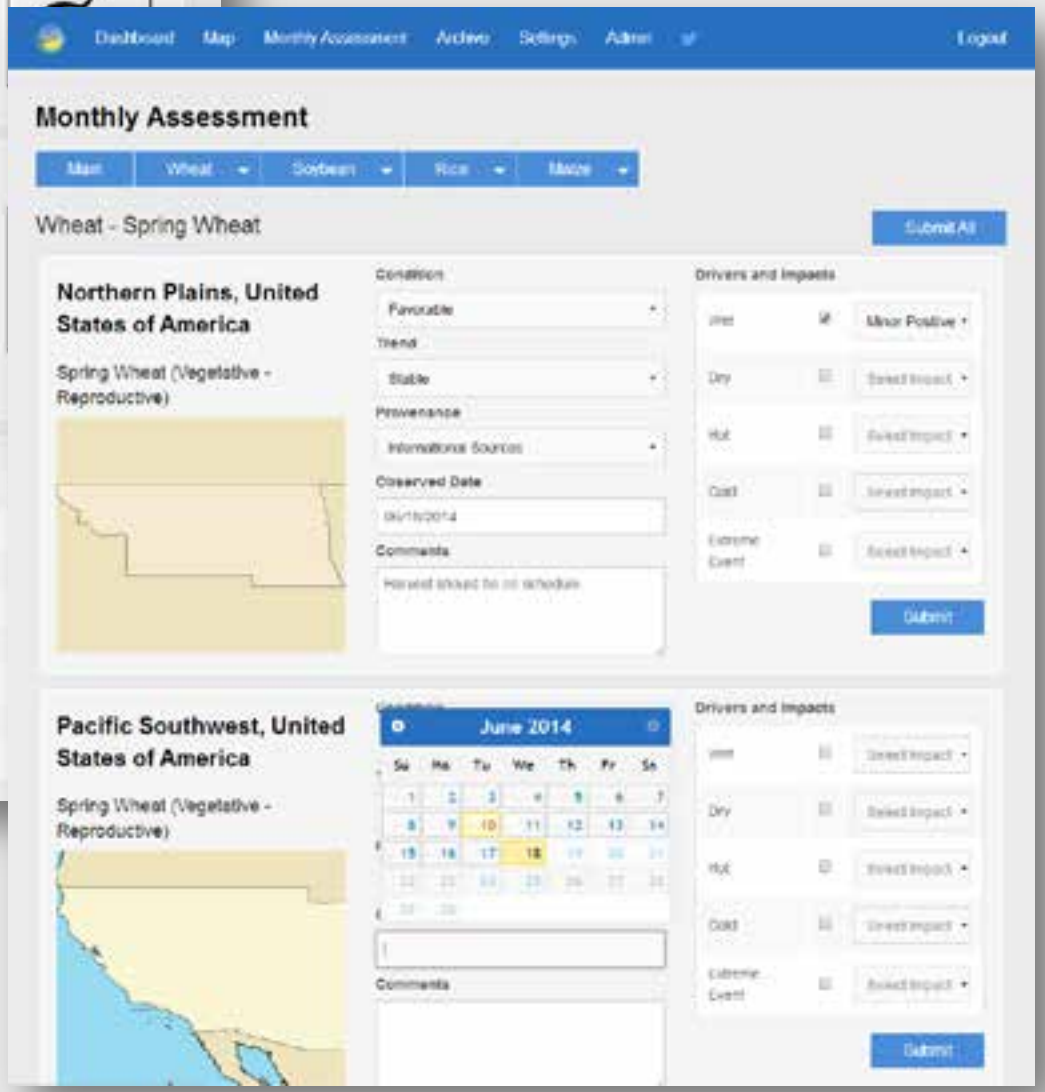




(Above) Zoomed-in view of Assessment widget: Displays submitted crop condition entries on the map, symbolized by condition. Clicking on a region will display the country, region, and crop stage of the selected area with the option to enter a new crop condition entry.

(Left) Monthly Assessment "Main" Page: Shows the completion status of all crop condition entries for crops and regions selected by the user on the Settings page.



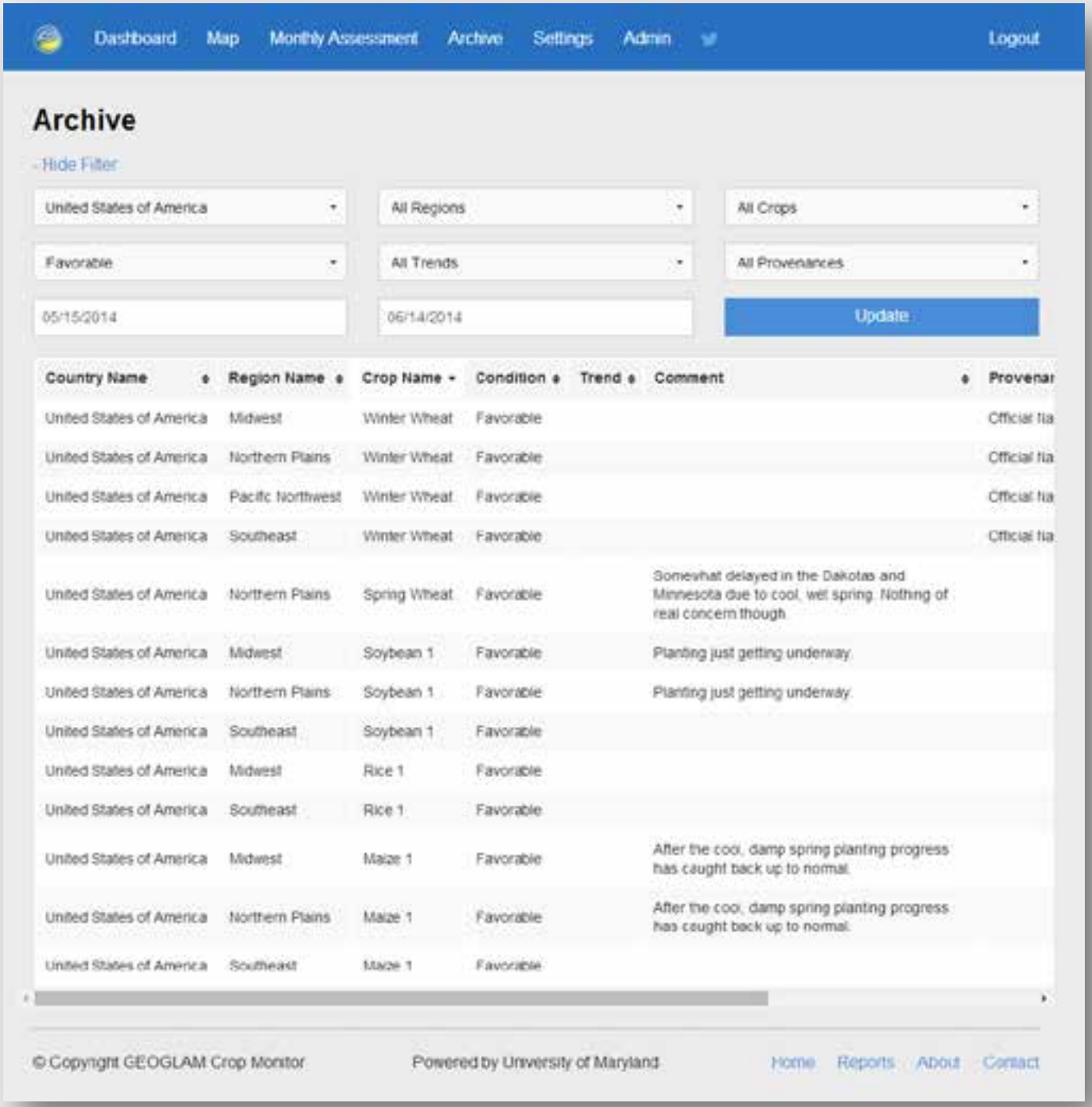


(Right) Monthly Assessment Crop Condition Entry: Provides assessment forms for all in-season crops.

Data Collected

The following data is collected every month for each crop in season for each region:

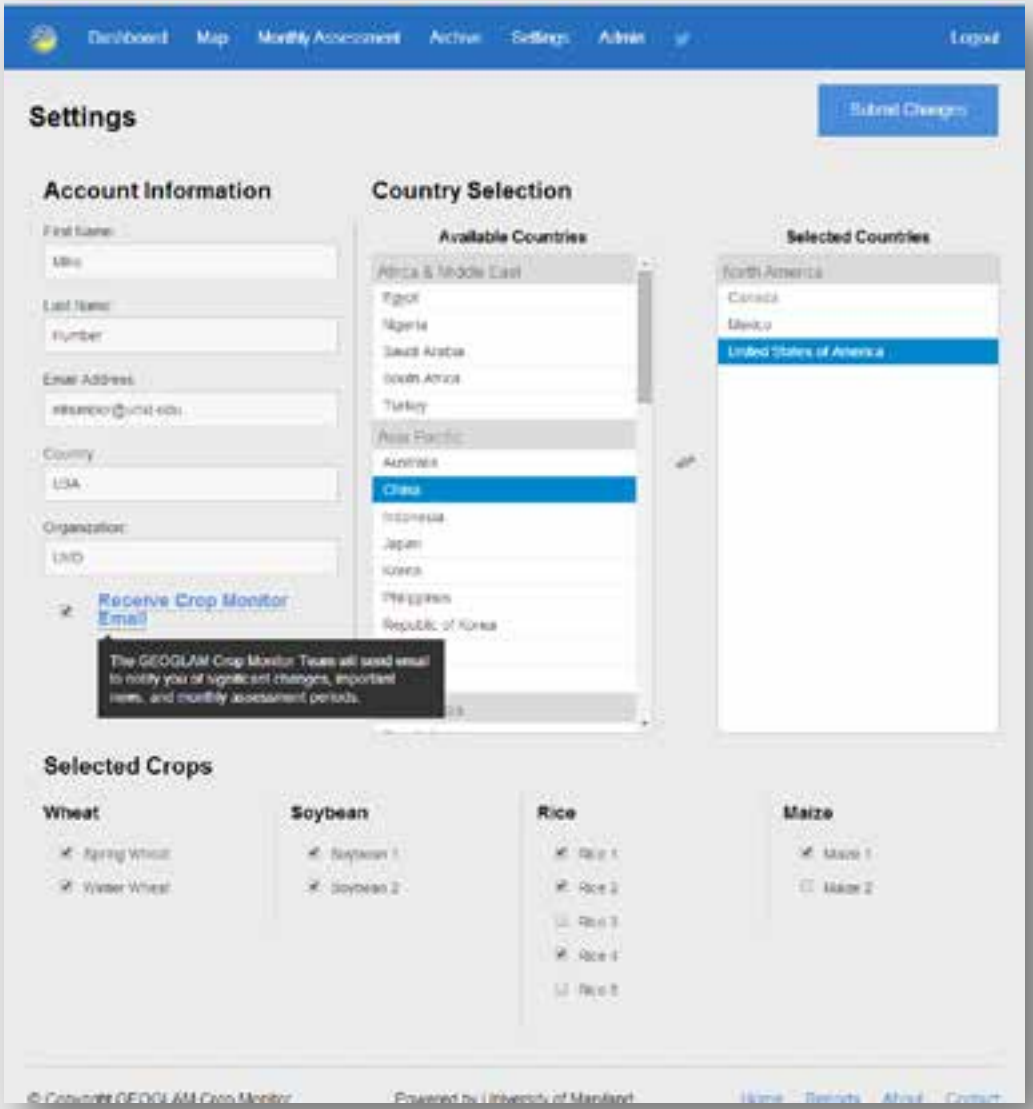
- Condition
  - Exceptional: Conditions are much better than average* at time of reporting. This label is used only during the grain-filling through harvest stages
  - Favorable: Conditions range from slightly below to slightly above average at reporting time.
  - Watch: Conditions are not far from average but there is a potential risk to production.
  - Poor: Crop conditions are well below average. Crop yields are likely to be more than 10% below average. This is only used when conditions are not likely to be able to recover, and impact on production is likely
- Drivers: Dry, Wet, Hot, Cool, Extreme Event
- Potential Impact: Unknown, Minor (+/-), Major (+/-)
- Trend: Improving, Stable, Worsening
- Comments
- Provenance
- Observed Date



(Left) Archive page: Displays submitted crop condition entries. Filters the results by date, region, crop, condition, trend, or provenance. Table can able be sorted by one of more columns, ascending or descending.

These results are filtered to show USA entries for all crops with “Favorable” conditions during the June reporting period, then sorted by the name of the crop (descending order).

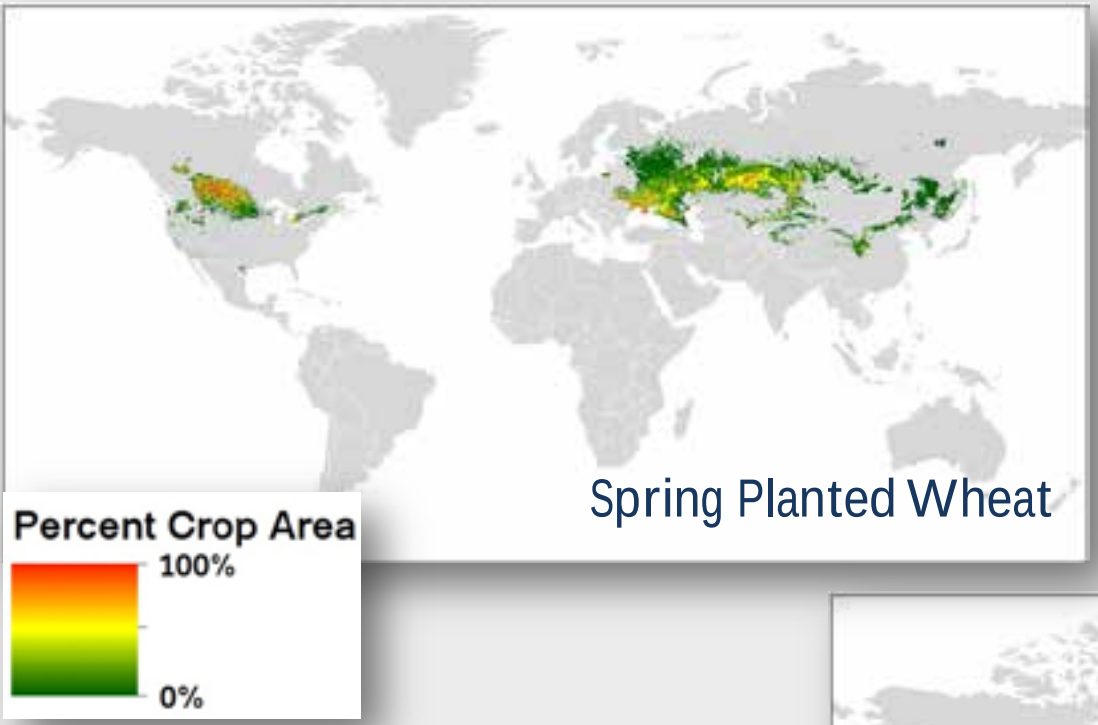
(Right) Settings page: Displays the logged-in user's contact information and allows the user to opt out of receiving Crop Monitor email, distributed via SendGrid.
Users can also select the countries which they wish to report on as well as select the crop categories which they will contribute crop condition entries to.



GIS Analysis in the Crop Monitor

- Combine crop area masks and crop condition responses from the Crop Assessment Tool to create synthesis maps and crop-specific condition maps
  - Synthesis and crop-specific condition maps show a quick overview of overall global crop conditions along with associated drivers
- Area calculations from the maps are used to create pie chart visualizations of the overall conditions of each crop
- This process will be automated in the near future to allow users to download this information directly from the tool

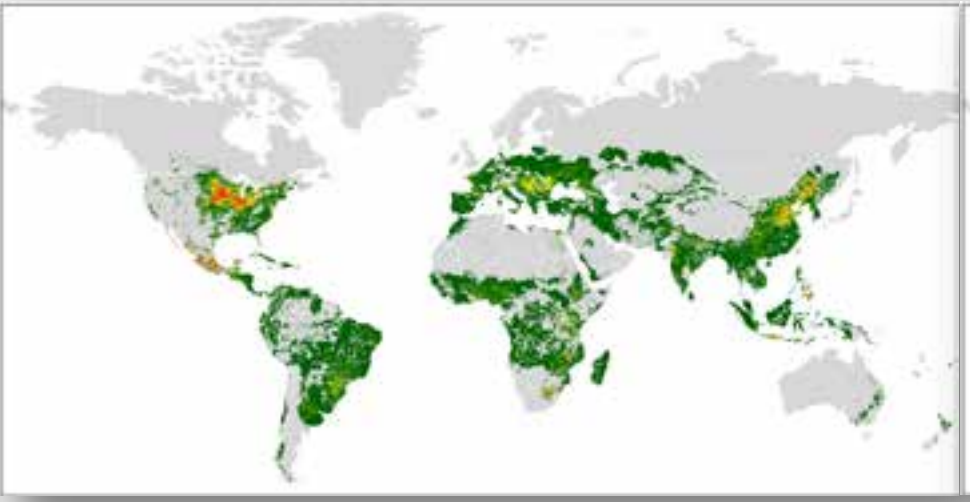
Crop Monitor Crop Masks and Calendars



New Crop Monitor products Reflect best available crop type distribution based on multiple national & global products

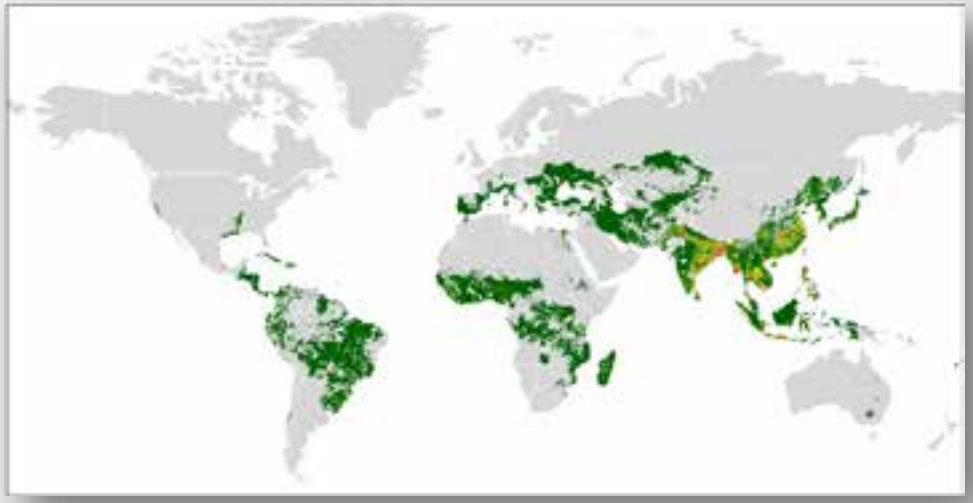
Sources: IFPRI/IIASA SPAM 2005 [beta version; released 2013]), USDA/NASS CDL 2013, AAFC Annual Crop Inventory Map 2013, SIAP (Mexico) Crop Type Maps, GLAM/UMD wheat and soy masks, Australian Land Use and Management Classification (Version 7), ARC South Africa, and EC JRC MARS crop type masks. Asian Rice countries to be- added in August.

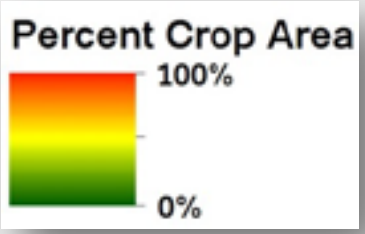
Soybean 1



Maize 1

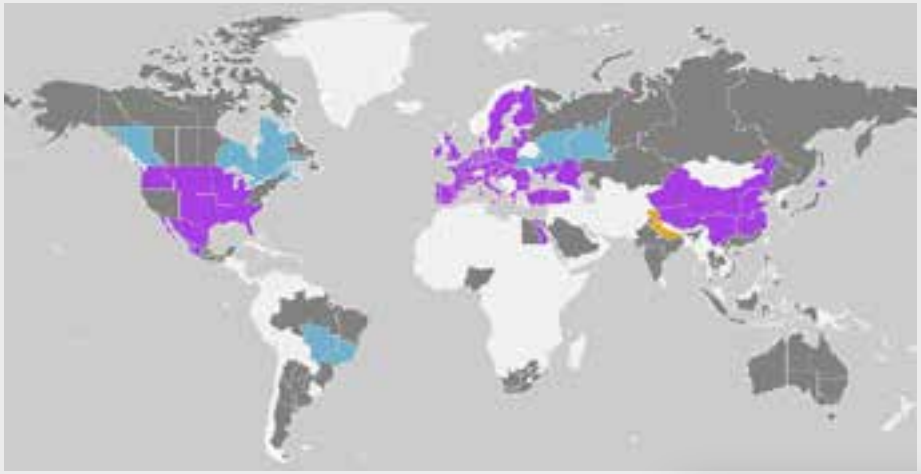
Rice 1





Crop Calendars

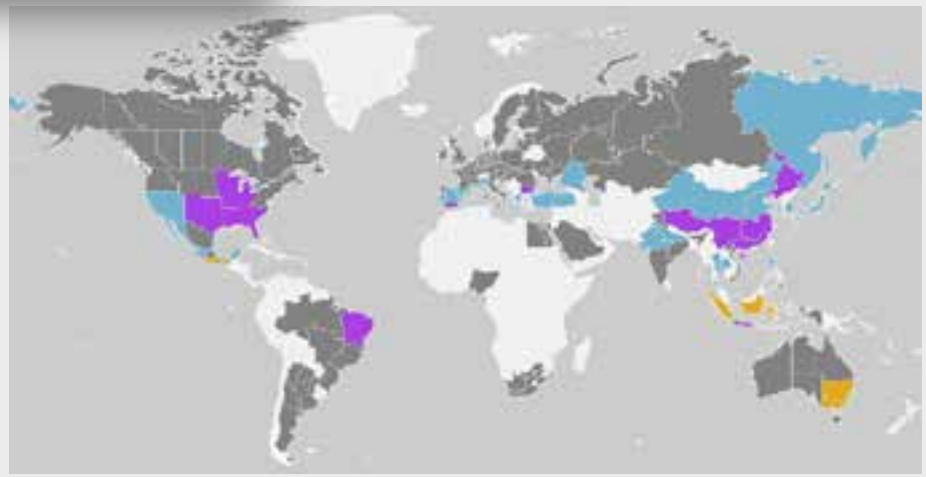
Winter Wheat



Maize 1

Soybean 1

Rice 1

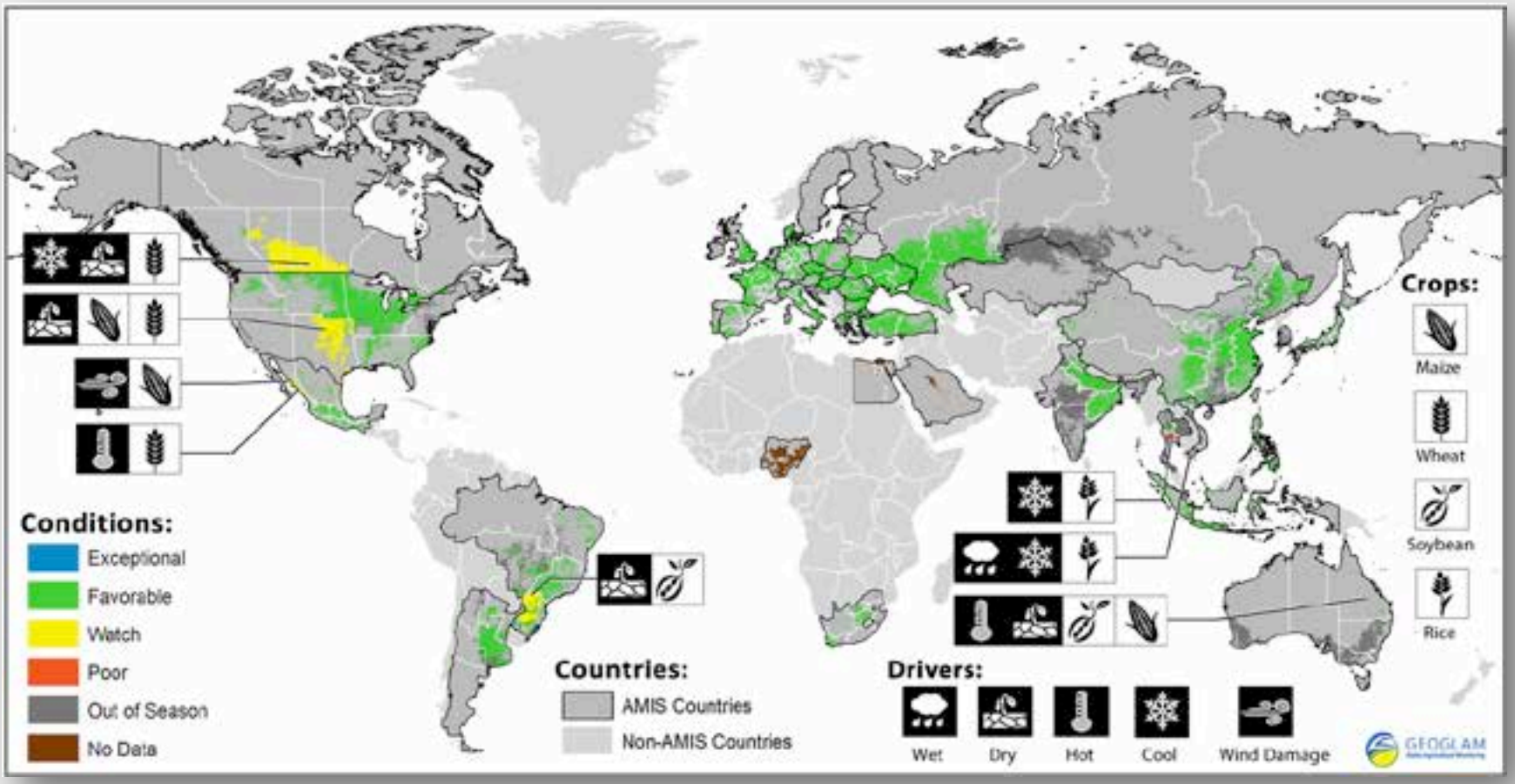


Based on GEOGLAM partner crop calendars and FAO and USDA crop calendars

Synthesis Maps (All Crops)

Crop Conditions as of April 28th, 2014

V2. with Crop Type & Drivers available on interface only

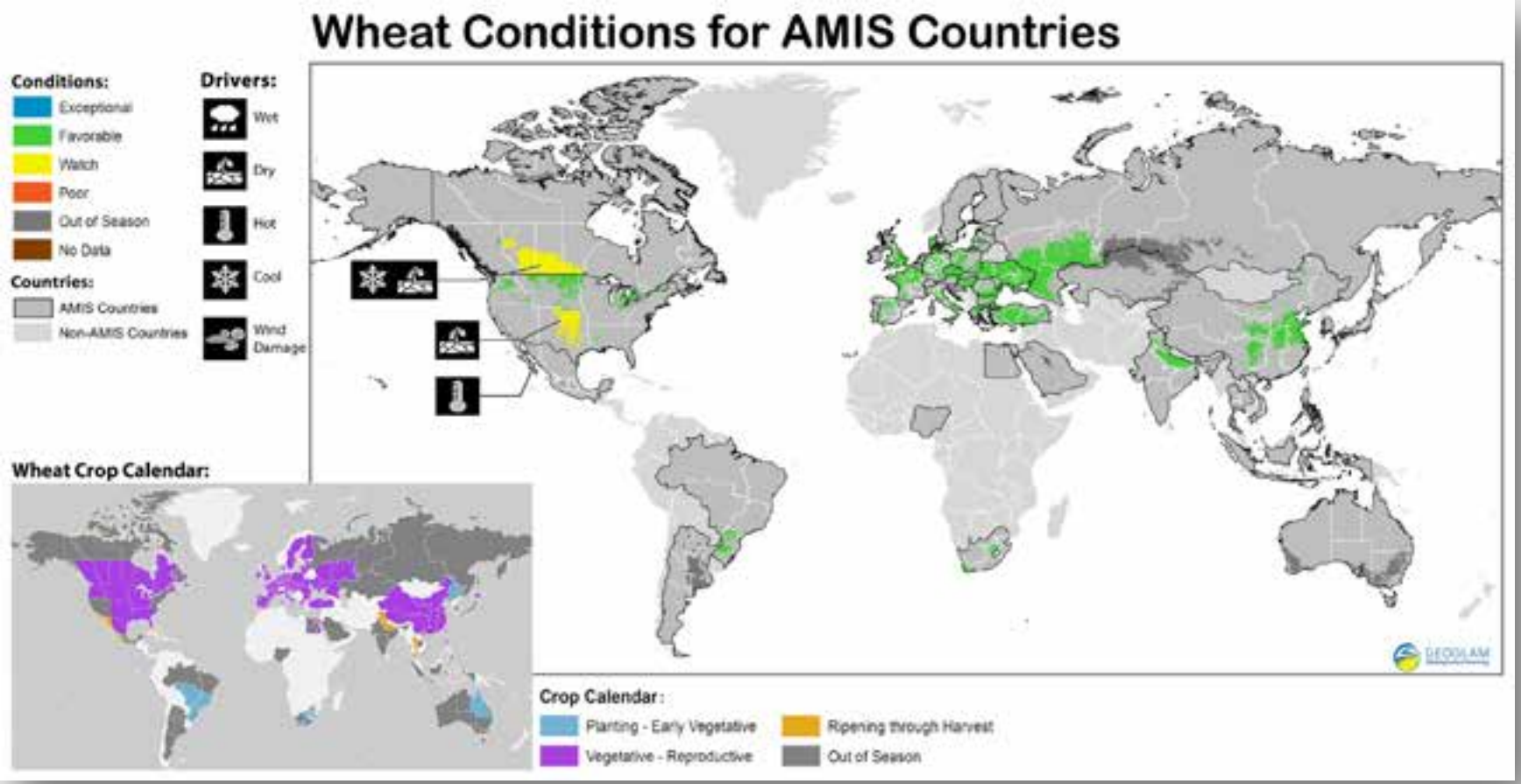


Crop condition map synthesizing information for all four AMIS crops

Crops that are in other than favorable conditions are displayed on the map with their crop symbol and associated climatic drivers affecting conditions

Crop-Specific Condition Maps

Wheat conditions as of April 28
(available from GEOGLAM Crop Monitor Website)

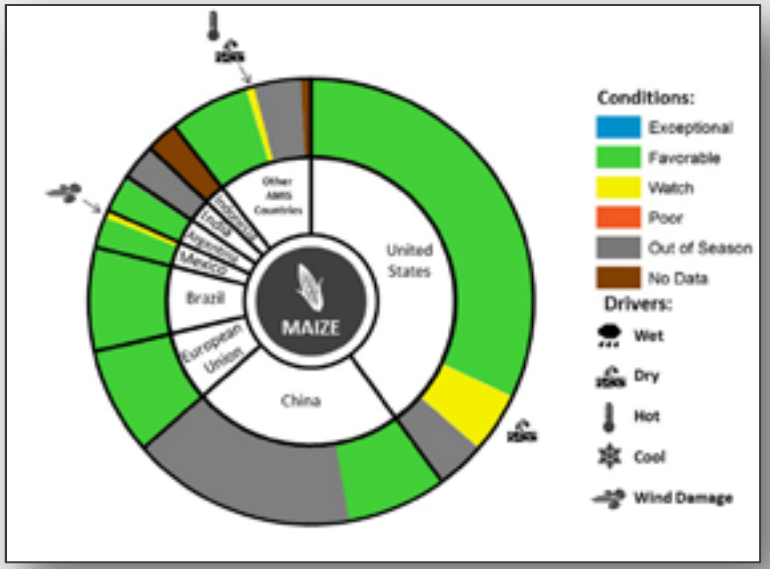


Where crops are in other than favorable conditions the climatic drivers responsible for those conditions are displayed. Inset crop calendar map is provided as context.

Pie Chart Description

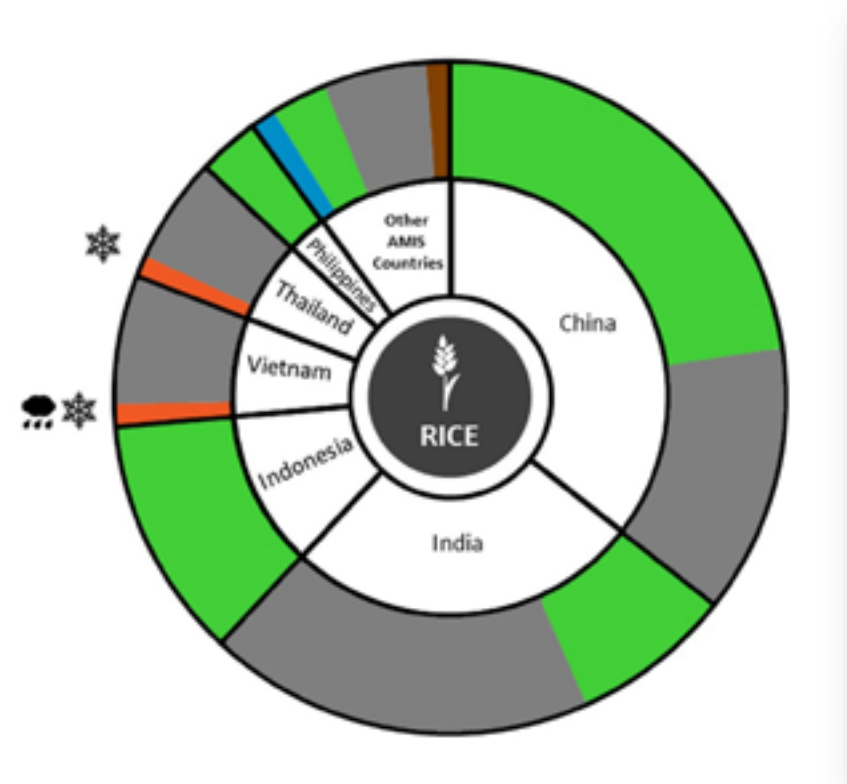
- A country's slice represents portion of the 5 year average of the total AMIS country production
- Countries making up 90% of production are individually shown, remaining 10% - "Other AMIS Countries" category
- Country's pie slice is divided between crops in-season (colour) and out-of-season (gray)
- The in-season portion is coloured according to the various crop conditions within that country
- Driver icons provided when conditions are 'poor' or 'watch'

- The crop calendar, condition and climatic driver information are based on inputs provided by the crop monitor analysts on a sub-national division basis, and therefore reflect conditions by area rather than overall national production.

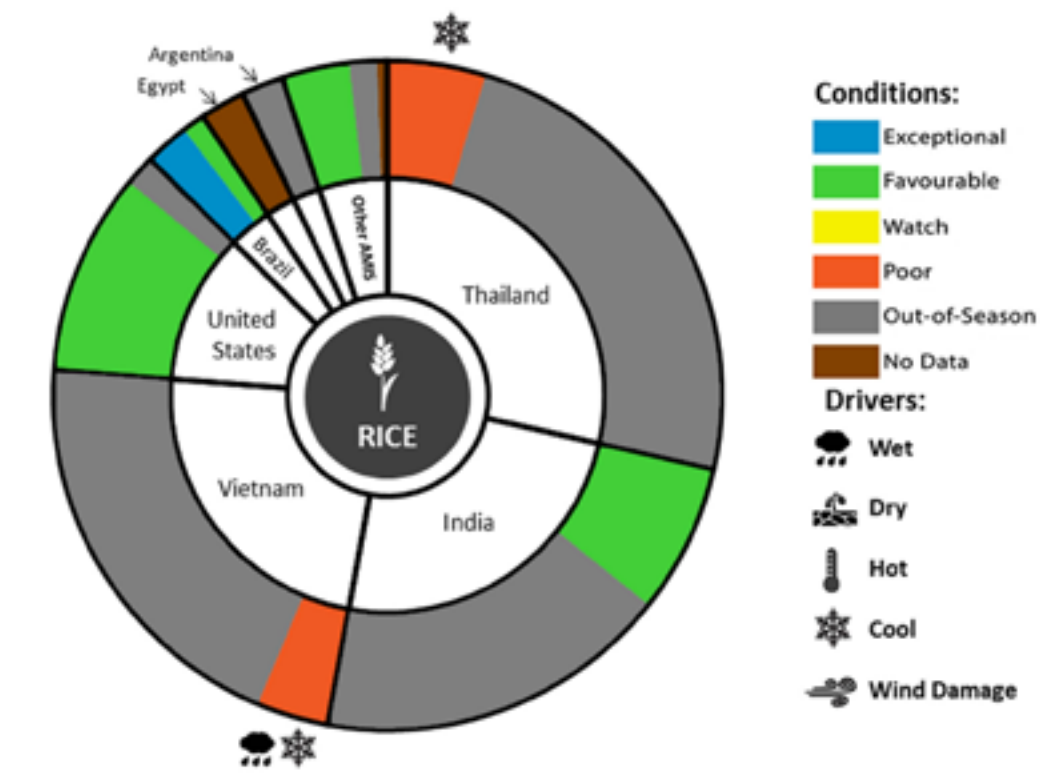


Rice

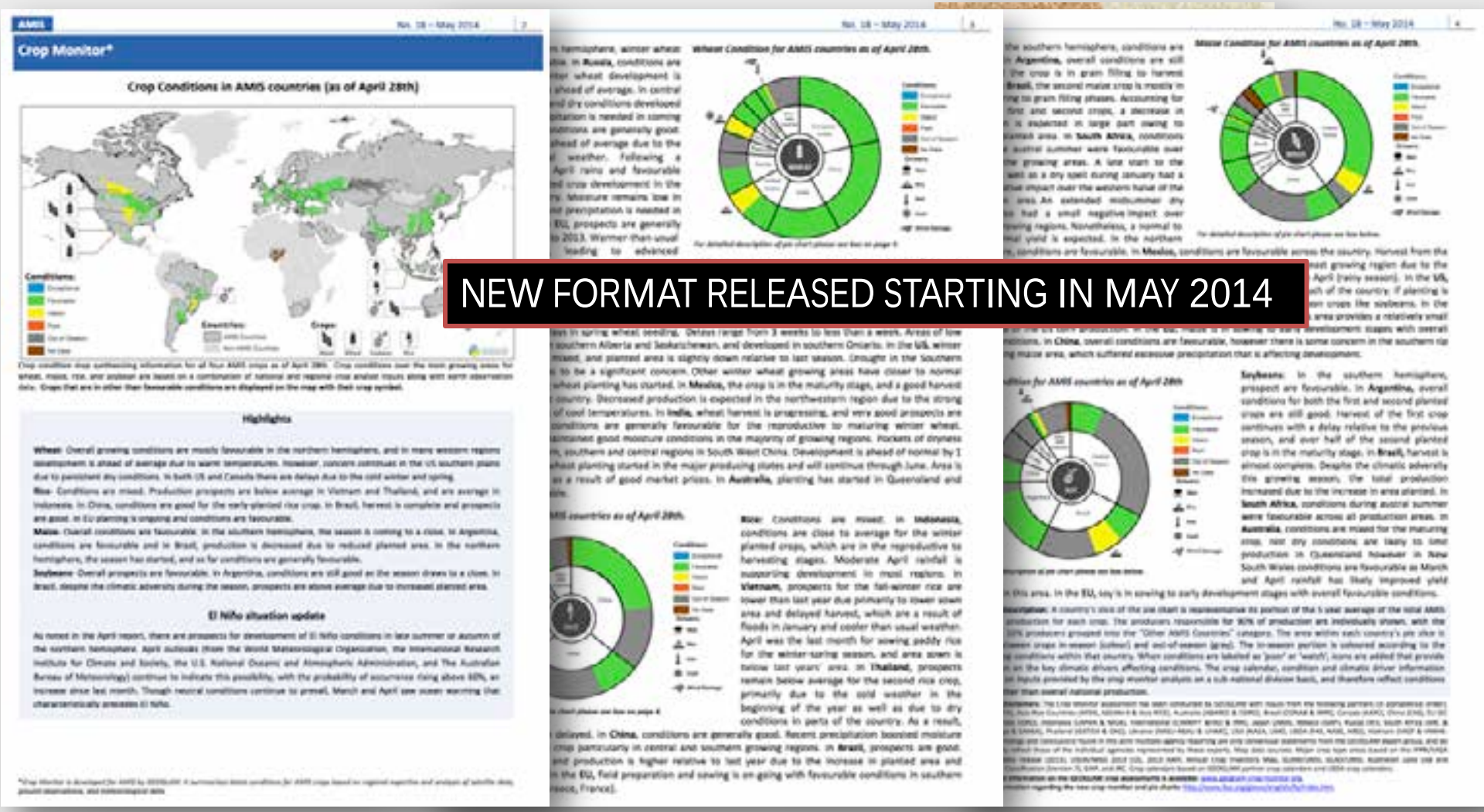
Production



Exports

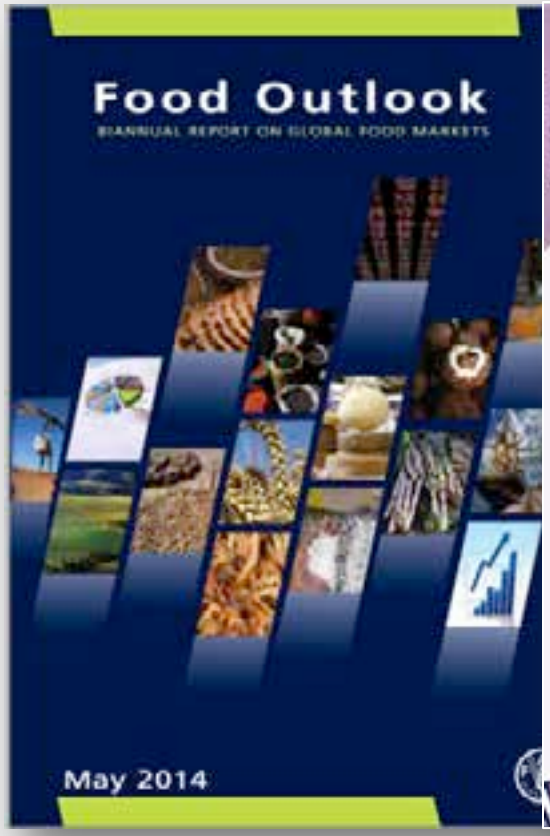


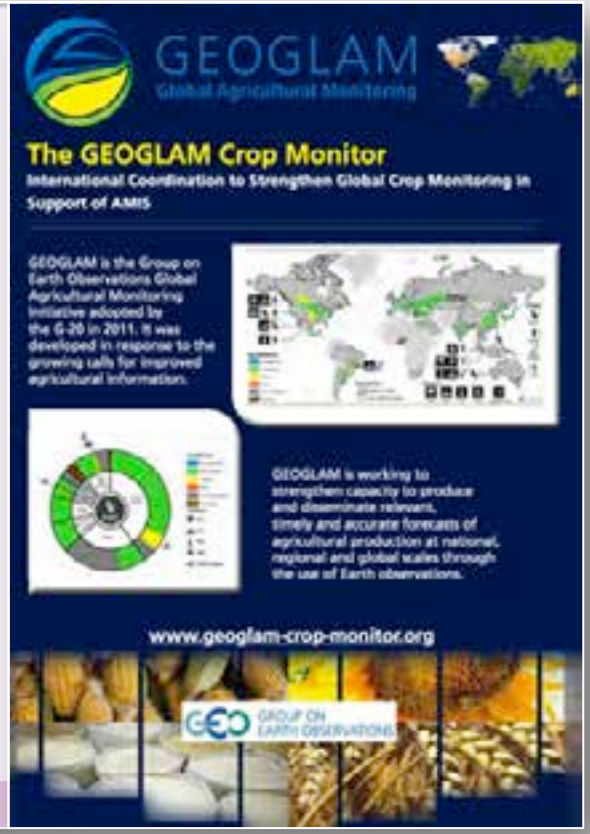
Crop Monitor Bulletin:
Operational Since September 2013



NEW FORMAT RELEASED STARTING IN MAY 2014

Feature Article in FAO Food Outlook





Released in May, 2014

Summary of Technology Used

Back-end

- ArcGIS for Server
- PostgreSQL 9.3
- ArcSDE for PostgreSQL
- IIS 8
- PHP 5.5
- Python, arcpy(.mapping)

Front-end

- ArcGIS for JavaScript API
- HTML5/CSS3
- JavaScript/jQuery
- Foundation by Zurb
- Drupal
- D3

The Crop Assessment Tool is now open to the public!

We encourage you to check it out at http://www.geoglam-crop-monitor.org under “Assessment Tool”. Registration is free and all features are now available to all users.

Note: Public entries are stored separate from partner entries and will not appear in the Crop Monitor Reports.

Upcoming Features

- Customizable reports (.pdf)
- Improved integration with crop production data
- Per-region anomaly charts for biophysical measures
- Public crowdsourcing version of interface expected to launch soon, entries recorded separate from partner entries
- Upcoming native mobile app
- Exploring implementations of the Crop Assessment Tool for other applications (rangeland and food security monitoring)

Thank You!

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IRRI

Australian Government
Department of Agriculture

Agriculture and Agri-Food Canada
Agriculture et Agroalimentaire Canada

Asia-RiCE
Crop Estimation and Monitoring

GEOTERRA IMAGE

इसरो isro

CIMMYT

FAO FIAT PANIS

INPE

USDA

ARC • LNR
Excellence in Research and Development

GISTDA

Ukrainian Hydrometeorological Center

asean

CSIRO

ІКД

SIAP
SERVICIO DE INFORMACIÓN AGROALIMENTARIA Y PESQUERA

JAXA
Explore to Realize

NASA

LAPAN

European Commission

IFPRI

Conab

ISRI

ИКИ

sansa
SOUTH AFRICAN NATIONAL SPACE AGENCY

STI
SPACE TECHNOLOGY INSTITUTE