Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

APCAS/24/A2.3

ASIA AND PACIFIC COMMISSION ON AGRICULTURAL STATISTICS

SIDE EVENT A

Country Experiences with EO Data

A2.3: USDA's EO programs for agricultural statistics

30TH SESSION 19–24 May 2024

Kathmandu (Nepal)

SIDE EVENT A:

Country Experiences with EO Data

A2.3: USDA's EO programs for agricultural statistics

Presenter: Sarah Hoffman, USDA-NASS

Background Information – USA

Lead Ministry/Agency	USDA/NASS (US Dept of Agriculture/National Agricultural Statistics Service)
Policy mandate	None for using EO
Legislative mandate (if any)	None for using EO
Stakeholders involved	Internal USDA/NASS, Data users of published statistics
Interagency collaborations	USDA/FSA (Farm Services Agency), USDA/FAS (Foreign Ag Service), USGS (US Geological Survey), and NASA (National Aeronautics and Space Administration)
Privacy legislation	The vast majority of the EO data we use is in the public domain. Otherwise, normal Surveys/Census confidentiality legislation rules apply
Privacy considerations	Must maintain trust of data providers and data users. There is no farmer association (personally identifiable information) published.

Background Information (cont.) – USA

Ancillary data	USGS National Land Cover Database (NLCD), State (FL, OR, WA, UT) supplemental data, US Bureau of Reclamation, LandIQ, FSA Common Land Unit (CLU) and 578 (farmer reported) information
Size of geospatial team	8 total, with 4 of them involved in planted area and yield
Roles in geospatial team	Mix of geographers, mathematical statisticians, and agricultural statisticians with subject matter expertise in areas of image processing, GIS, statistics, modeling, agronomy, cartography and data science
SPECIAL NOTE	Disaster assessment EO work is done using the other EO outputs

Major Challenges for USA

Original Challenge

Until recently, USDA was unable to use Cloud computing with confidential data (in-situ data), requiring us to download EO datasets

Solution

We now have approval to work in the cloud, allowing us to use Google Earth (etc).

New Challenge

Convert all processes to Google Cloud Platform and Earth Engine **this summer**

Noteworthy

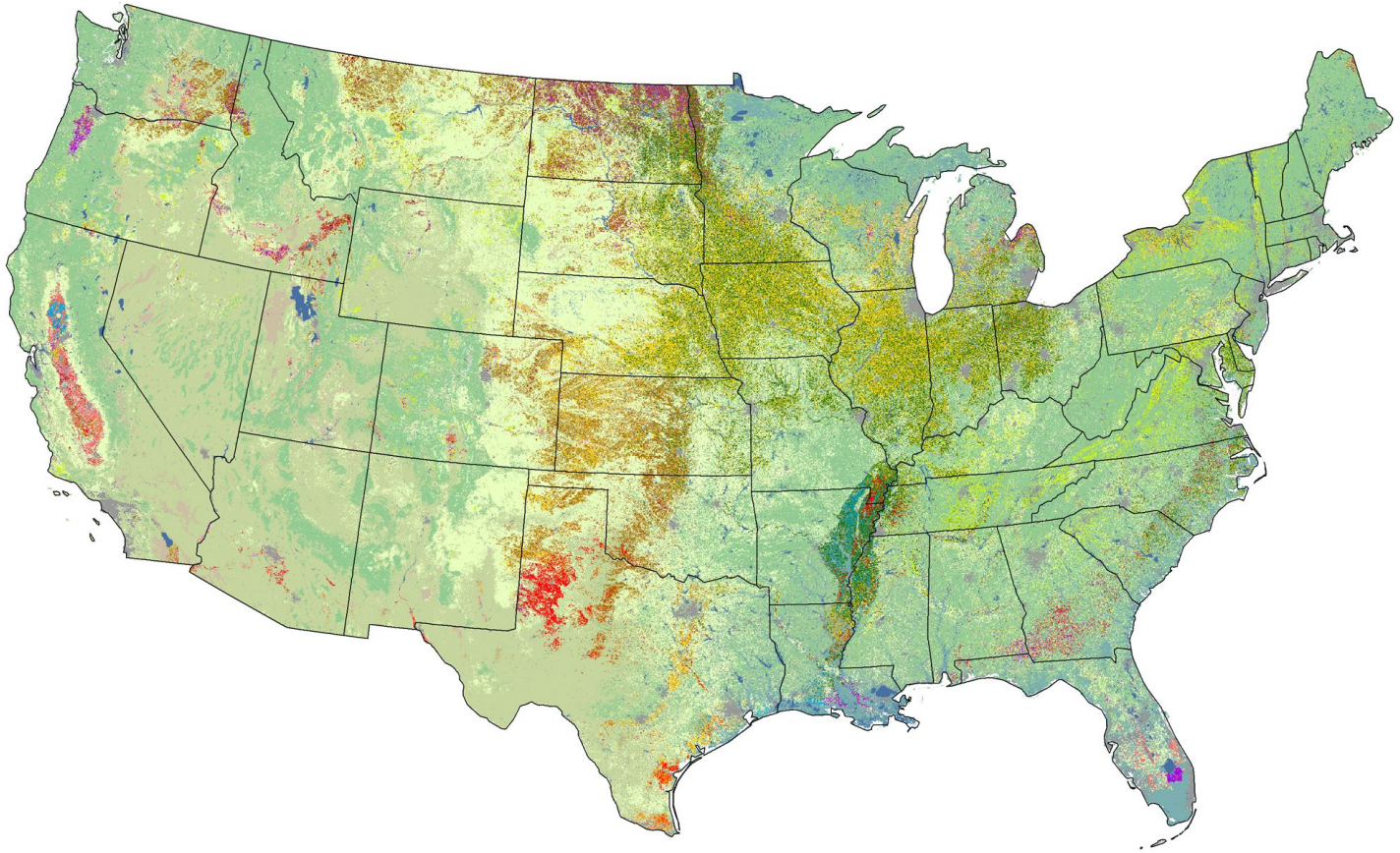
This will allow us to spend more time on research, expanding what we can do with EO data.

Area and Cropland Data Layer – USA

Satellite imagery sources	Landsat 8 & 9 (30m, 8-day) Sentinel 2 A&B (10 m, 5-day) Optical
Data processing	ESRI ArcGIS (ground reference preparation) ERDAS Imagine (Imagery Preparation) Rulequest See 5.0 (Decision tree software) NLCD Mapping Toolkit - ERDAS add-on (Classification)
Crops covered	Over 100 crop categories with a focus on primary crops in 48 contiguous states
Statistics produced	Land cover data layers (includes Crop type mapping) Planted acres indicators used to supplement crop area estimation CDL – annual; planted acres – monthly

Cropland Data Layer (CDL)

- Purpose:
  - Combine remotely sensed imagery, Farm Service Agency (FSA) data, and NASS survey data to produce **supplemental and unbiased acreage estimates** for major commodities
  - Produce crop-specific **digital land cover data layers** for dissemination in industry standard formats



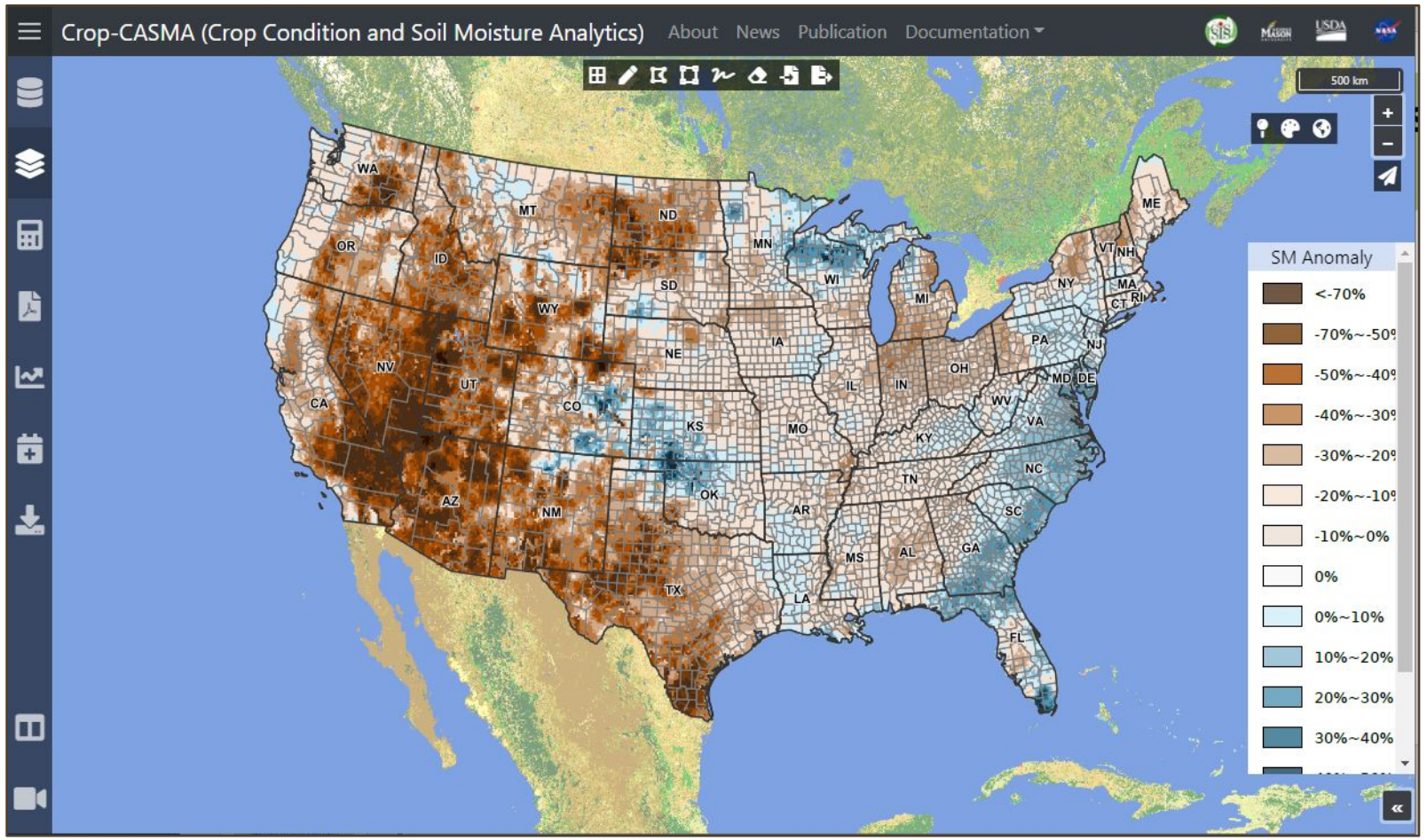
Cropland Data Layer Video: https://youtu.be/vOAuMkprG7k

Crop-CASMA (Crop Condition and Soil Moisture Analytics) – USA

Satellite imagery sources	MODIS (thermal, 250m, daily) VIIRS (thermal, 375m, daily) NASA SMAP (Passive microwave) Sentinel 1 (synthetic aperture radar)
Crops covered	Major crops for crop progress and condition Soil moisture isn't crop specific
Statistics produced	Web app showing Soil Moisture Anomaly Enhances our Soil Moisture Maps for weekly State-specific Crop Progress and Condition Report

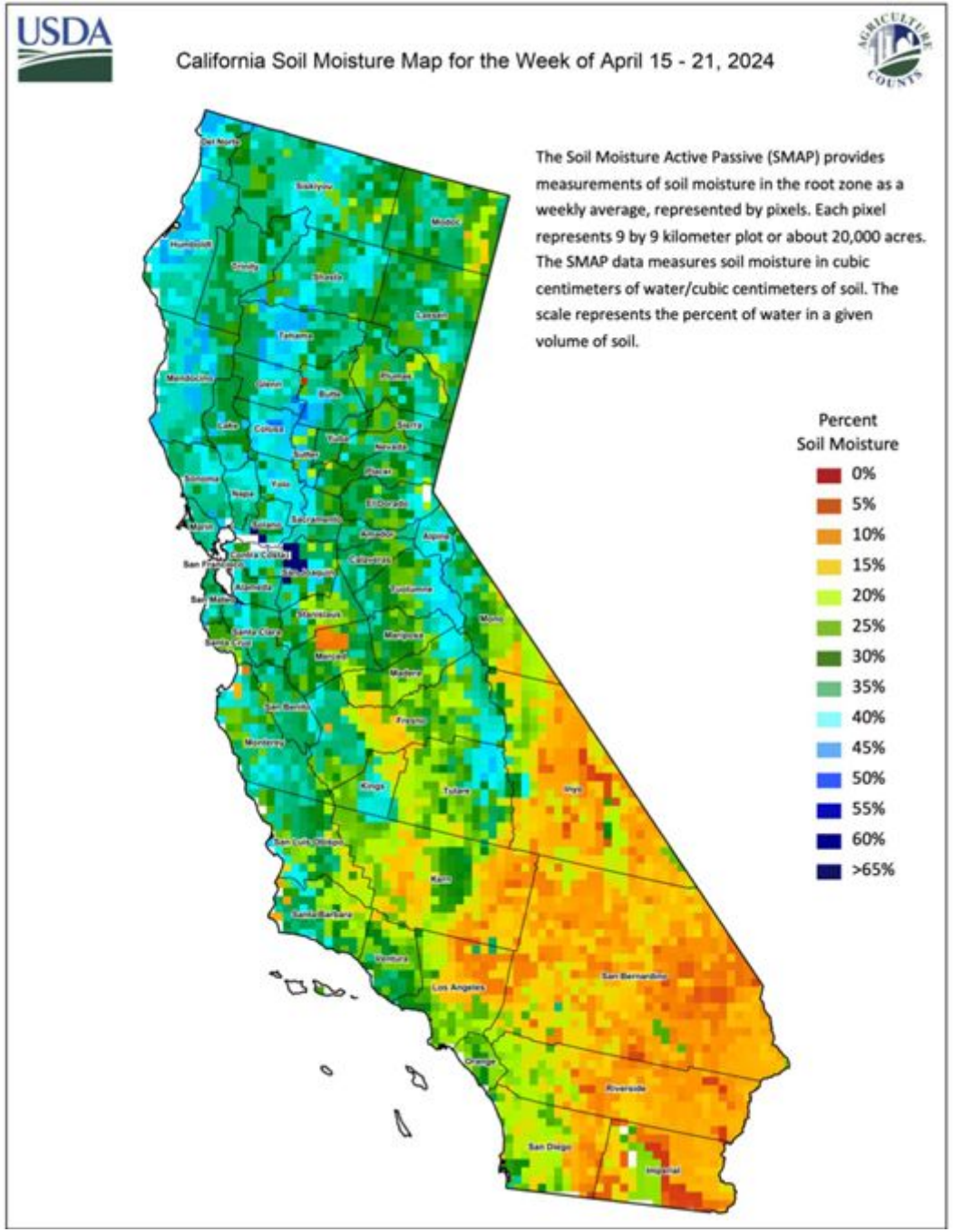
Crop-CASMA (Crop Condition and Soil Moisture Analytics)

- **Provides remotely sensed soil moisture (SM) and vegetation condition data** derived from the Soil Moisture Active Passive (SMAP) and Moderate Resolution Imaging Spectroradiometer (MODIS) missions across the conterminous U.S.
- Soil Moisture Anomaly



Output from CropCASMA

- Example for California Crop Progress and Condition Report (April 29, 2024)
- Soil Moisture Map (% soil moisture in the root zone)



Yield – USA

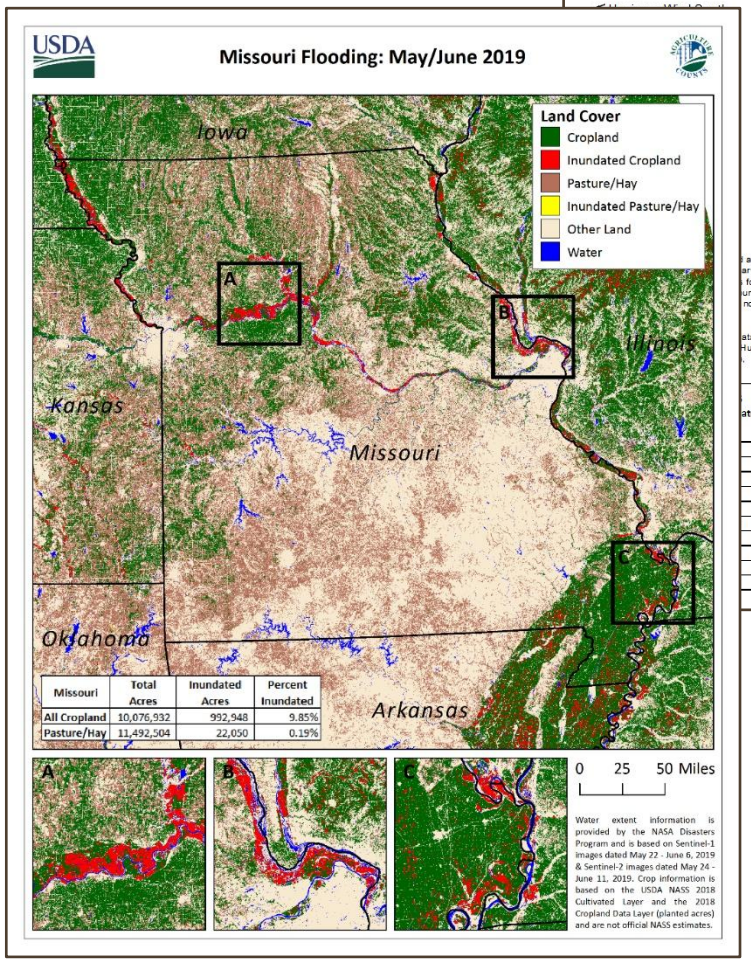
Satellite imagery sources	MODIS (250m, daily) VIIRS (375m, daily) Both Thermal
Data processing	Modeling (NDVI)
Crops covered	Corn and Soybeans (Other major crops not as reliable yet)
Statistics produced	Independent monthly Yield indicators used to supplement crop area estimation
Area covered by EO data analysis (national/sub-national)	Main Corn and Soybean States

In-situ data– USA

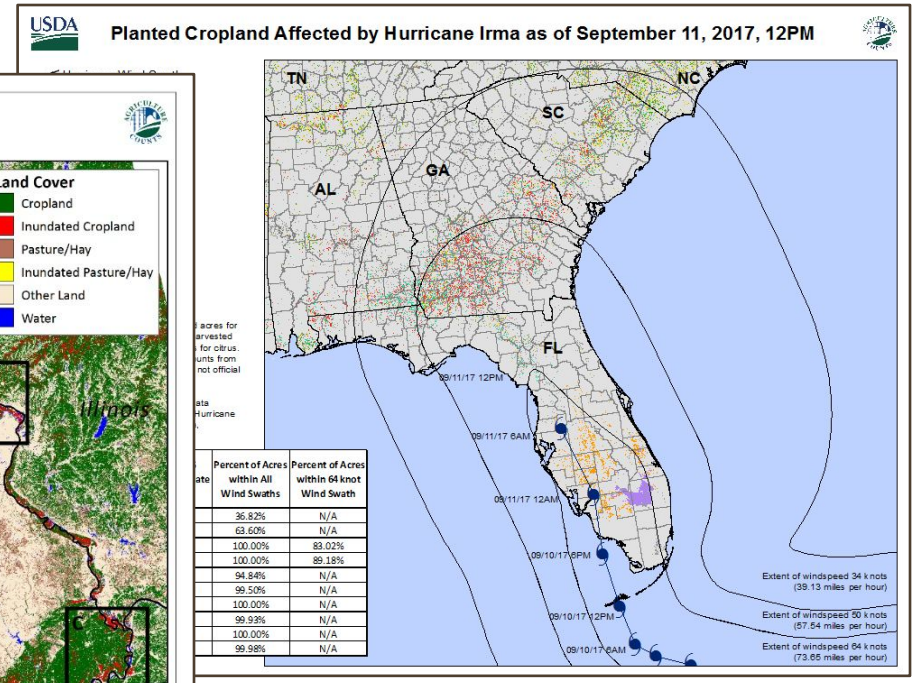
Data/survey source	USDA/Farm Service Agency (FSA) data, USGS NLCD (non-ag), USDA-NASS JAS survey data
Lead agency	USDA/NASS
Sampling approach	Administrative data from FSA is randomly sampled for training and verification
Data collection approach	FSA - Administrative data composed of Common Land Units (CLU) (GIS shapefiles) and farmer reported data specifying crop type linked to CLU.
Variables collected	FSA - field location and size, crop type; NASS - area, yield, stocks, and more, USGS NLCD land cover (non-ag)
Frequency of data collection	FSA CLU annually with associated administrative data updated monthly, NASS - quarterly, USGS NLCD (every 3 years)

Disaster Monitoring Program – Analysis and Dissemination

- The **Disaster Analysis Website provides public access** to the following products for download:
  - Maps
  - Quantitative assessment reports of non-confidential data
  - Geospatial data
  - Metadata
  - Methodology



Inundated cropland due to regional flooding



Cropland affected by hurricane wind speeds

Upcoming Challenges for USA

Cloud computing	Migrate to Google Cloud Platform **this summer**
Yield	Research ways to get more crops in our EO yield
Program Expansion	More partnerships with NASA, USDA/NIFA, others
Imagery sources	Switching satellites (MODIS will be out, VIIRS is different, NISAR launch, etc.)

Thank you for your attention!

For more information, please visit:

CropScape: https://nassgeodata.gmu.edu/CropScape/

CroplandCROS https://croplandcros.scinet.usda.gov/

Crop-CASMA: https://cloud.csiss.gmu.edu/Crop-CASMA/

VegScape: https://nassgeo.csiss.gmu.edu/VegScape/

Disaster Monitoring Website: https://www.nass.usda.gov/Research_and_Science/Disaster-Analysis/index.php