

Global Food Security Initiative Update



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Food Security

Our planet can produce enough food to feed everyone, although more than 800 million people still suffer from chronic hunger. In many of the world's critical growing areas—from California's Central Valley to Iowa farms to the plains of sub-Saharan Africa—erosion and drought are damaging arable land. In parts of the world these are creating a "dust bowl" situation.

The world needs innovative new ways to grow food with limited amounts of water. While the world's emphasis has focused for decades on building water supplies and irrigation to bolster crop yields, a new era is dawning that places equal emphasis on creating early warning systems, restoring degraded waters, and enhancing the efficiency of water use. NASA's system of Earth-observing satellites plays a unique role at the forefront of this evolution.



Earth

Satellite Data Help Australian Ranchers Meet Rising Food



From a Roadside View to a Global View



NASA Food Security and Agriculture Initiative

ROSES 2016 A.51 Earth Science Applications: Food Security And Agriculture

Food security needs are growing as NASA capability to observe and integrate Earth observations with food system information is growing.

NASA “seeks to increase capacity in applications of Earth observations, demonstrate the benefits of Earth science, and induce broader and greater use.” Section 3.1

Objectives of the Food Security and Agriculture Consortium

- Advance use of Earth observations
- Increase the adoption of Earth observations
- Expand the number of applications developed, tested, and adopted ...
- Advance understanding of effective ways ... to enable sustained applications ...
- Enhance awareness ... of upcoming Earth observing satellite missions ...
- Advance impact assessment techniques quantifying the benefits of Earth observations ...
- Identify opportunities and topics for possible future investigations;
- Advance communication of the benefits of Earth science and observations.



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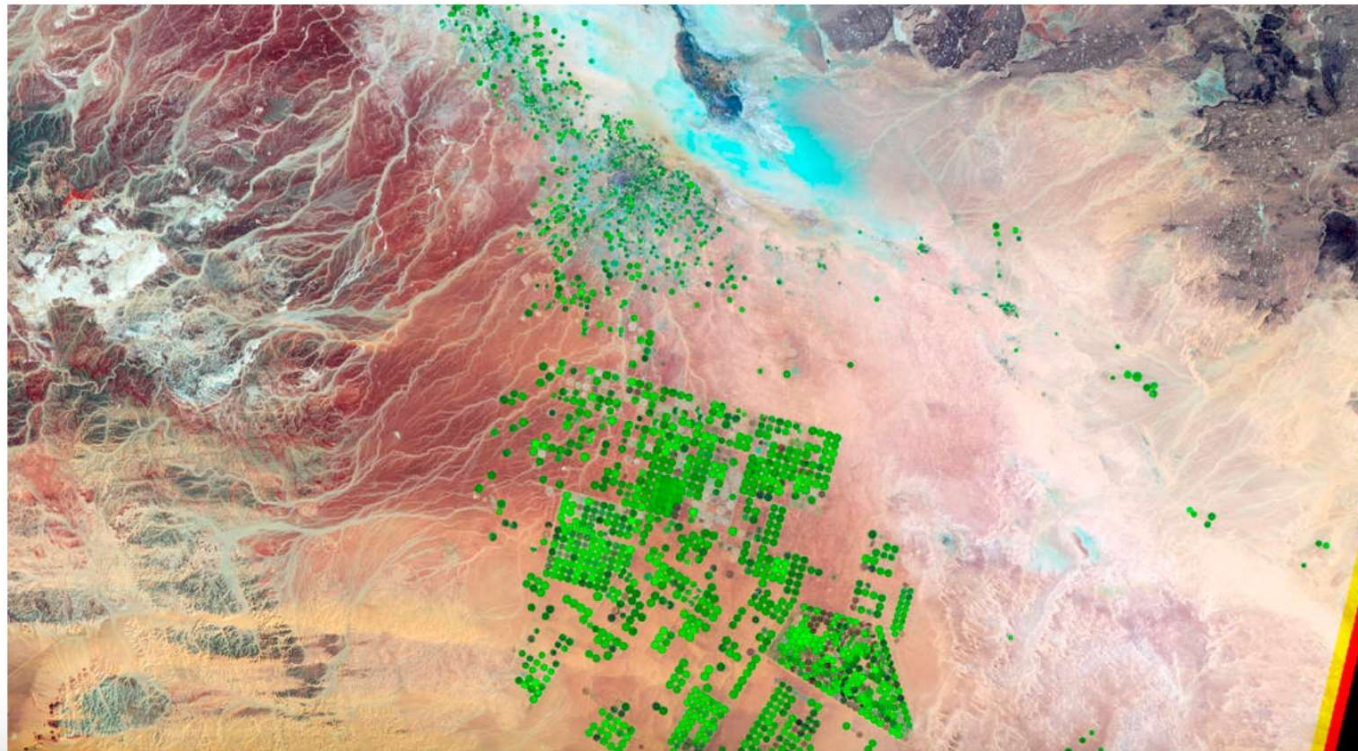
Dec. 7, 2017

NASA, University of Maryland Join Forces on Food Security



NASA has tapped the University of Maryland to lead a new consortium focused on putting satellite data to use to enhance food security and agriculture around the world.

The [Earth Observations for Food Security and Agriculture Consortium](#) (EOFSAC) will combine the expertise of more than 40 partners to advance the use of Earth observations in informing decisions that affect the global food supply.



NASA HQ
Applied Sciences

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graph TD; A[NASA HQ Applied Sciences] --- B[NASA Goddard Food Security Office]; A --- C[NASA Capabilities Food Security Working Group]; B --- D[UMD Food Security and Agriculture Consortium]; C --- D;
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NASA Goddard
Food Security
Office

NASA Capabilities
Food Security
Working Group

UMD Food Security
and Agriculture
Consortium

NASA Applied Sciences Program

bringing the benefits of space back to Earth

Current focus areas and programs



**Health &
Air Quality**



**Water
Resources**



**Ecological
Forecasting**



Disasters



Capacity Building

Interdisciplinary areas



Agriculture / Food Security



Energy



Transportation

Food Security NASA Capabilities Working Group

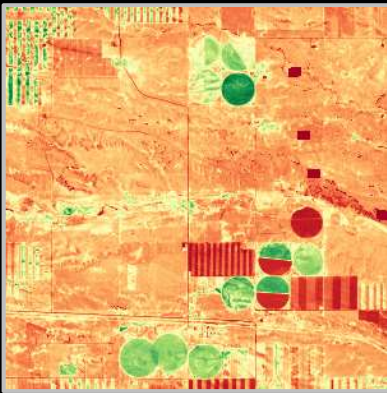
Internal team of NASA scientists with unique technical and scientific expertise in sensors, agriculture applications, and food security who cooperate with the consortium to ensure effective synergy with NASA programs:

1. Advise on potential technical or scientific gap areas that would need to be filled by additional expertise
2. Enable NASA scientists and data to be embedded within Consortium projects and serve as advisors, though any gaps identified or directed work would require additional funding
3. Represent NASA on intergovernmental meetings related to food security

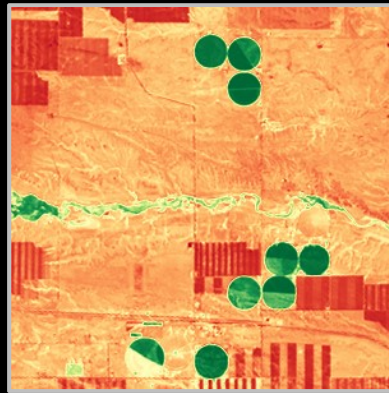
Vegetation index informs USDA Global Crop Model since the 1970's

The U.S. Department of Agriculture (USDA) Foreign Agricultural Services has applied NDVI to its operational productivity forecast for decades. Now higher resolution Harmonized Landsat/Sentinel data are being applied.

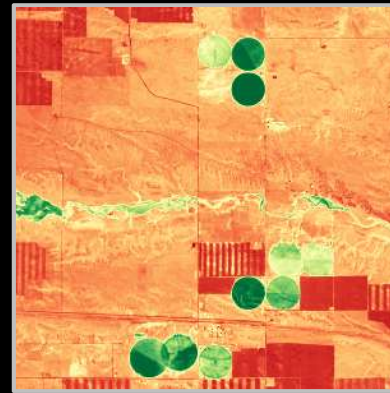
May 4, 2016



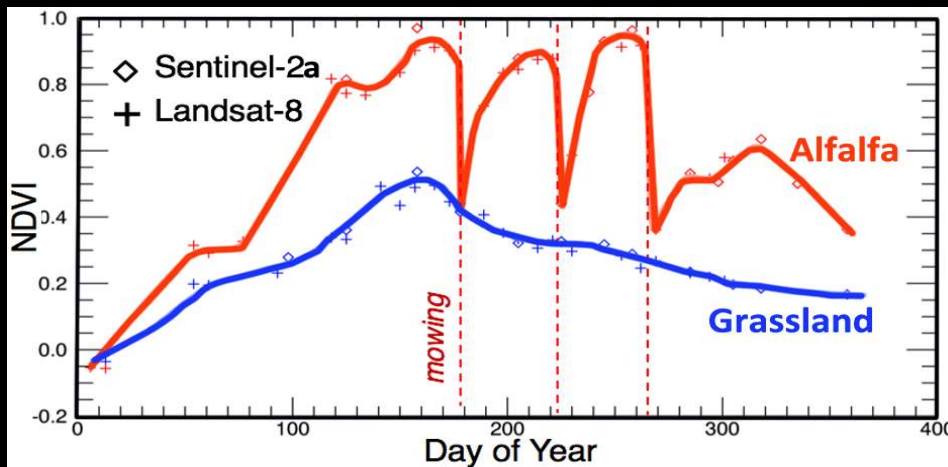
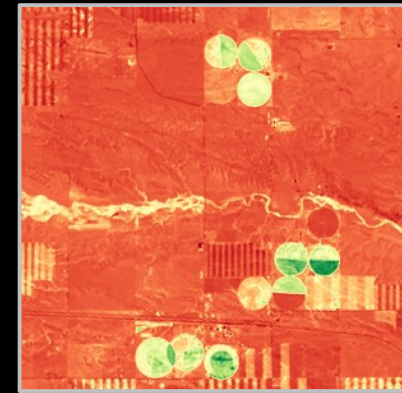
August 8



September 1



October 20



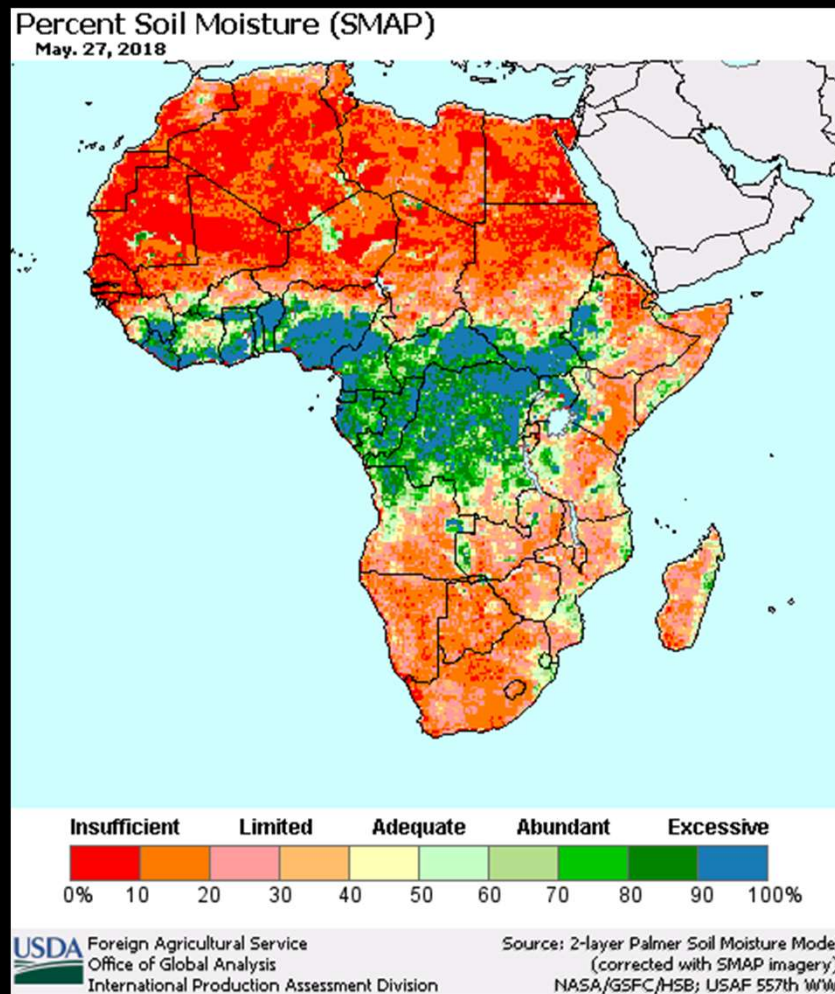
Grassland & alfalfa fields in Cheyenne, Wyoming

Temporal resolution fine enough to detect mowing events within alfalfa fields!

courtesy of Johannssen, McCarty, Tucker

Soil Moisture Improves USDA Global Crop Model

The U.S. Department of Agriculture (USDA) Foreign Agricultural Services recently approved incorporating NASA SMAP soil moisture products into its operational products, giving an extra month of lead time in predicting crop health.



NASA SMOS- and SMAP products and tools now in USDA FAS products and also available in Google Earth Engine

I. Mladenova, N. Sazib, and J. Bolten

Initial members of Working Group

<u>Name</u>	<u>Center</u>	<u>Expertise</u>
Brad Doorn	HQ	Water Resources Program Manager
Stephanie Schollaert Uz	Goddard	Applied Sciences Manager, ENSO, ocean
Christa Peters-Lidard	Goddard	LIS, Interagency groups (e.g. FEWS-NET)
Jim Tucker	Goddard	MODIS, VIIRS, (NGA NASA POC)
Batu Osmanoglu	Goddard	SAR
Thomas Holmes	Goddard	ET (TIR and MW), ALEXI
John Bolten	Goddard	SMAP
George Huffman	Goddard	GPM, IMERG
Bryan Duncan	Goddard	Ozone, Air Quality
Alex Ruane	GISS	AgMIP
Cynthia Roszenweig	GISS	AgMIP
Chris Hain	Marshall	ALEXI, SPoRT
Stephanie Granger	JPL	WWAO
Natasha Stavros	JPL	NiSAR
Karen Yuen	JPL	OCO, SIF
Narendra Das	JPL	SMAP, Crop modeling, DA
Kent Ross	Langley	DEVELOP
Forrest Melton	Ames	TOPS, NEX

Food Security NASA Capabilities Working Group

Actions:

1. Create food security themed fact sheets (e.g. vegetation health, air pollution impact on crops, soil moisture)
2. Engage outsiders on NASA's food security initiative (e.g. NASA Earth Day celebration at Union Station, Senate Hunger Caucus panel, NISAR Ag workshop)
3. Plan joint working meeting with Consortium (December)



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



SUB-SAHARAN AFRICA

Nioro, Senegal



Smallholder rain-fed farms growing maize, millet and peanut

NIORO SENEGAL


Nkayi, Zimbabwe



Smallholder rain-fed farms growing maize, sorghum and peanut

NKAYI ZIMBABWE

Free State, S. Africa



Commercial and small farms growing maize, wheat and sorghum

FREE STATE S. AFRICA

Kenya



Small maize farms in varied agro-ecological zones

KENYA

SOUTH ASIA

South Punjab, Pakistan



Small, medium and large irrigated farms growing cotton and wheat

S. PUNJAB PAKISTAN

Kurnool, India



Adaptations for Fallow-Chickpea Cropping Systems

KURNOOL INDIA

Meerut, India



Vulnerability of rice-wheat small farm households

MEERUT INDIA



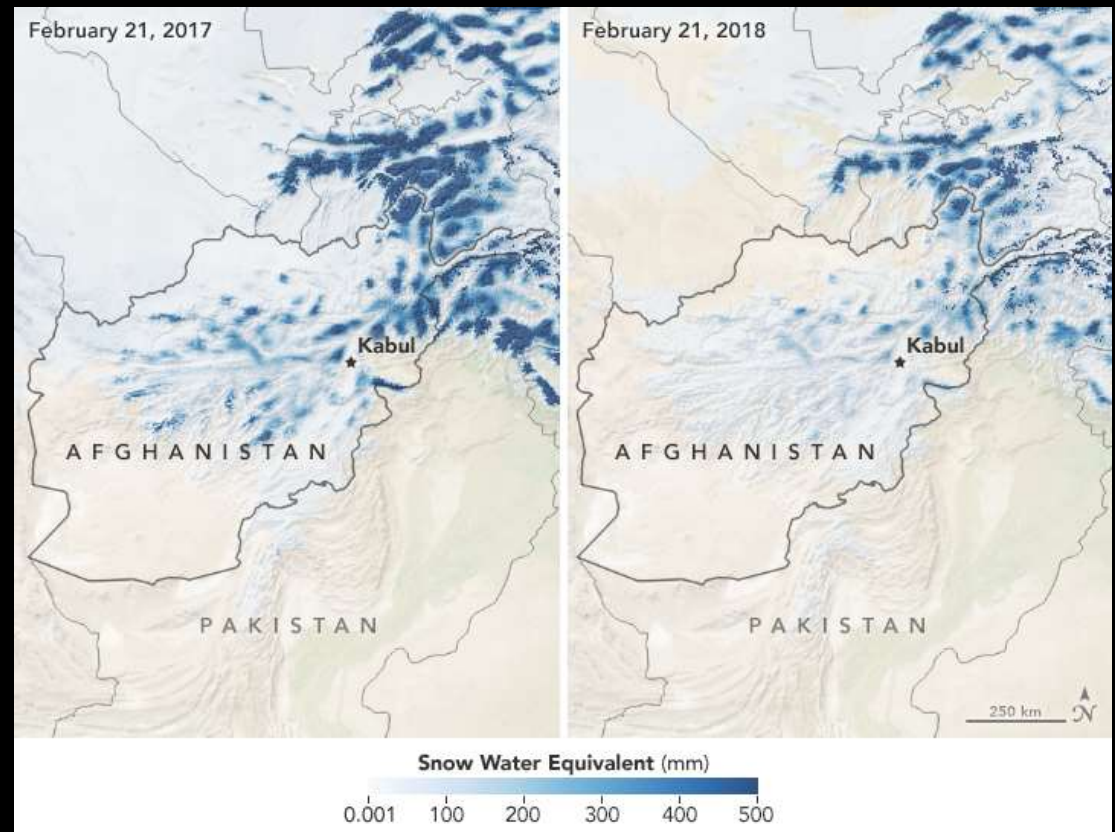
Opportunity to build resilience, adapt, and mitigate if we can anticipate challenges

Record Low Afghanistan Snowpack threatens 2018 agriculture productivity

Below average precipitation and above average temperatures caused the Famine Early Warning System Network (FEWS NET) to predict food insecurity:

- Afghanistan may need 1.5 million tons of wheat from U.N.
- Low rainfall has led to surge in private wells

FEWS NET members include USAID, NASA, NOAA, USDA, and USGS



NASA Earth Observatory
March 20, 2018

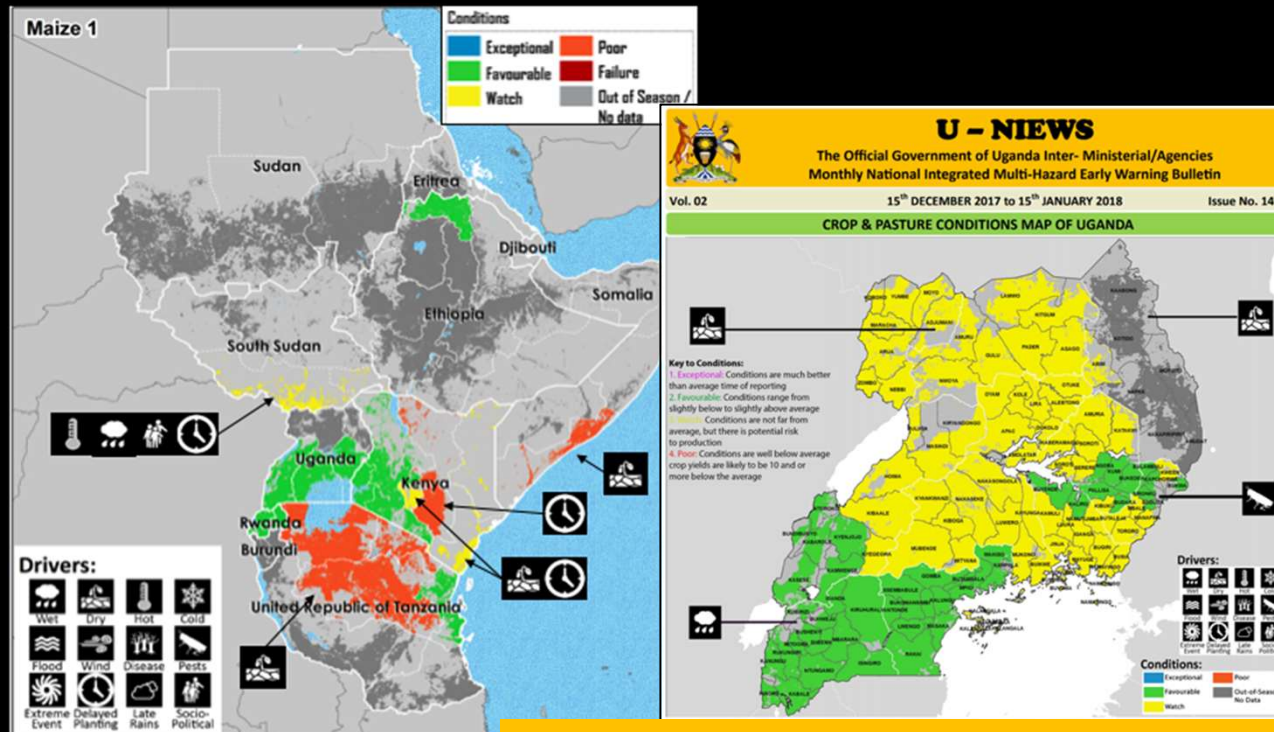
A. McNally (NASA/UMD), J. Jacob (NASA/SSAI), NASA LIS team, FEWS NET



National Agricultural Monitoring in Uganda, Tanzania, and Kenya



Easily interpretable, timely products on crop conditions inform agricultural policies and increase reliability of crop assessments, e.g. GEOGLAM Early Warning Crop Monitor and a regional Crop Monitor focused on Tanzania, Uganda, and Kenya.



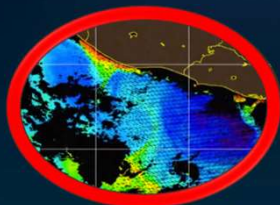
In 2017 in Karamoja Uganda, the early warning of drought saved time and loss (cash pay-outs and next season crop investment).

- Government saved US\$4M and supported ~150,000

This project National Integrated resulted in the Crop Monitor Map for Uganda's Early Warning System (U-NIEWS) bulletin, a key uptake at the national level, with an aim to reduce hunger through early warning and response programs.



SERVIR connects space to village through a partnership by NASA, USAID, and technical organizations to foster self-reliance by developing countries with using satellite data to improve evidence-based decisions around food security, water resources, disasters, land use.



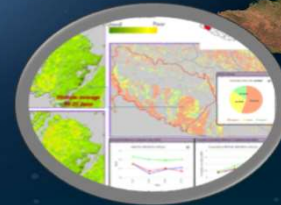
Mapping harmful algae in El Salvador



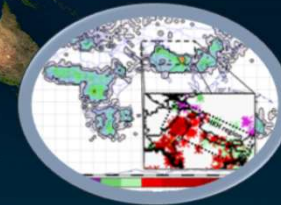
Detecting ephemeral water bodies for herders



Mapping land cover and land use change



Monitoring agricultural drought



Flood Forecasting In Bangladesh

NASA Food Security Office

Stephanie Schollaert Uz, Lead
Sean McCartney (SSAI), Coordinator
Christa Peters-Lidard, Advisor

Adapted from the Grants & Cooperative Agreement Handbook, 1260.51 Cooperative Agreement Special Condition

- **Interfaces between the Consortium and NASA Headquarters** Earth Science Division, including the Water Resources Program Manager, Applied Sciences Program's project portfolio, and NASA science teams, including Mission Applications and Capacity Building
- **Participates in regular meetings** with Consortium leadership and partners, including the annual Consortium meetings, receives quarterly and annual progress & impact reports from Consortium
- Collaborates with Consortium on the **development of work plans** outlining specific responsibilities of the Consortium and its project partners
- Provides input on external advisory committee, funding strategy for the Seed Starter program
- Coordinates end user outreach with the Consortium, including workshops, webinars, panels focusing on applications, conference sessions when appropriate (e.g. AGU, AMS)
- Coordinates with NASA Communications prior to public releases
- Interacts with other US government agencies, companies, international organizations and multilateral organizations