GEOGLAM
Global Agricultural Monitoring
Open Science for Food Security

October 8, 2021

Ian Jarvis, GEOGLAM Director

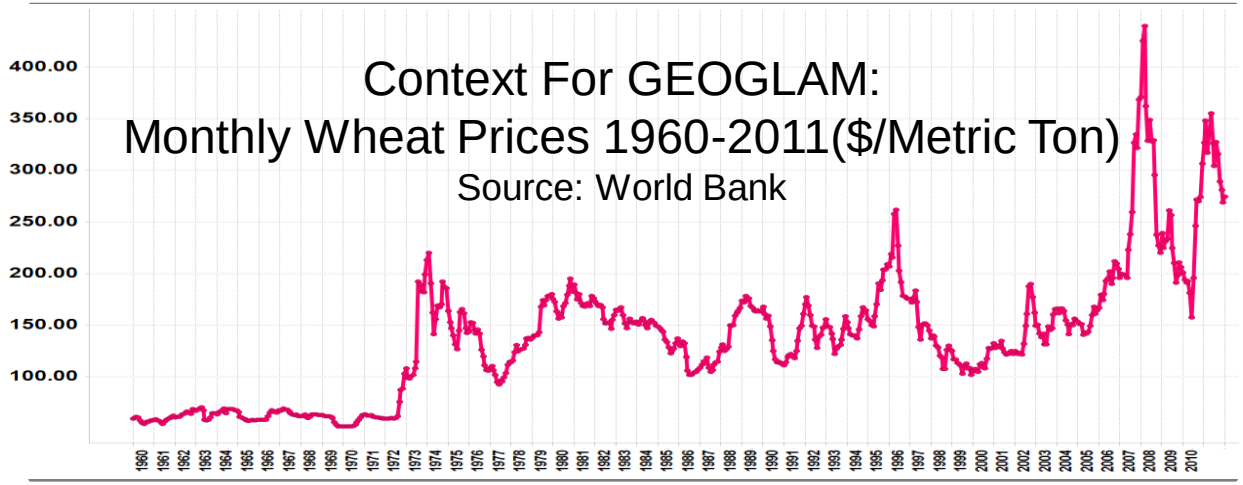
GLOBAL AGRICULTURAL MONITORING

ijarvis@geosec.org

2005-2011 Group On Earth Observations (GEO) Agriculture Community of Practice

2011 G20 Agriculture Ministers launched GEOGLAM

2013 AMIS Crop Monitor



The Four Pillars

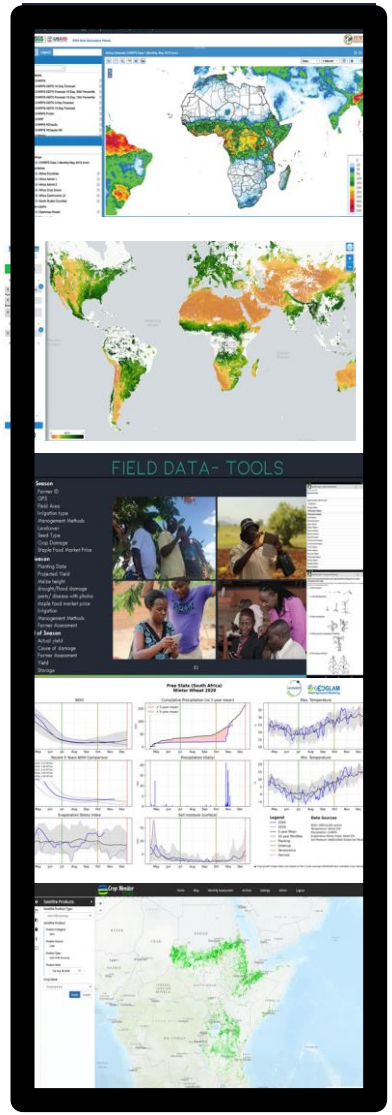
Partnerships

Open Community

Over 100 Institutions Worldwide

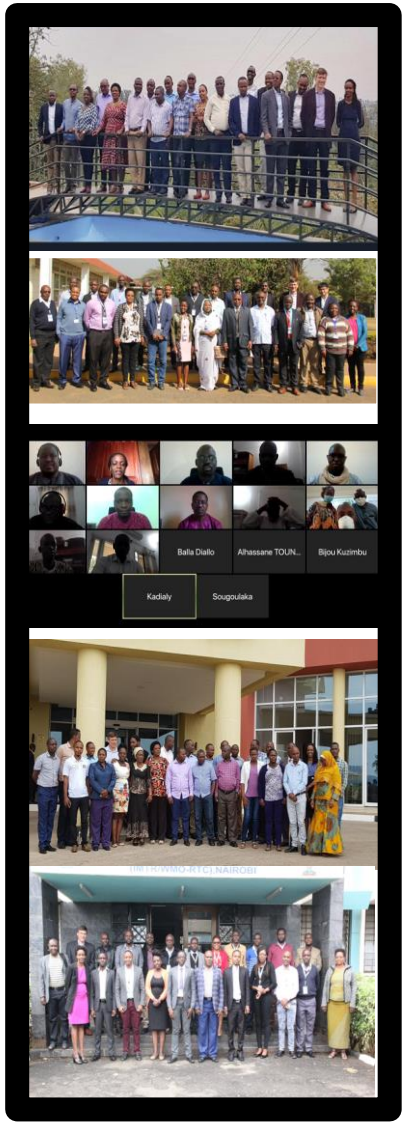
100's of Participants

Open EO Data and Systems



Research and Development

Capacity Co-Development



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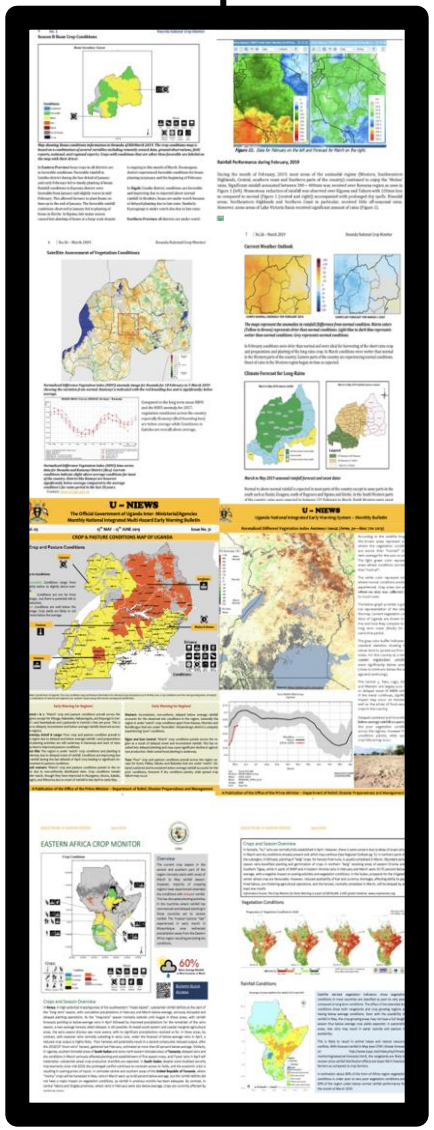
Information for Impact



Examples of Implementation:

Operational Crop Assessments:
Global-Regional-National

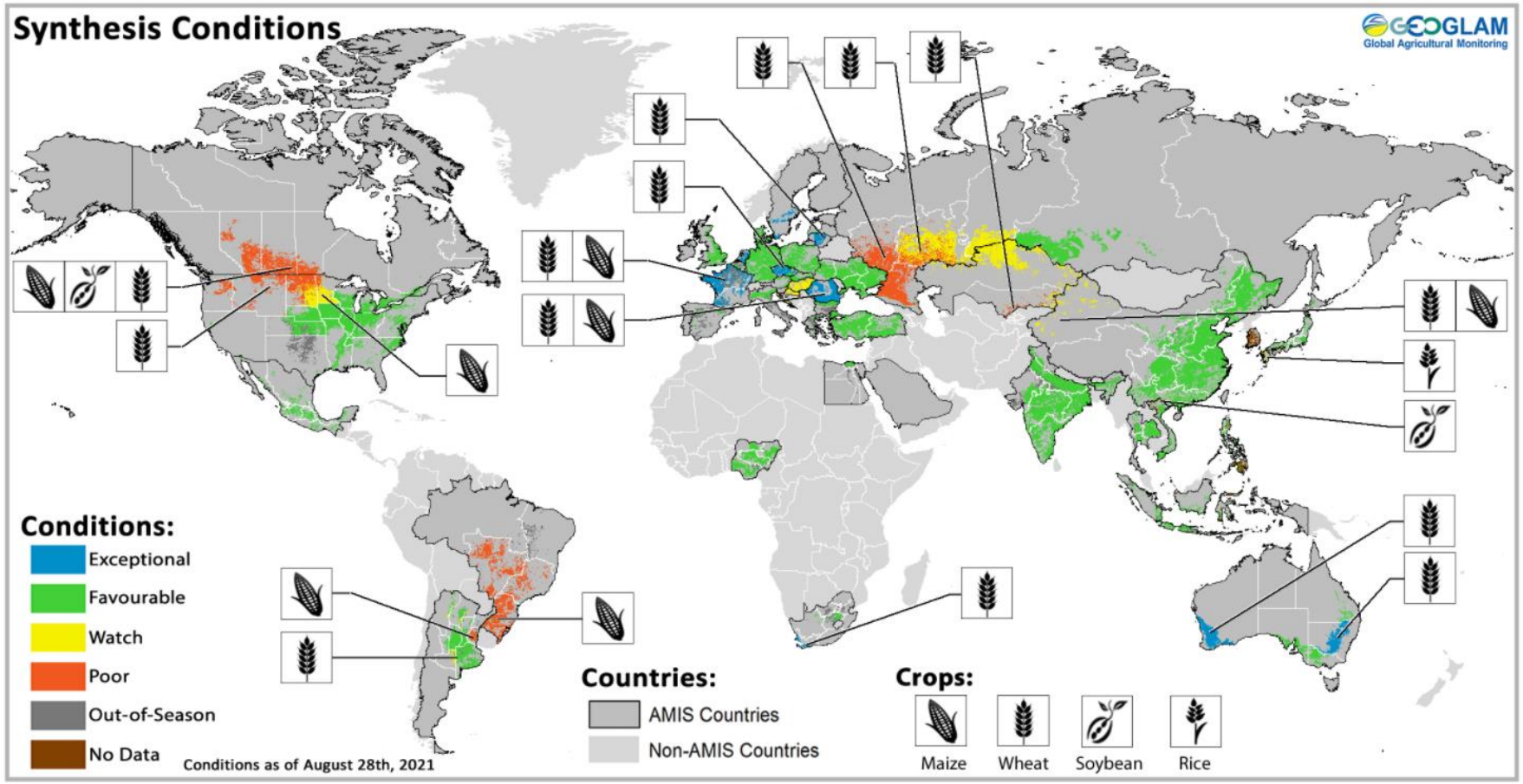
GEOGLAM Monitoring of Agricultural Commodity Production

September 2021

Since 2013 GEOGLAM produces a monthly crop monitor for the Agricultural Market Information System (AMIS) of the G20

Cropmonitor.org
amis-outlook.org

The AMIS crop monitor covers over 80% of the global production of the four major agriculture commodities
- maize, rice, wheat and soy



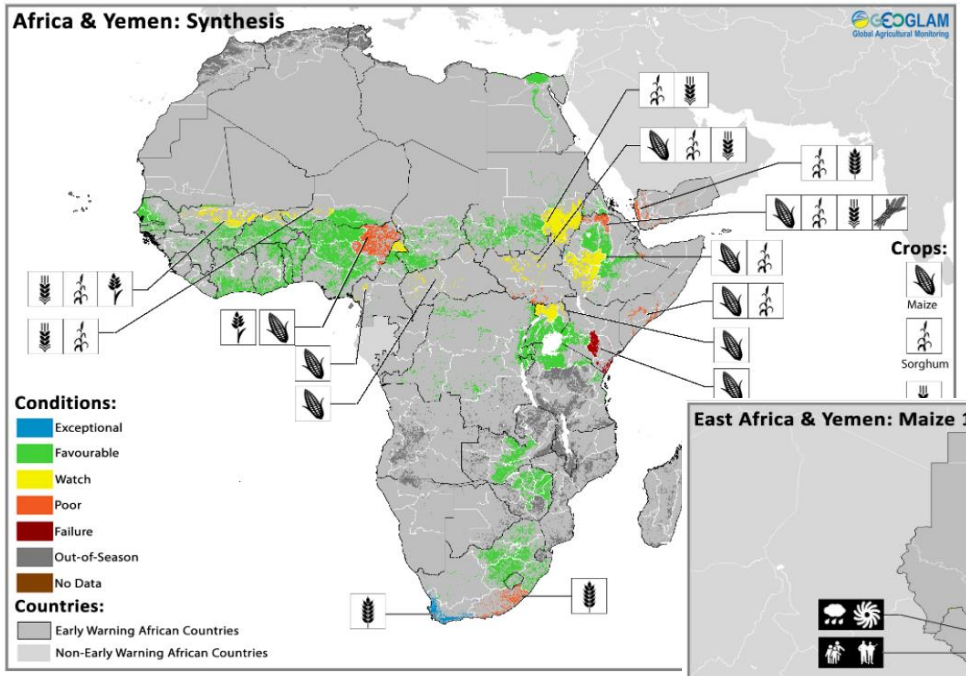
GEOGLAM Crop Monitor for Early Warning

September 2021 – Africa Summary

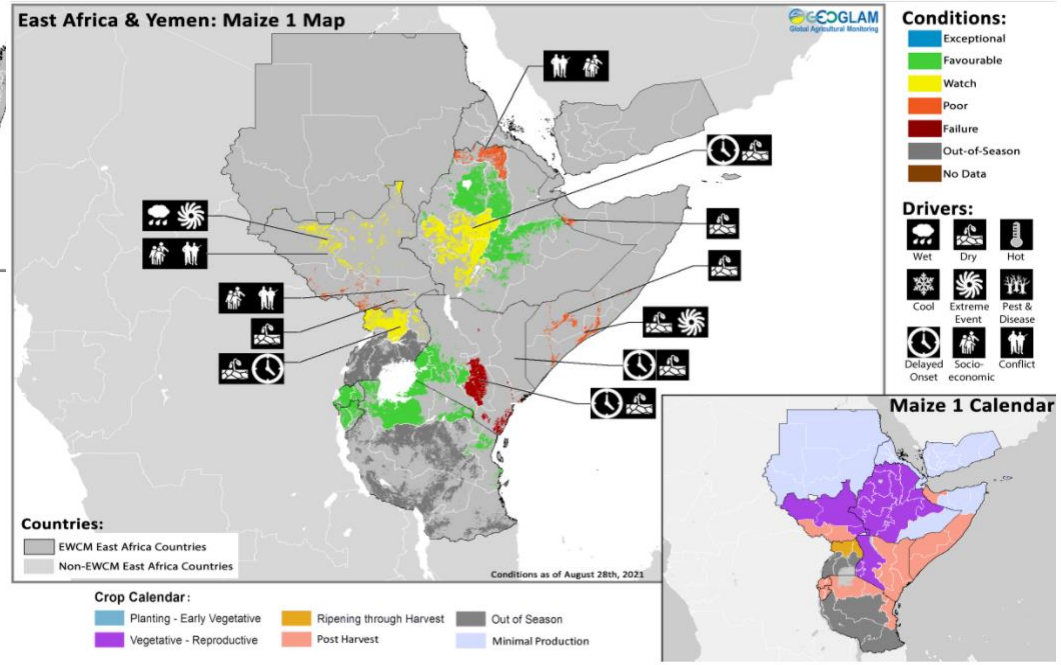
Since 2016, monthly assessment for food security response organizations

Focus on crops important for regional food security

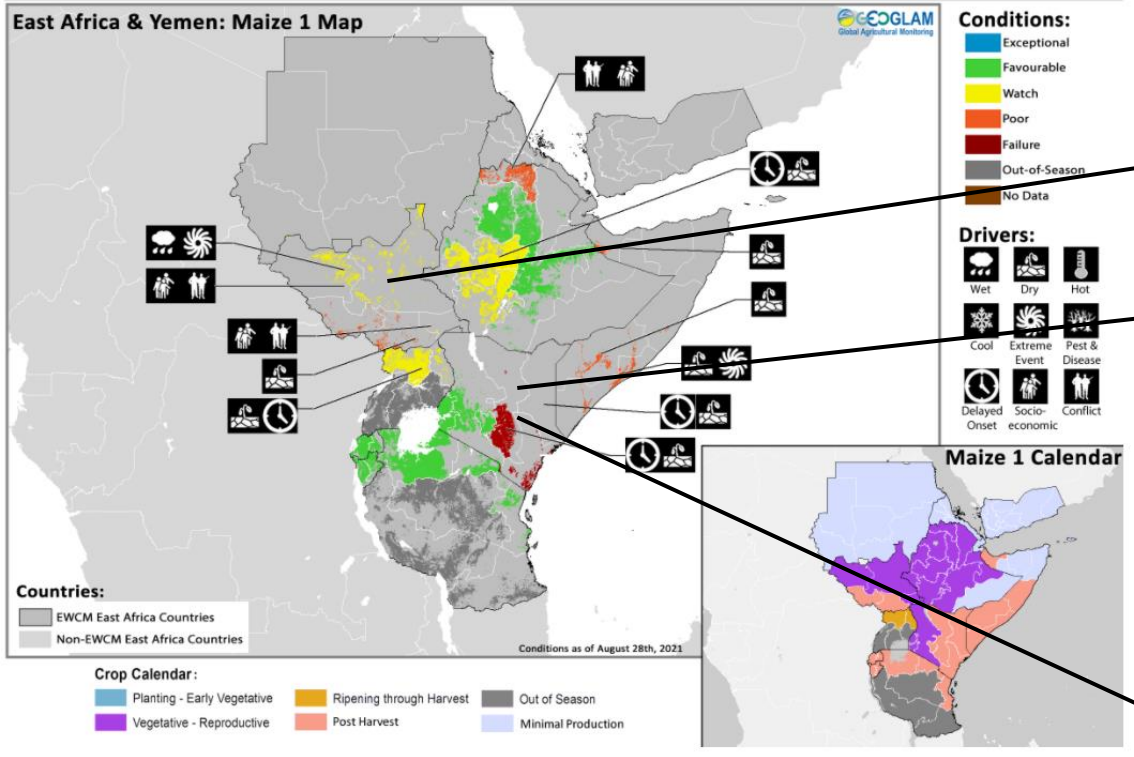
Identifies the primary divers of adverse conditions



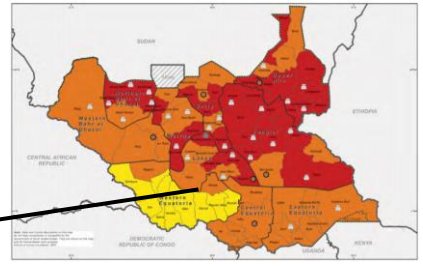
Horn of Africa-Maize



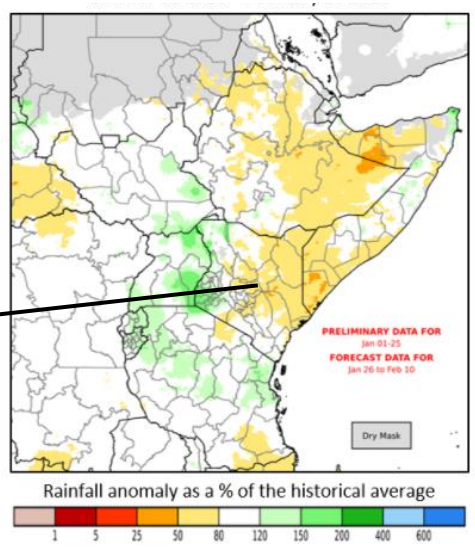
Crop Monitor for Early Warning



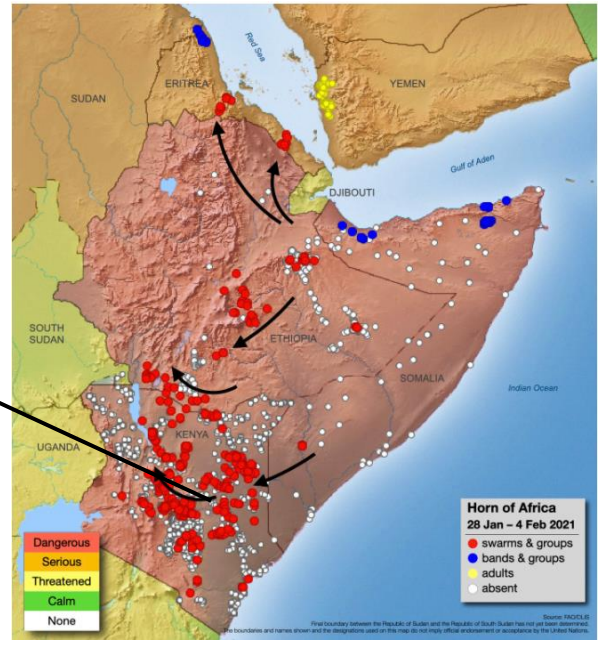
Conflict Report
Acute Food Insecurity



Rainfall Anomaly



Locust Update
Feb 4 2021



Working with partners to enhance the early warning reports

Responding to the Needs of the International Food Security Community

United Nations Office for the Coordination of Humanitarian Affairs

OCHA

Special Reports in Emerging Areas of Concern

Cropmonitor.org

REPORT ARCHIVE

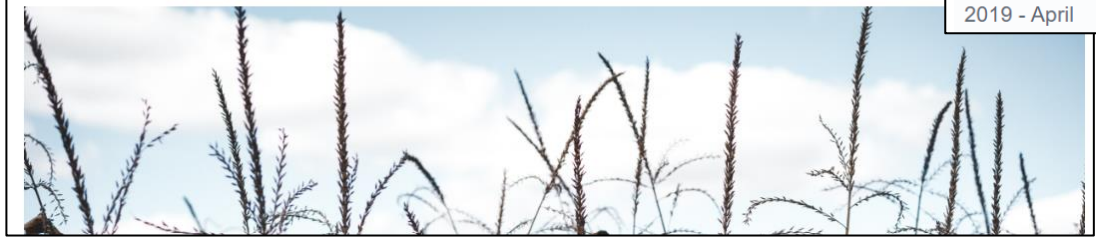
AMIS | Early Warning | Special Reports | Conflict Reports | Climate Forecas

Date	Download Link
2021 - January	Special Report La_Nina
2020 - December	Special Report Central_America
2020 - September	Special Report DPRK_Flooding
2020 - August	Special Report Lake_Chad_Basin
2020 - May	Special Report East_Africa
2020 - April	Special Report South
2020 - February	Special Report Zimba
2020 - January	Special Report South
2019 - November	Special Report South
2019 - October	Special Report Centr
2019 - September	Special Report Kenya
2019 - June	Special Report East_
2019 - April	Special Report South

GEOGLAM and COVID-19: Responding to an emerging food security emergency

Blog / GEOGLAM Secretariat / May 7, 2020

Tweet Share



SPECIAL REPORT

January 25th, 2021

PDF Download link

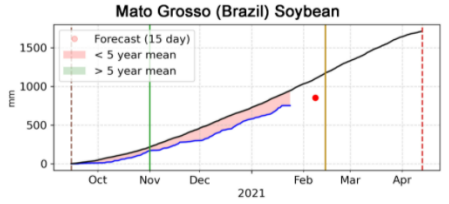
For previous reports visit the Archive.

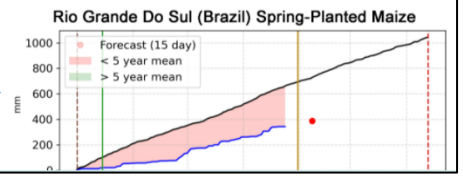
La Niña 2020/2021 Impacts in Argentina & Brazil

Highlights:

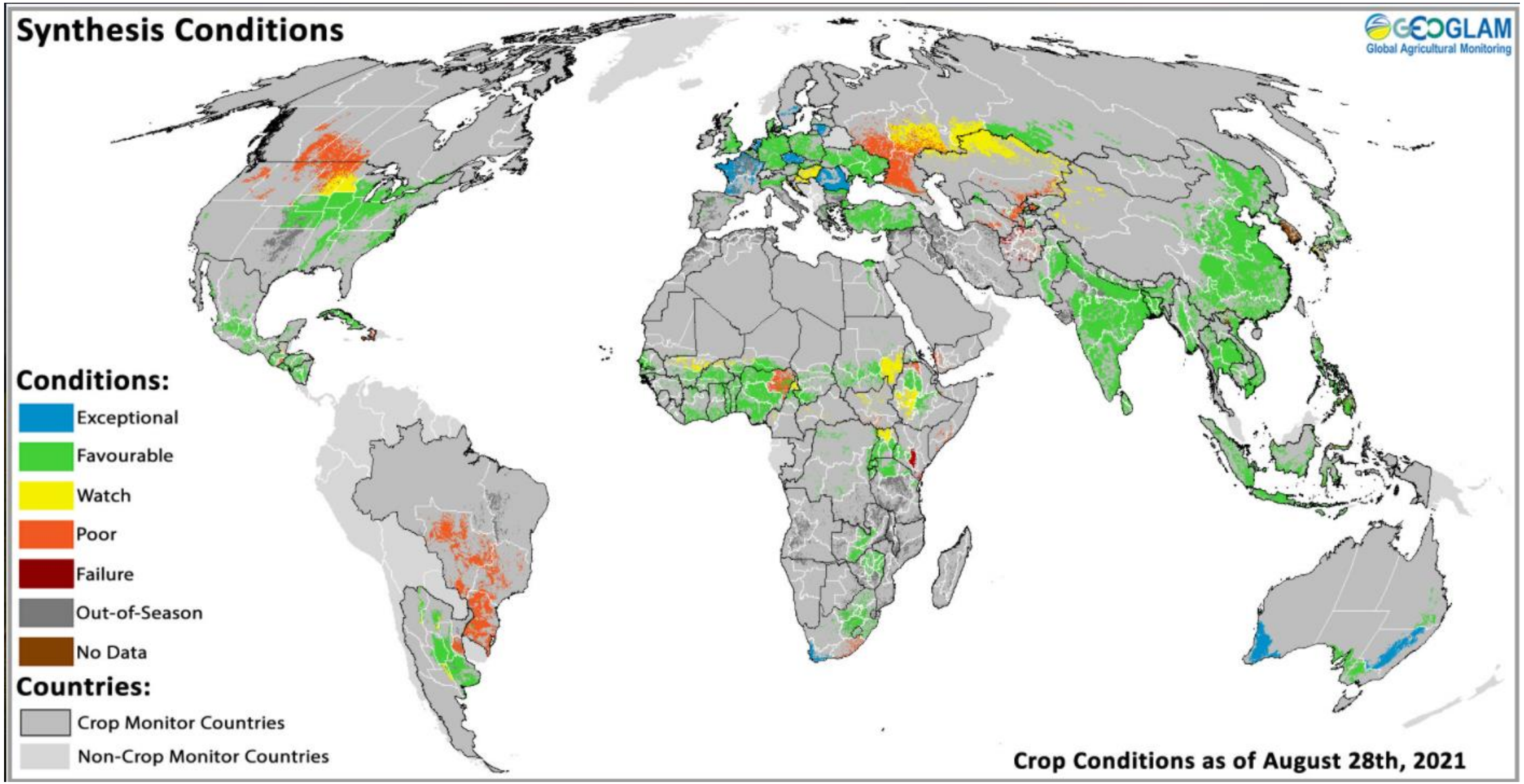
- La Niña conditions began in August-September 2020 and are currently forecast to continue from January to March (~95% chance) and then with a possible transition to neutral conditions from April to June (~55% chance).
- Argentina and Brazil are key producers and exporters of maize and soybean, among other crops, and current conditions are affecting the production prospective.
- Argentina's *early-planted* maize has experienced dry conditions while *late-planted* maize is under generally favourable conditions. *Spring and summer-planted* soybeans have suffered a similar fate to maize; however, they have slightly better yield expectations than maize.

Cumulative Precipitation (vs 5 year mean)





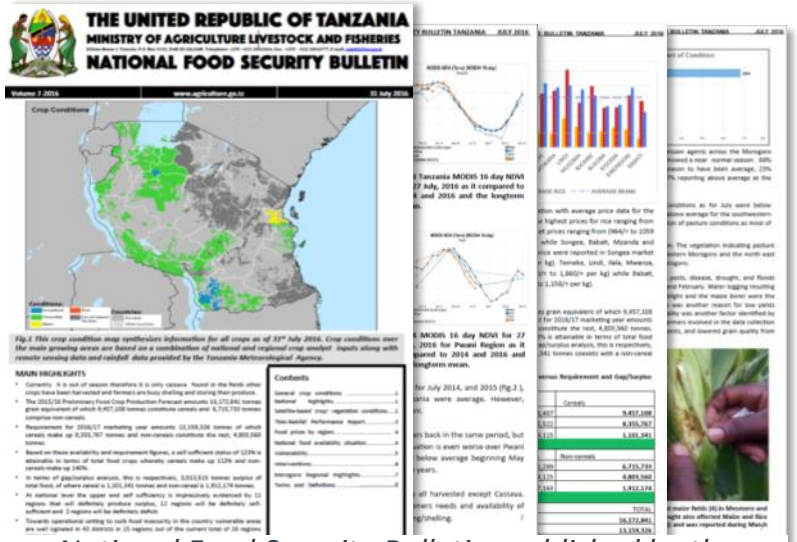
Synthesis – September 2021



Co-Development of National Monitoring Systems

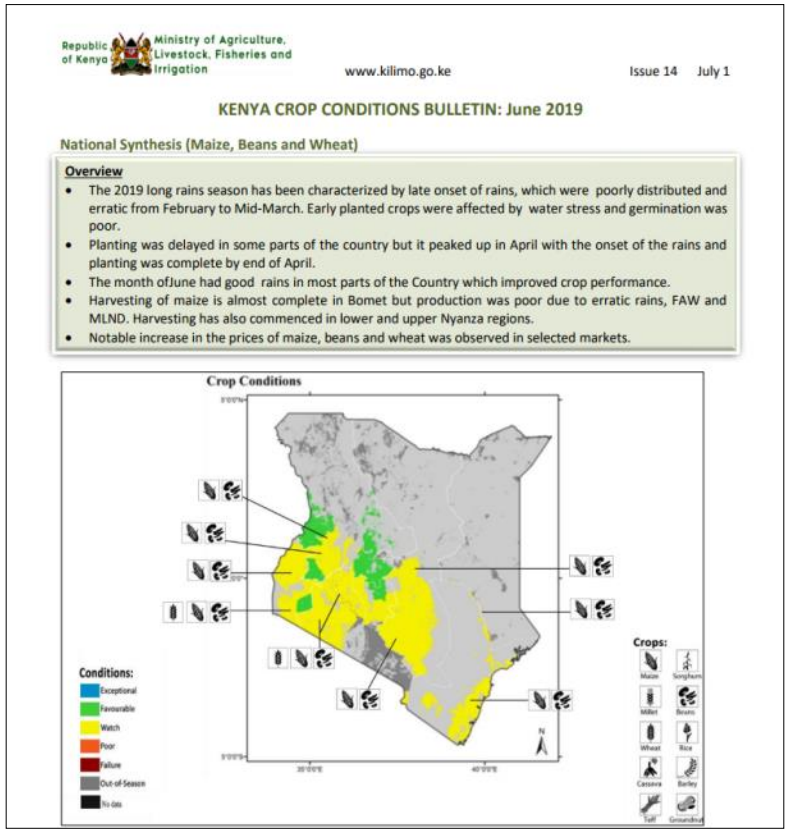
7 Countries, 1 Region

Tanzania


THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF AGRICULTURE LIVESTOCK AND FISHERIES
NATIONAL FOOD SECURITY BULLETIN

National Food Security Bulletin, published by the Tanzania Ministry of Agriculture Food Security, National Food Security Division

Kenya


Republic of Kenya
Ministry of Agriculture, Livestock, Fisheries and Irrigation
www.kilimo.go.ke
Issue 14 July 1

KENYA CROP CONDITIONS BULLETIN: June 2019

National Synthesis (Maize, Beans and Wheat)

Overview

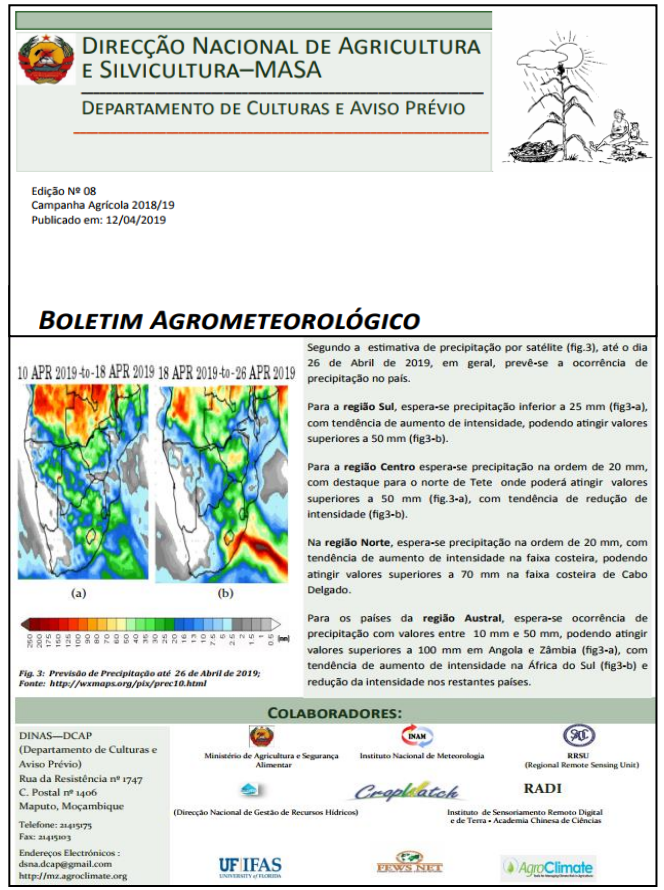
- The 2019 long rains season has been characterized by late onset of rains, which were poorly distributed and erratic from February to Mid-March. Early planted crops were affected by water stress and germination was poor.
- Planting was delayed in some parts of the country but it peaked up in April with the onset of the rains and planting was complete by end of April.
- The month ofJune had good rains in most parts of the Country which improved crop performance.
- Harvesting of maize is almost complete in Bomet but production was poor due to erratic rains, FAW and MLND. Harvesting has also commenced in lower and upper Nyanza regions.
- Notable increase in the prices of maize, beans and wheat was observed in selected markets.

Crop Conditions

Conditions: Exceptional, Favourable, Watch, Poor, Failure, Out-of-Season, No data

Crops: Maize, Sorghum, Millet, Beans, Wheat, Rice, Cassava, Barley, Teff, Groundnut

Mozambique


DIRECÇÃO NACIONAL DE AGRICULTURA E SILVICULTURA–MASA

DEPARTAMENTO DE CULTURAS E AVISO PRÉVIO

Edição Nº 08
Campanha Agrícola 2018/19
Publicado em: 12/04/2019

BOLETIM AGROMETEOROLÓGICO

10 APR 2019-to-18 APR 2019 18 APR 2019-to-26 APR 2019

(a) (b)

Fig. 3: Previsão de Precipitação até 26 de Abril de 2019; Fonte: http://wxmaps.org/pix/prec10.html

Segundo a estimativa de precipitação por satélite (fig.3), até o dia 26 de Abril de 2019, em geral, prevê-se a ocorrência de precipitação no país.

Para a **região Sul**, espera-se precipitação inferior a 25 mm (fig3-a), com tendência de aumento de intensidade, podendo atingir valores superiores a 50 mm (fig3-b).

Para a **região Centro** espera-se precipitação na ordem de 20 mm, com destaque para o norte de Tete onde poderá atingir valores superiores a 50 mm (fig.3-a), com tendência de redução de intensidade (fig3-b).

Na **região Norte**, espera-se precipitação na ordem de 20 mm, com tendência de aumento de intensidade na faixa costeira, podendo atingir valores superiores a 70 mm na faixa costeira de Cabo Delgado.

Para os países da **região Austral**, espera-se ocorrência de precipitação com valores entre 10 mm e 50 mm, podendo atingir valores superiores a 100 mm em Angola e Zâmbia (fig3-a), com tendência de aumento de intensidade na África do Sul (fig3-b) e redução da intensidade nos restantes países.

COLABORADORES:

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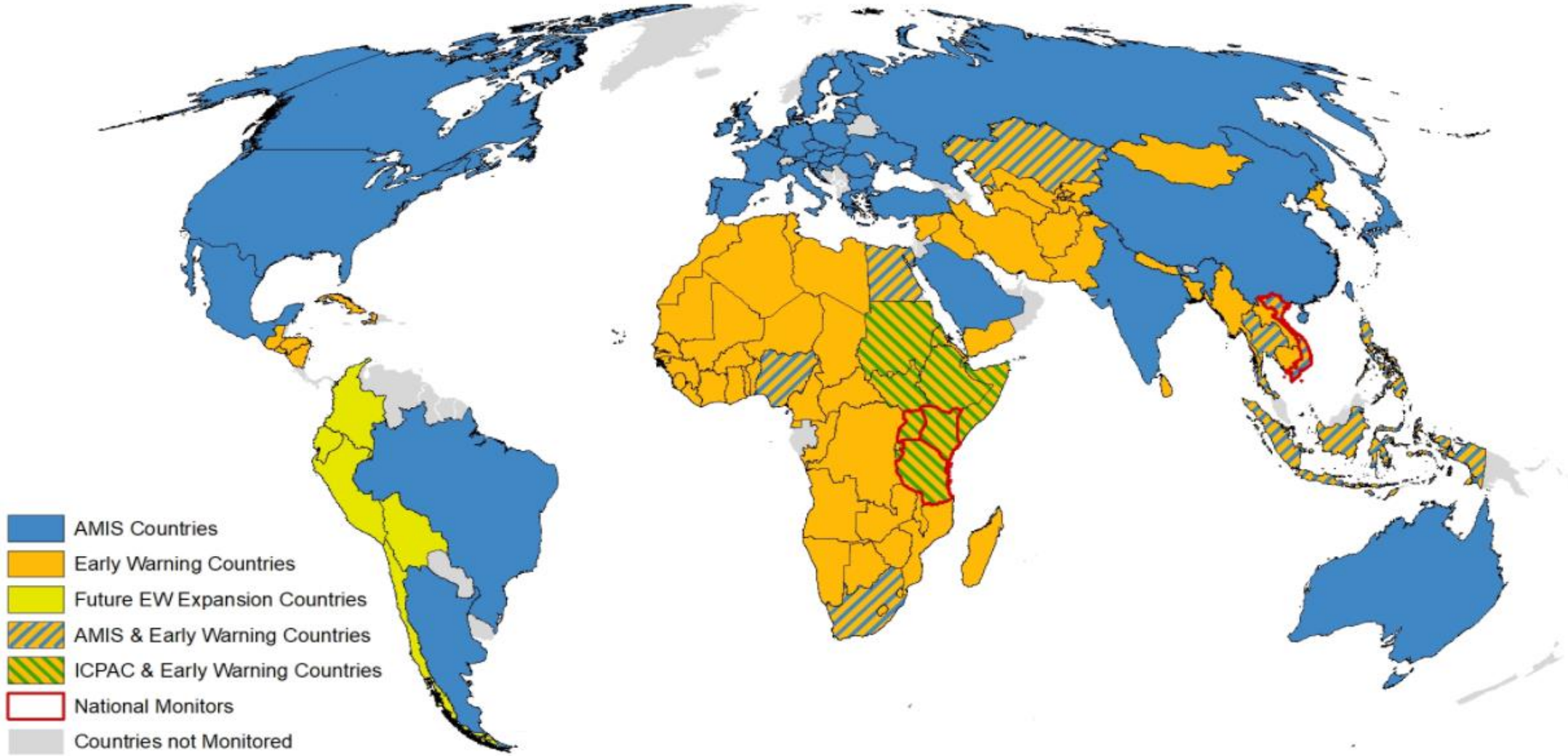
http://mz.agroclimate.org

Ministério de Agricultura e Segurança Alimentar
Instituto Nacional de Meteorologia
RRSU (Regional Remote Sensing Unit)
(Direcção Nacional de Gestão de Recursos Hídricos)
Cropwatch
RADI
Instituto de Sensoriamento Remoto Digital e de Terra • Academia Chinesa de Ciências
UF IFAS
FEWS NET
AgroClimate

Current State of Crop Monitoring



GEOGLAM

National Impact Examples

GEOGLAM
Global Agricultural Monitoring

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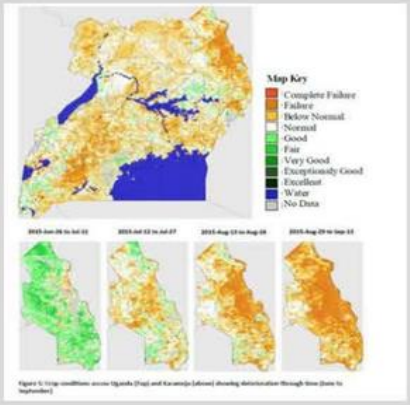
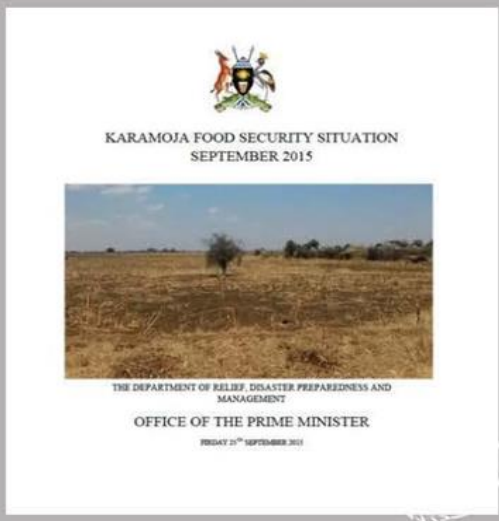
Uganda 2015: Early Warning Saves Lives

EO SUPPORTED IMMEDIATE DECISION AND ACTION

- Food security report presented to Inter-Ministerial Committee September 25, 2015
- First trucks of relief food dispatched September 26, 2015

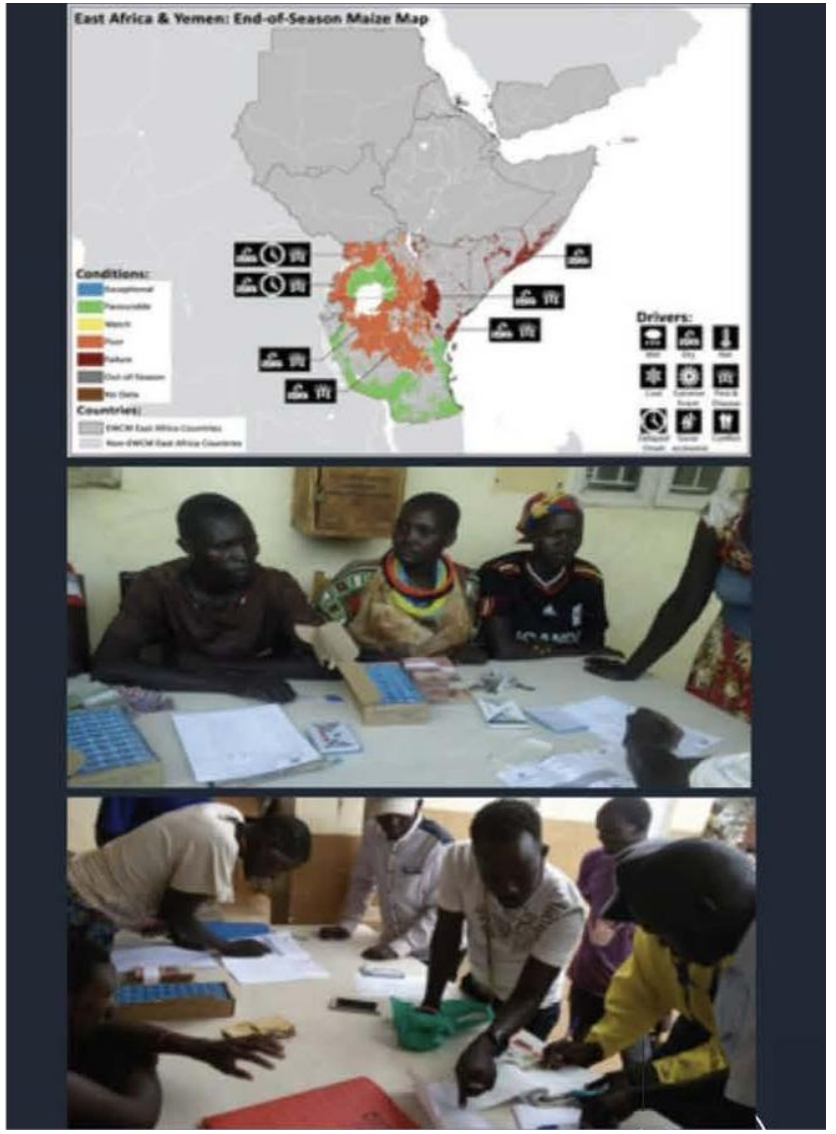




Disaster Risk Reduction

Uganda 2016/17

> *"In the past we always reacted to crop failure, spending billions of shillings to provide food aid in the region. 2017 was the* ***first time we acted proactively because we had clear evidence from satellite data very early in the season"***
>
> Martin Owor, Commissioner Office of the Prime Minister (OPM)

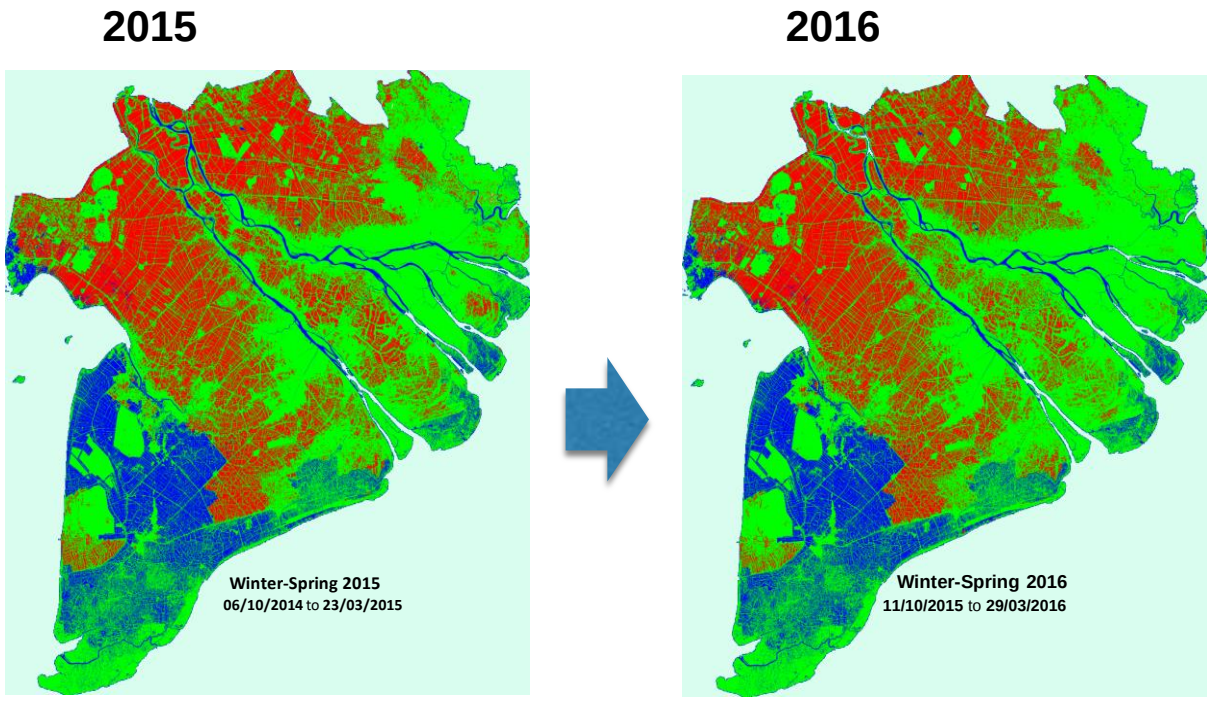


- Earth Observations provided warning 3 months sooner than previous years
- The government was able to quickly implement programs to address the climate emergency and reduce suffering
- Proactive action reduced cost by 51% (2016-17 budget)
- Led to operationalization of crop monitor in national early warning system

Regional Impact Stories, Rice Monitoring – Mekong Basin

From Research to Operations: Rice Monitoring in Mekong River basin

- 2016 was an El Niño and the result was severe drought in the Mekong Basin that resulted in salt water intrusion
- Research was able to identify a decrease in rice harvested as compared to the previous years
- AsiaRice are now working to operationalize rice monitoring, this is an input into both the GEOGLAM Crop Monitors

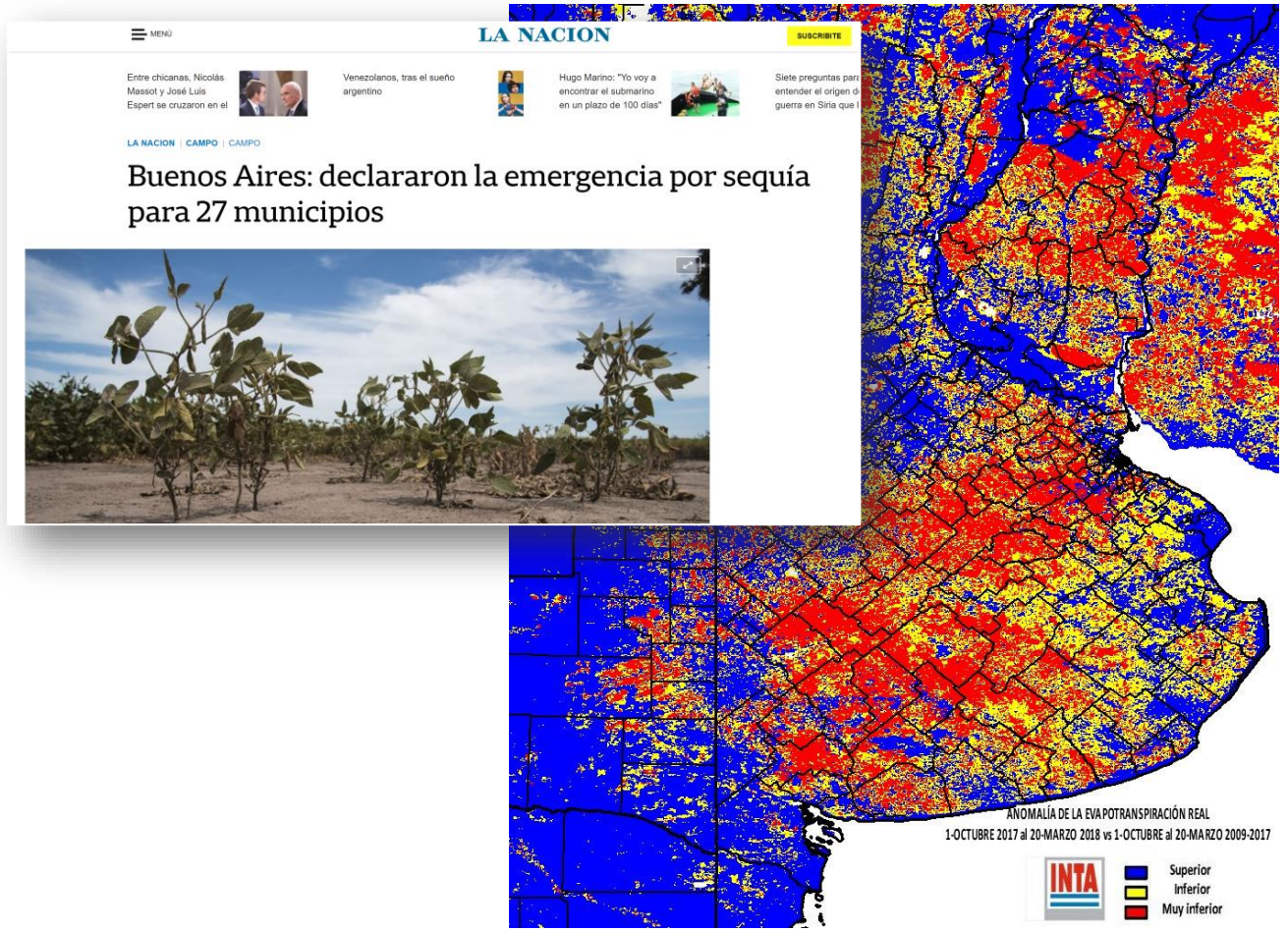


By March 2016 GEORICE detected a 276,000 ha (16.7%) decrease in rice production caused by shortage of water and saline intrusion

National Impact Stories, Major Producer - Argentina

Argentina Drought 2017-2018

- Argentina suffered one of the **worst droughts** in its history in 2018
- Agriculture Ministry needed **objective scientific evidence** of drought to enact policy
- Working with INTA (GEOGLAM national partner) the government was able to declare an "**agricultural emergency**" with great spatial precision, **triggering financial safety net programs**



Togo 2020

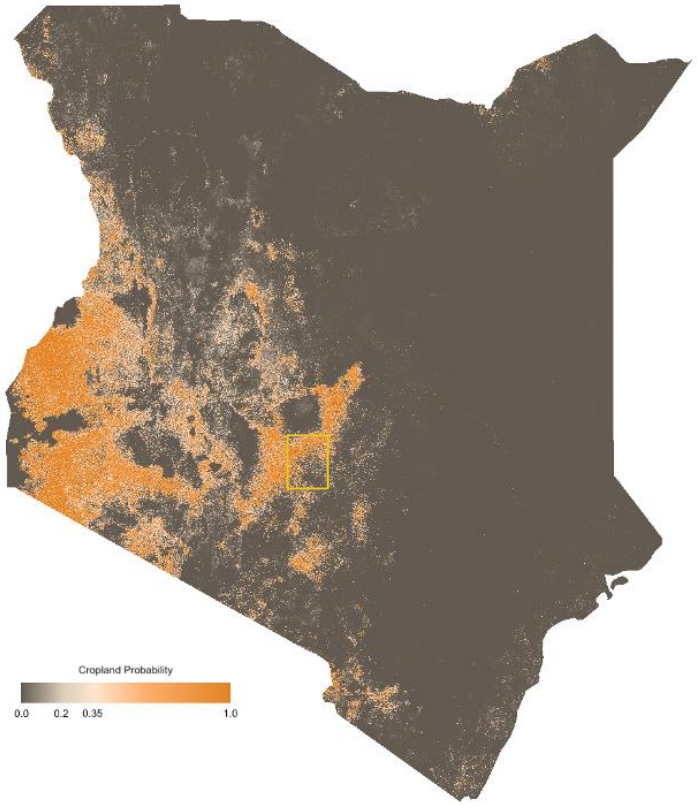
Cina Lawson
Togolese Minister of Post, Digital Economy and Technological Innovation

"This map provides unmatched clarity into the nature and distribution of agricultural land nationwide [and helps] **provide decisive knowledge being used to design social protection policies** aimed at improving the livelihoods of agrarian rural communities."

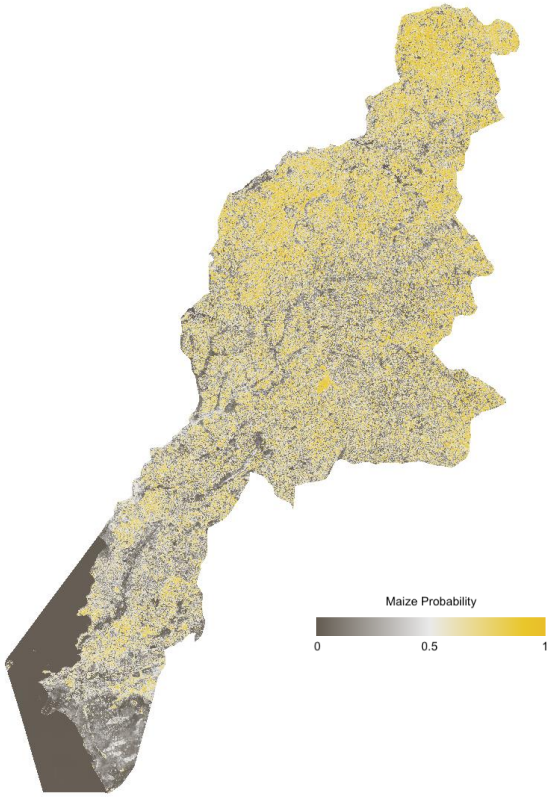
Kenya

Adapting to a Changing Climate:

National Food Security monitoring



Kenya cropland map (2019)



Maize map of Busia county, Kenya (2019)

Best practice and guidance

Understanding the current state and changes to agriculture

Capacity building to empower stakeholders to perform analyses

Seasonal to Decadal Cropland Maps

National Adaptation Plans

Working within the UNFCCC NAP process to develop guidance on EO for agriculture Monitoring

- Develop knowledge packages that provide countries easy access and run tools
- Centralized approach to scaling up co-development to less developed countries
- Multiple knowledge packages proposed to address crop condition and agricultural land use and management (Essential Varaibles)

SUPPLEMENTARY MATERIALS TO THE NAP TECHNICAL GUIDELINES

The supplementary materials are intended to offer in-depth coverage of selected steps of the process to formulate and implement national adaptation plans (NAPs).

UNFCCC
NAP Central

Moving Forward to Address Evolving Policy Challenges

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

UN World Conference on Disaster Risk Reduction
2015 Sendai Japan

Essential Agriculture Variables (EAV's) for GEOGLAM

GEOGLAM
Global Agricultural Monitoring

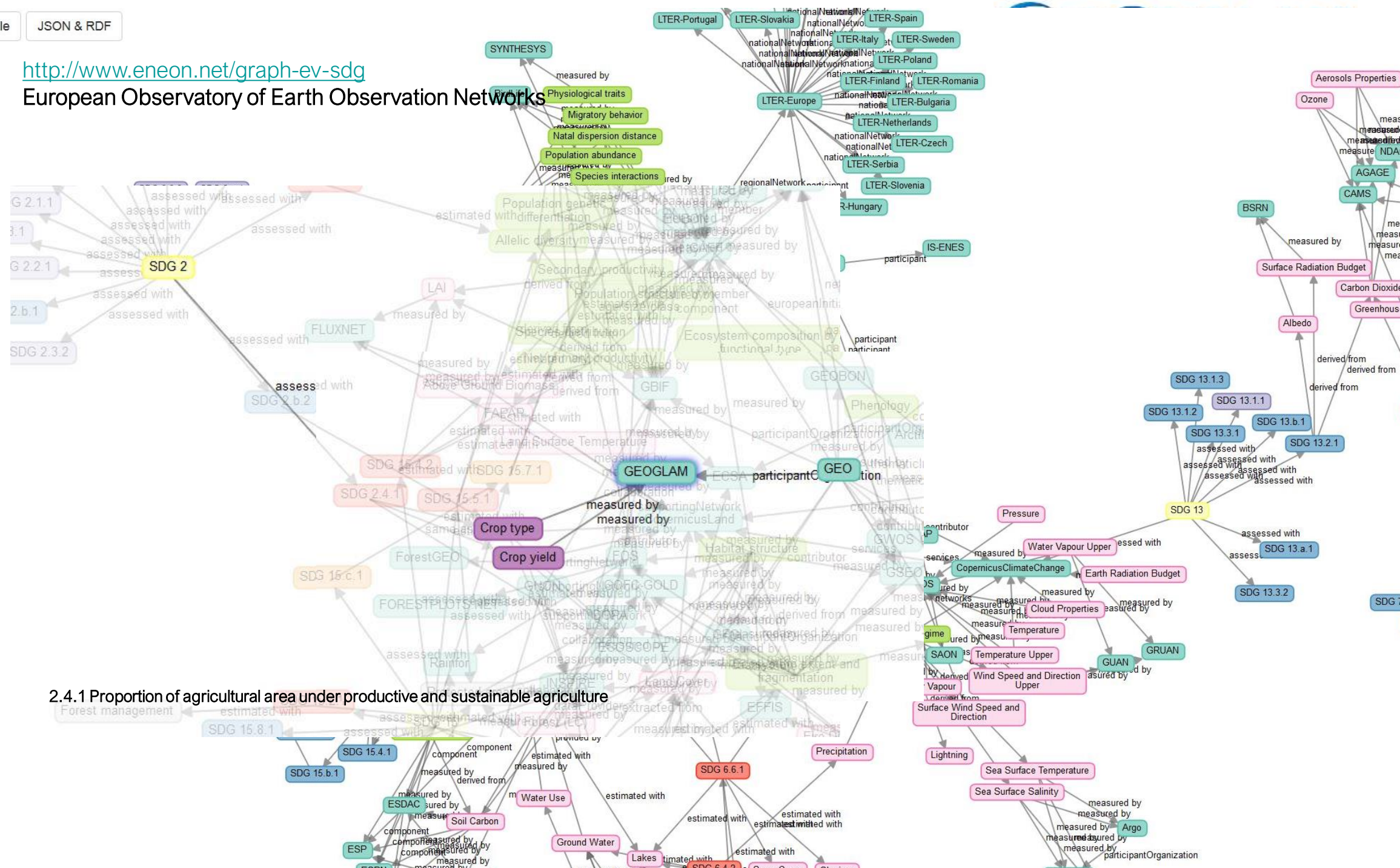
@G20_GEOGLAM
www.geoglam.org

Complete list | Table | JSON & RDF

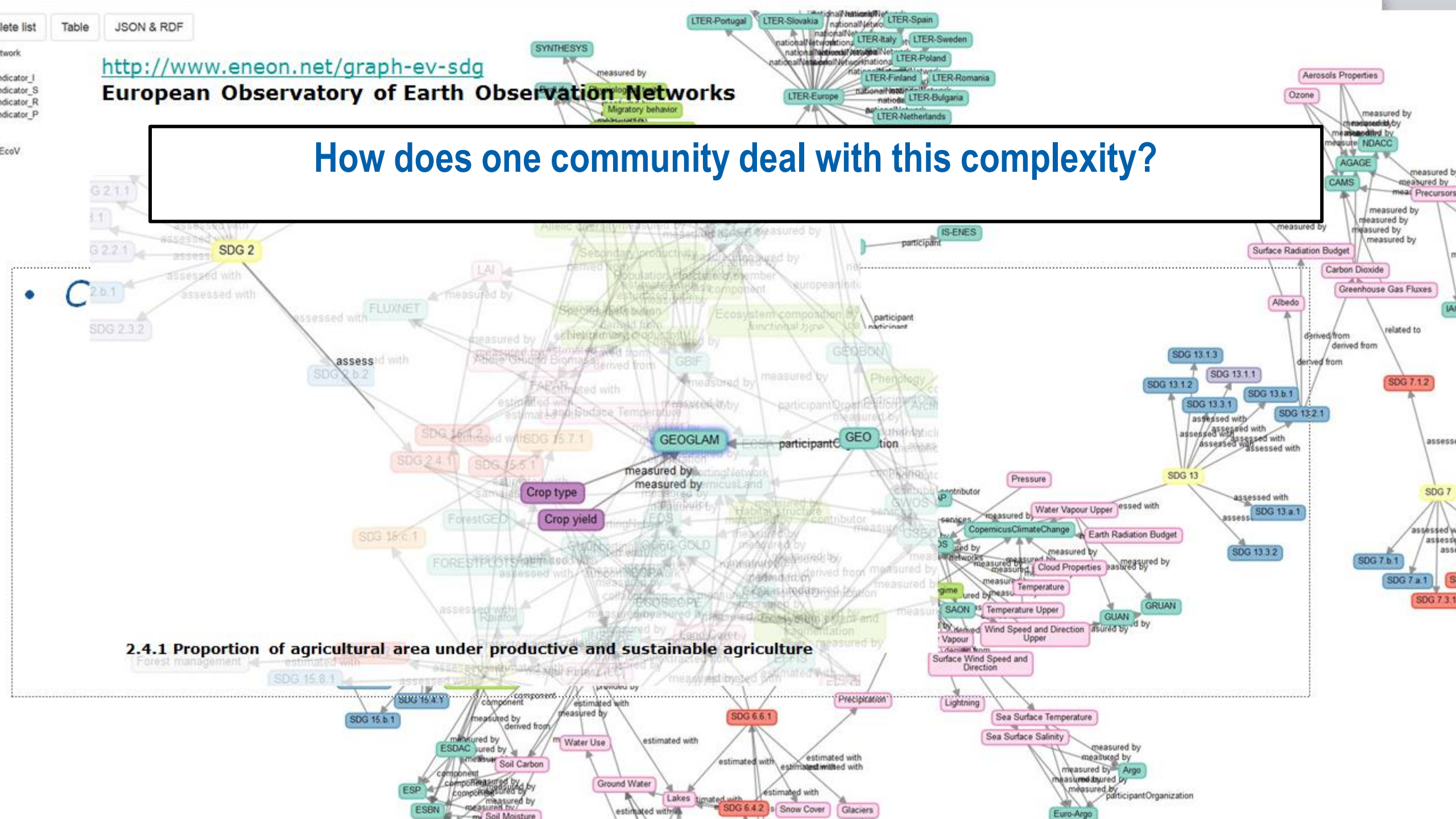
- EONetwork
- SDG
- SDGIndicator_I
- SDGIndicator_S
- SDGIndicator_R
- SDGIndicator_P
- EBV
- ECV
- SocioEcoV
- EAV

http://www.eneon.net/graph-ev-sdg

European Observatory of Earth Observation Networks



2.4.1 Proportion of agricultural area under productive and sustainable agriculture


lete list
Table
JSON & RDF
http://www.eneon.net/graph-ev-sdg
European Observatory of Earth Observation Networks
How does one community deal with this complexity?
SDG 2
assess
GEOGLAM
GEO
Crop type
Crop yield
measured by
measured by
2.4.1 Proportion of agricultural area under productive and sustainable agriculture
SYNTHESYS
LTER-Portugal
LTER-Slovakia
LTER-Spain
LTER-Italy
LTER-Sweden
LTER-Poland
LTER-Finland
LTER-Romania
LTER-Europe
LTER-Bulgaria
LTER-Netherlands
Migratory behavior
IS-ENES
participant
Aerosols Properties
Ozone
NDACC
AGAGE
CAMS
Precursors
Surface Radiation Budget
Carbon Dioxide
Greenhouse Gas Fluxes
Albedo
derived from
related to
SDG 13.1.3
SDG 13.1.2
SDG 13.1.1
SDG 13.b.1
SDG 13.3.1
SDG 13.2.1
SDG 13
SDG 13.a.1
SDG 13.3.2
SDG 7.1.2
SDG 7
SDG 7.b.1
SDG 7.a.1
SDG 7.3.1
Pressure
Water Vapour Upper
CopernicusClimateChange
Earth Radiation Budget
Cloud Properties
Temperature
Temperature Upper
Wind Speed and Direction Upper
SAON
GRUAN
GUAN
Surface Wind Speed and Direction
Lightning
Sea Surface Temperature
Sea Surface Salinity
Argo
Euro-Argo
participantOrganization
Precipitation
SDG 6.6.1
Water Use
Ground Water
Lakes
SDG 6.4.2
Snow Cover
Glaciers
ESDAC
Soil Carbon
ESP
ESBN
Soil Moisture
SDG 15.4.1
SDG 15.b.1
FLUXNET
LAI
GBIF
GEOBON
Phenology
ForestGEO
FOS
SDG 15.c.1
SDG 15.8.1
Forest management
SDG 15.7.1
SDG 15.5.1
SDG 2.4.1
SDG 2.b.2
SDG 2.1.1
SDG 2.2.1
SDG 2.b.1
SDG 2.3.2

Dealing with a Complex Policy Landscape

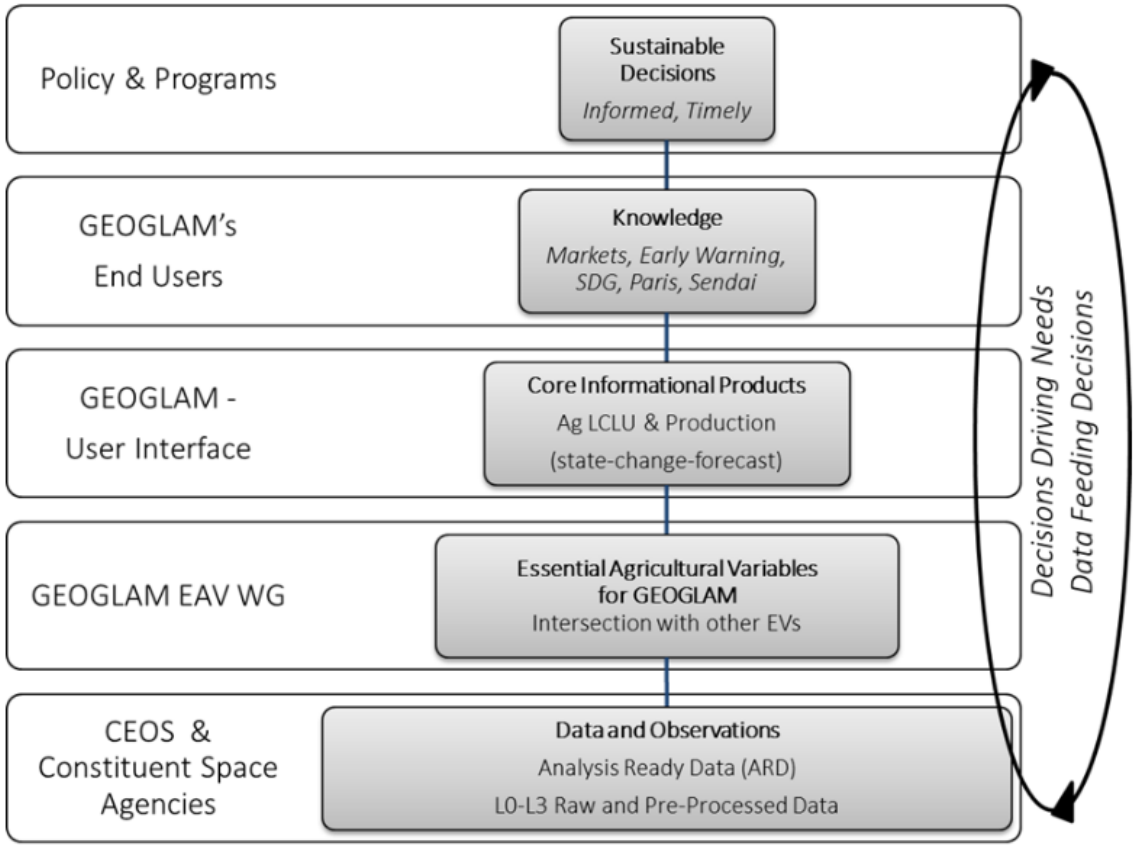
- Information produced by the GEOGLAM community can support a multitude of policy targets
- Almost all targets and goals require information integrated across multiple science communities
- Need for a common approach across communities to enable integration and information sharing

Development of Essential Agricultural Variables (EAV's)

The Concept

- Essential Variables (EV's) suggests a minimum set of fundamental variables required to characterize the state and changes in a system

- EAV's are at a minimum a useful **communication device**, at best it allows us to **reduce complexity** when faced with multiple needs



Moving Forward
Essential Agricultural Variables

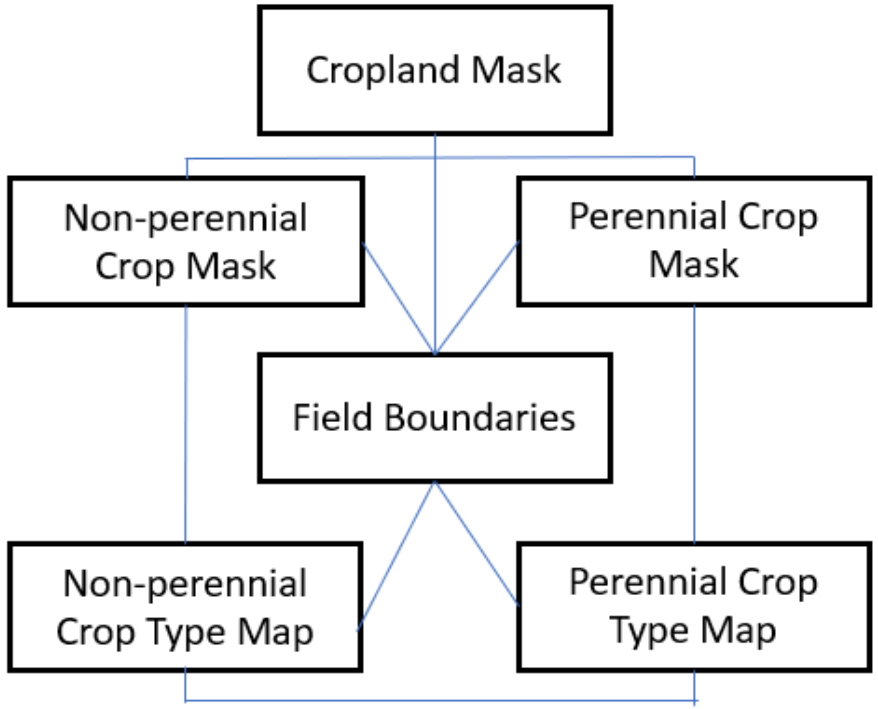
GROUP ON EARTH OBSERVATIONS

GEO Knowledge Hub

GEOGLAM Global Agricultural Monitoring

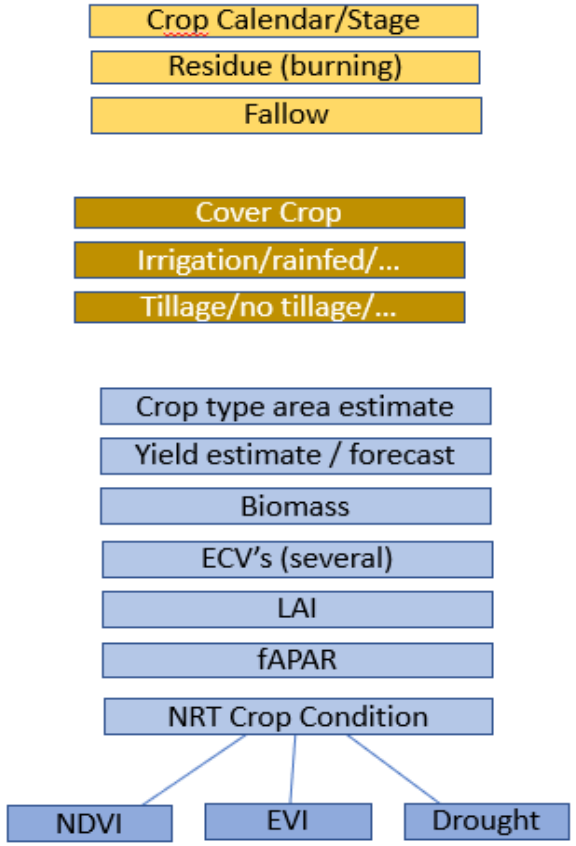
Revised V3.1 11 January 2021

Hierarchy of Crop Map Units With Essential Variables



Essential Variables

- Crop Management Attributes
- Field Management Attributes
- Production Attributes
- Crop Condition Indicators

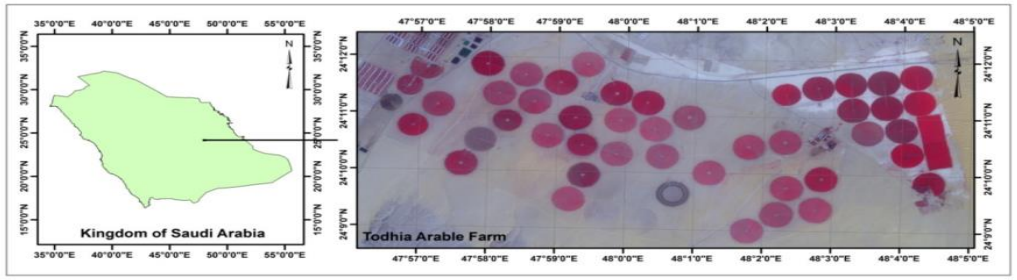


RESEARCH & DEVLOPMENT:

Joint Experiments for Crop Assessment and Monitoring (JECAM). Research for Operational Implementation.

JECAM Principles

- **R&D focused on operational outcomes**
- **Collect and share** time-series datasets
- Develop **common standards** in definition, reporting methods and field protocols.
- The ultimate objective to provide a suite of **best practices and tools** to the GEOGLAM community for the implementation of operational systems



JECAM
Joint Experiment for Crop Assessment and Monitoring

GROUP ON EARTH OBSERVATIONS

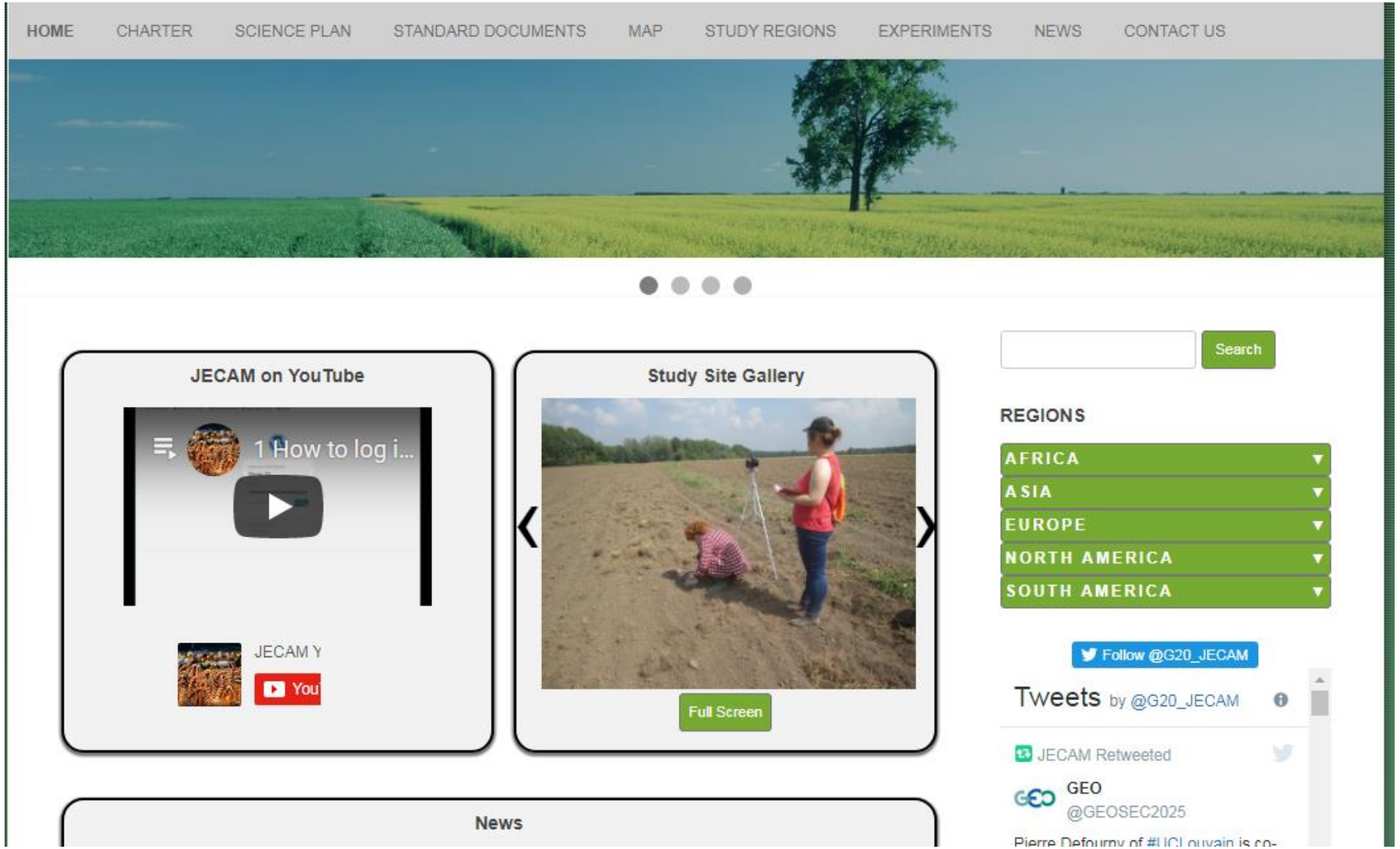
Global network of voluntary research sites

GEOGLAM
Global Agricultural Monitoring

JECAM
Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON EARTH OBSERVATIONS

JECAM.ORG



GEOGLAM
Global Agricultural Monitoring

@G20_GEOGLAM
www.geoglam.org

JECAM
Joint Experiment for Crop Assessment and Monitoring

Achievements and activities of joint experiments

Completed experiments

- → Large field cropland mapping experiment
- → Crop type mapping experiment
- → Crowd/expert sourcing experiment for cropland validation
- → Calibration dataset experiment
- → SAR experiments

Ongoing experiments and activities

- → Experiment on the comparison of different training data sources for cropland mapping
- → Smallholder cropping system experiment
- → Crop type and biomass mapping based optical and SAR synergy

!! NEW !!

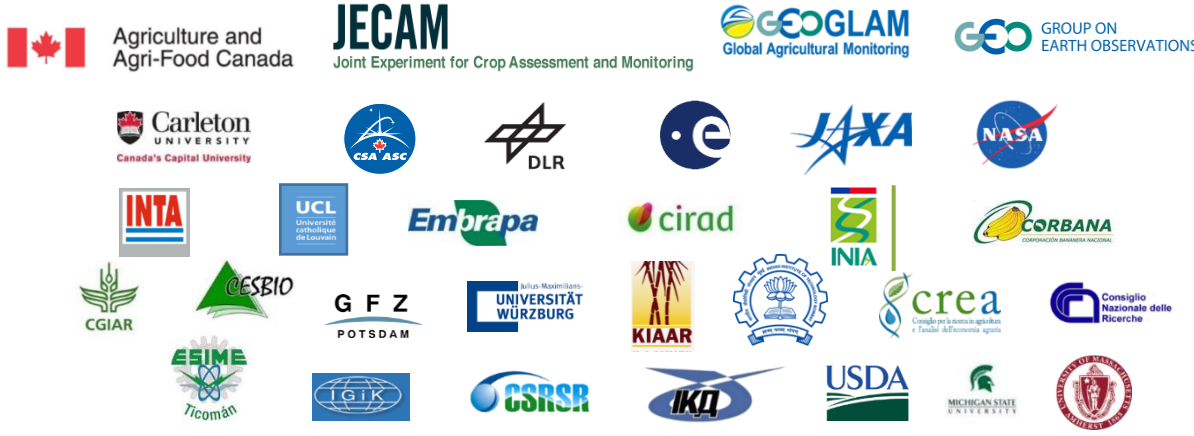
- → Website updates and Annual Reporting for 2021
- → Best practices documentation
- → New publications
- → Planning for 2022

JECAM
Joint Experiment for Crop Assessment and Monitoring

SAR Cross-Sites Intercomparison

Highlights

- Week long SAR Seminar
- University Course
- Approx. 20+ peer reviewed papers
- Monthly Newsletters
- Experiment Section in JECAM.org



Collaboration represents 25 sites spread over 16 countries, involving >20 national organizations.

Join the Network!

- Site researchers interested in collaboration
- Contact Ian (ijarvis@geosec.org)

	Optical Only	Kitchen Sink*	Optical & SAR Optimized	Optical & SAR R2 Only	Optical & SAR S1 Only	SAR Only
Argentina	84.4	84.4	84.7	85.0	84.5	94.8
Canada-Carman	86.7	88.4	87.5	87.8	87.7	87.9
Canada-Casselman	87.4	92.3	92.0	91.5	91.0	90.4
France	97.5	98.3			98.1	91.0
Germany	81.5	85.2			84.0	83.1
India	92.5	93.9		93.2		97.0
USA-Georgia	83.0	88.5	86.1	85.8	85.5	85.8
USA-Iowa	96.7	97.3	96.9	97.1	96.8	96.2
USA-Michigan	87.5	88.4	88.1	88.4	88.0	78.2
USA-North Dakota	86.0	83.4			87.0	81.0

GEOGLAM
Global Agricultural Monitoring
Open Science for Food Security

October 8, 2021

Ian Jarvis, GEOGLAM Director

GLOBAL AGRICULTURAL MONITORING

ijarvis@geosec.org

Thank You!