

Satellite based drought monitoring and early warning

Examples of EO data and applications

Flemish Institute for Technological Research (VITO)

Roel Van Hoolst, Bart Deronde



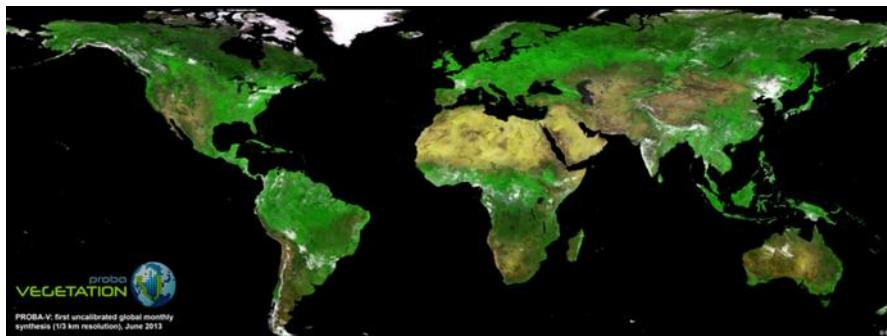
VITO - Remote Sensing Unit

SENSOR/MISSION DESIGN
IMAGE PROCESSING

REMOTELY PILOTED AIRCRAFT SYSTEMS
IMAGE QUALITY
TRAINING & CONSULTANCY
GLOBAL & LOCAL APPLICATIONS



WATER
CAL/VAL
AGRICULTURE
BIODIVERSITY

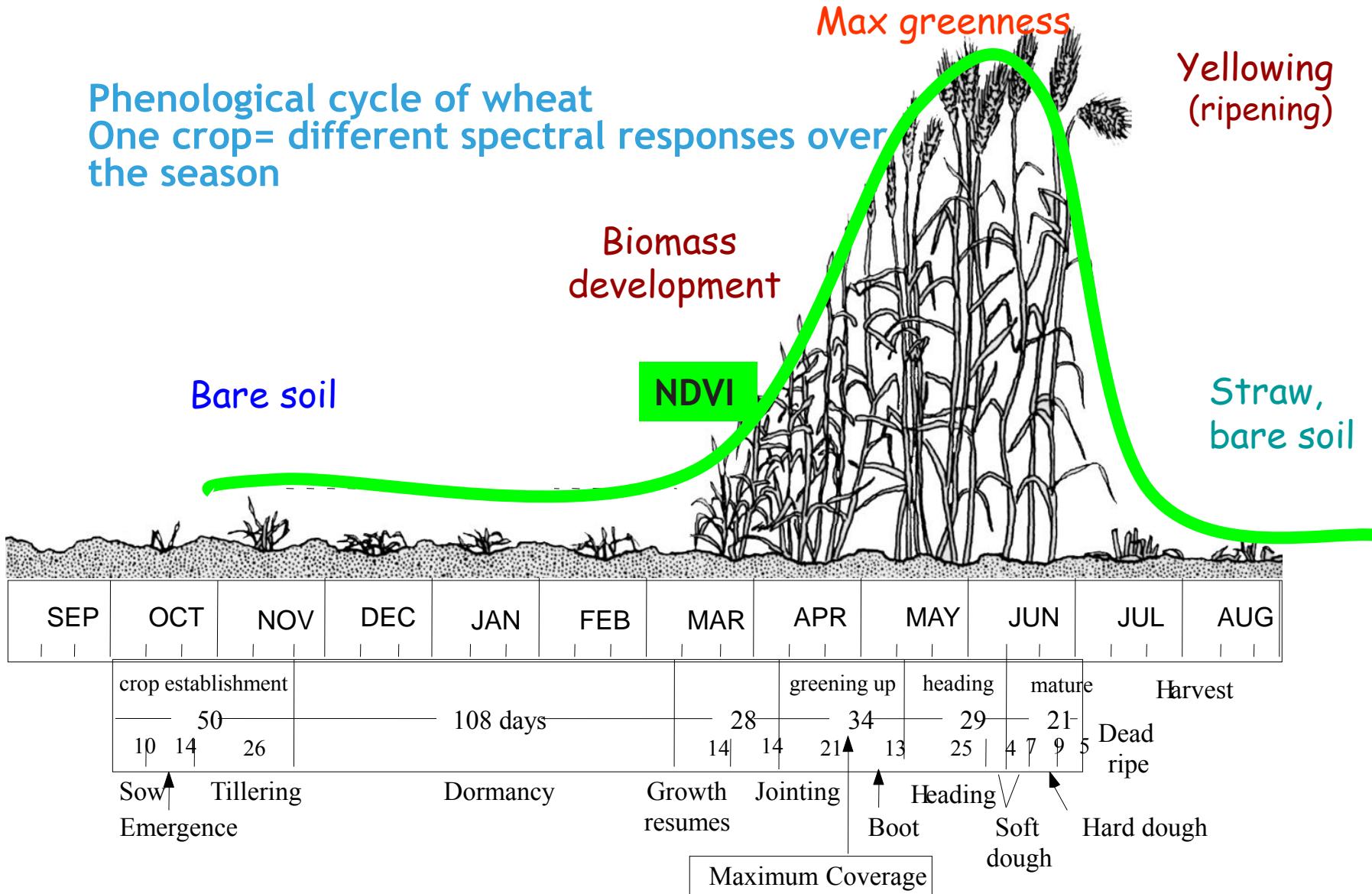


land.copernicus.eu

vito-eodata.be

Free of charge

Vegetation monitoring - Time Series Analysis



Examples of existing EO datasets

Freely available at VITO and Copernicus Global Land Service(historical & in near real time)

The screenshot shows a grid of six service cards. Each card features a thumbnail image of a satellite in space, followed by the service name, a small 'Collections' link, and a 'More' link icon. The services are: PROBA-V 1 KM SYNTHESSES NEAR REAL-TIME, PROBA-V SEGMENTS, PROBA-V 300 M SYNTHESSES (OLDER THAN 1 MONTH), PROBA-V 100 M SYNTHESSES (OLDER THAN 1 MONTH), SPOT-VEGETATION, METOP-A/HHR S10 SYNTHESSES, and ENVISAT-MERIS S10 SYNTHESSES. The PROBA-V cards also include a 'VEGETATION' logo.

About | Contact us

Copernicus Global Land Service

Providing bio-geophysical products of global land surface



Home Products News Product Access

Overview

> **Vegetation**

- Burnt Area
- Dry Matter Productivity
- Fraction of Absorbed Photosynthetically Active Radiation
- Fraction of green Vegetation Cover
- Leaf Area Index
- Normalized Difference Vegetation Index
- Vegetation Condition Index
- Vegetation Productivity Index

> **Energy**

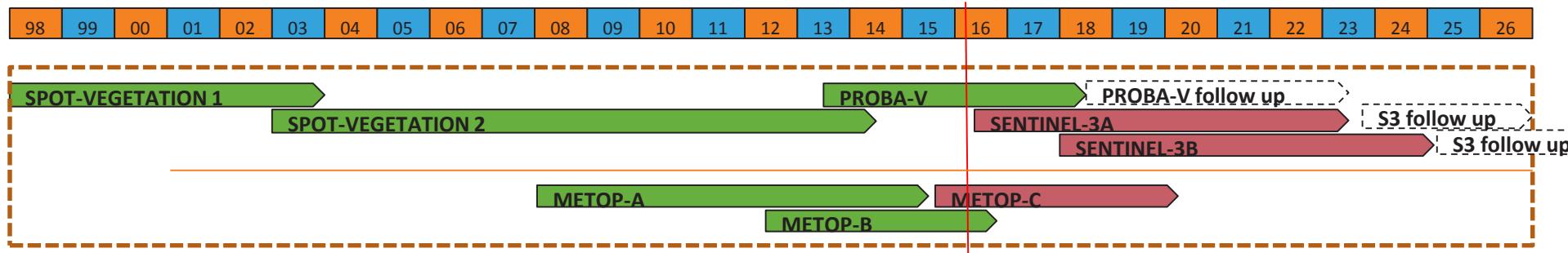
- Land Surface Temperature
- Surface Albedo
- Top Of Canopy Reflectances

> **Water**

- Soil Water Index
- Water Bodies

User support corner

- Leaflet
- Contact us
- FAQ



Proba-V (100m)/300m/1km products → NDVI, fAPAR, Dry Matter Productivity,...
METOP-AVHRR 1km → NDVI

Global Vegetation Monitoring Systems

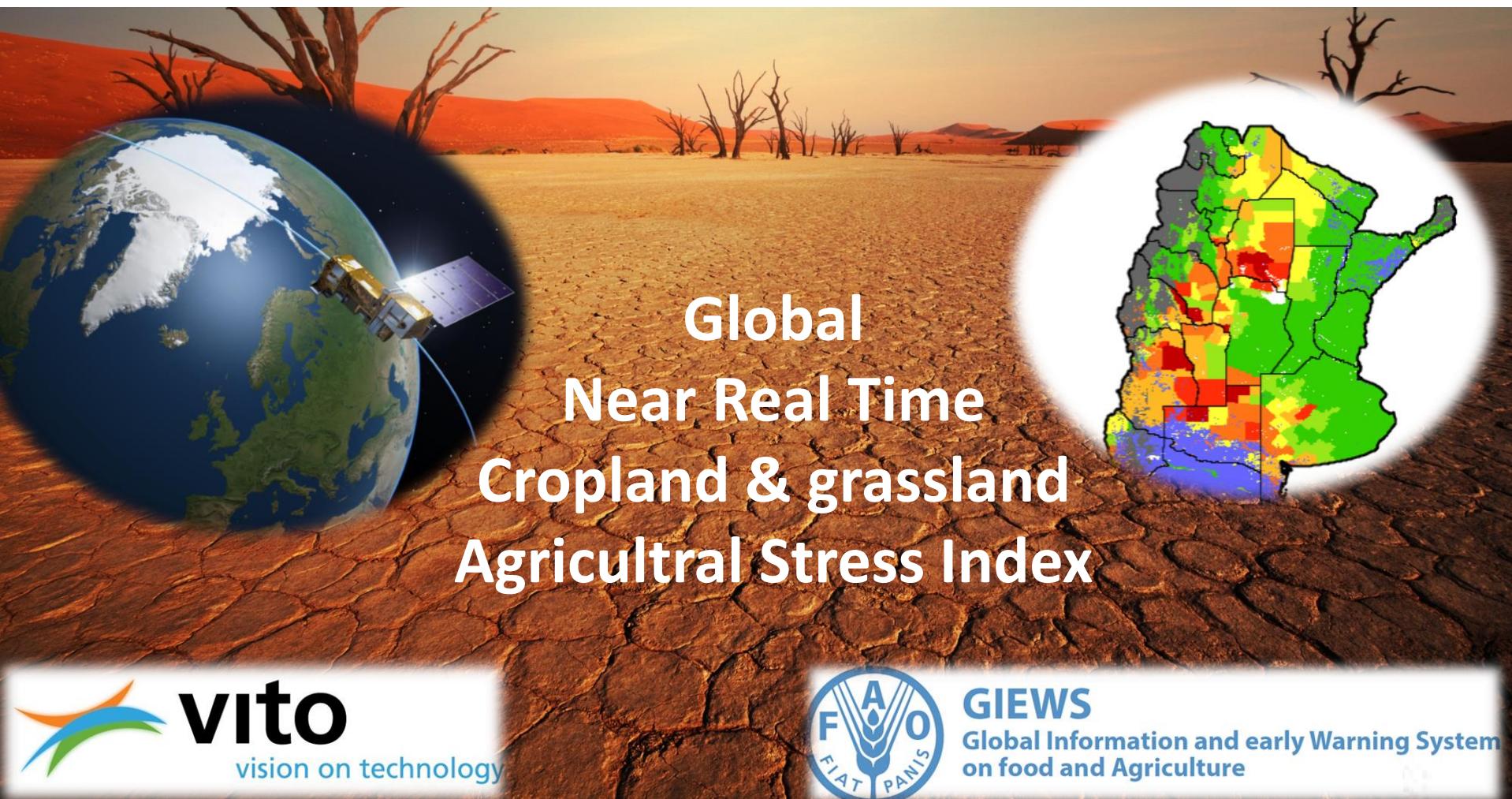
Two examples:

Agricultural Stress Index System (ASIS) based on METOP-AVHRR
Proba-V Mission Exploitation Platform - Time Series Viewer



Example 1

MONITORING AGRICULTURE DROUGHT WITH REMOTE SENSING DATA



Example 1

Earth Observation



Seas

ers

Reference

The country level maps and graphs depict the latest 36-month period of the seasonal, vegetation and precipitation indicators. The data is presented by dekad and month [More](#)

Brazil

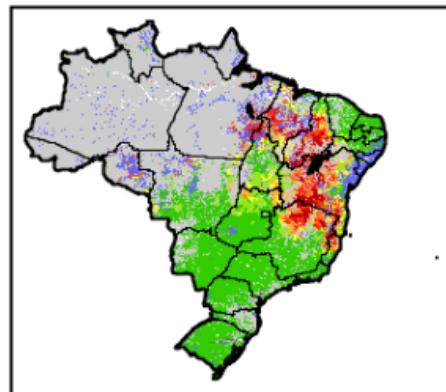
Another country:

[Seasonal Indicators](#) [Vegetation Indicators](#) [Precipitation Indicators](#) [Graphs \(GAUL level 1\)](#)[ASI-Season 1](#) [ASI-Season 2](#) [Mean-VHI-Season 1](#) [Mean-VHI-Season 2](#) [ASI-Annual Summary-Season 1](#) [ASI-Annual Summary-Season 2](#)[Agricultural Stress Index](#) [More](#)

Legend

First Dekad

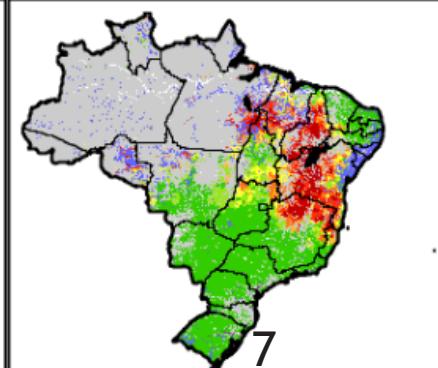
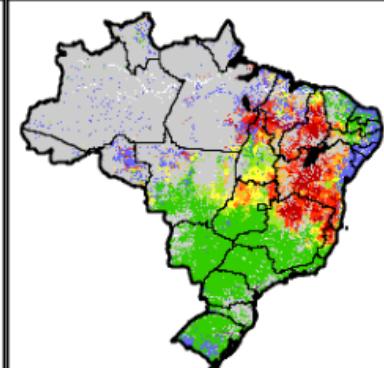
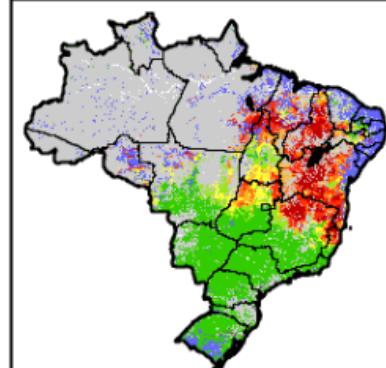
Feb-16



Second Dekad

Third Dekad

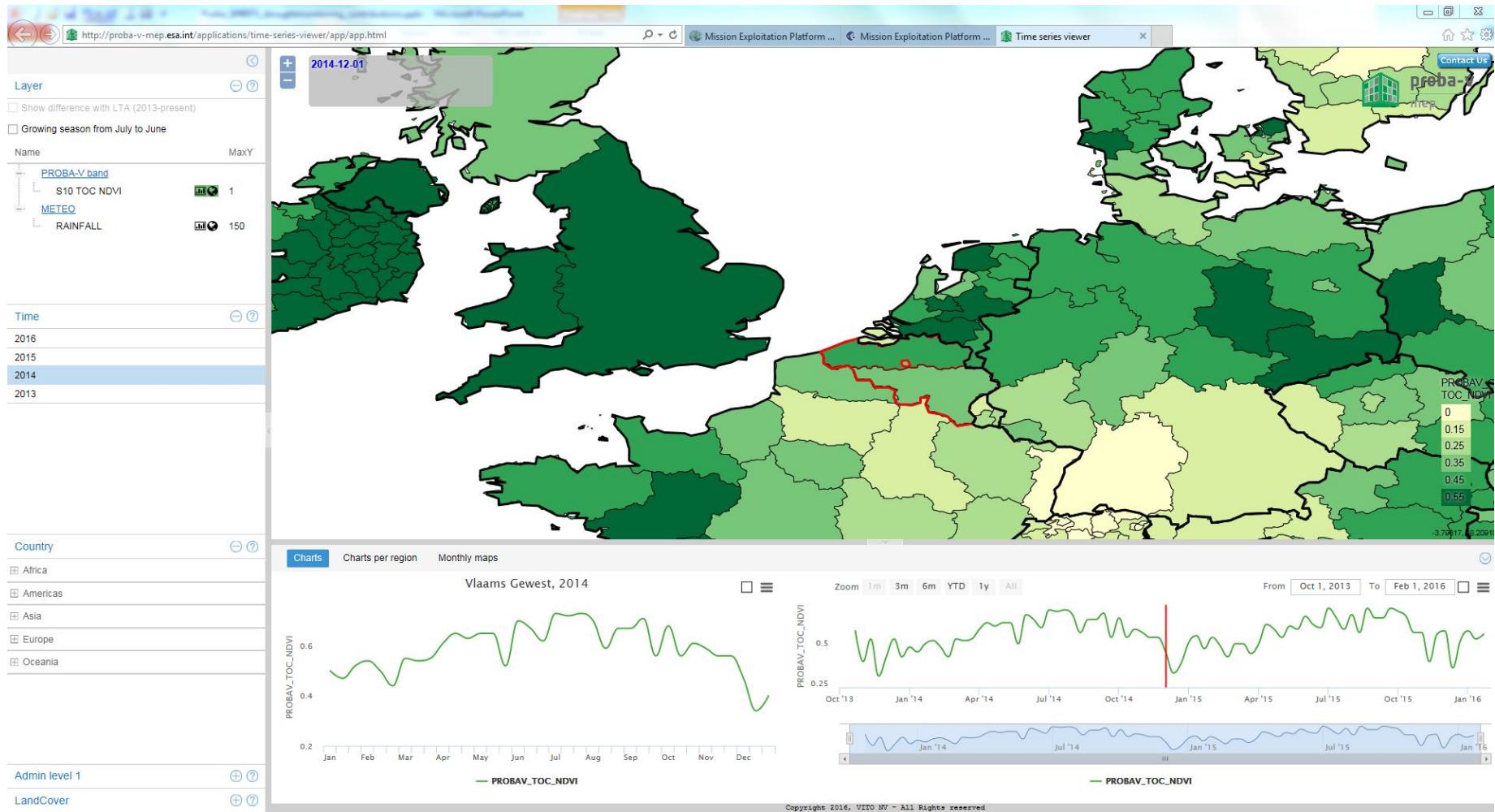
Jan-16



Example 2

Proba-V Mission Explotation Platform

<http://proba-v-mep.esa.int/>



Capacity Building & Training on the use of time series for vegetation monitoring

Set-up of low cost receiving stations



SPIRITS workshop for early warning



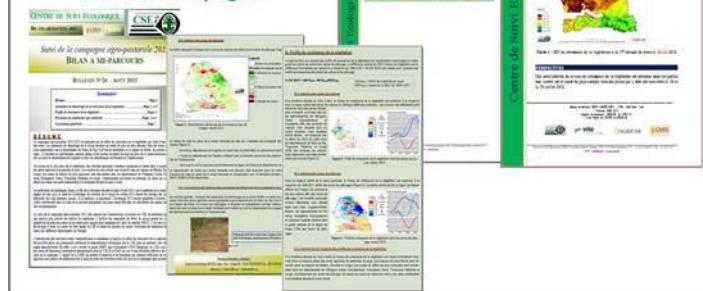
Support in generation of bulletins and reports for food-security or drought monitoring

Diffusion de l'information

- Bulletins décennaux du CSE et du GTP
- Bulletins de mi-parcours et fin de campagne du CSE

→ Bulletins décennaux

→ Bulletins mi-parcours et fin de campagne



Post-Processing Software: SPIRITS

- JRC-VITO development: *Software for the Processing and Interpretation of Remotely Sensed Image Time Series*
- Several tools to exploit RS time series & to make agro-meteorological bulletins
- Freely available, incl. Manual & Tutorials
- Users: VITO, JRC, FAO, WFP, Africa
- Training sessions (\pm 50 so far)

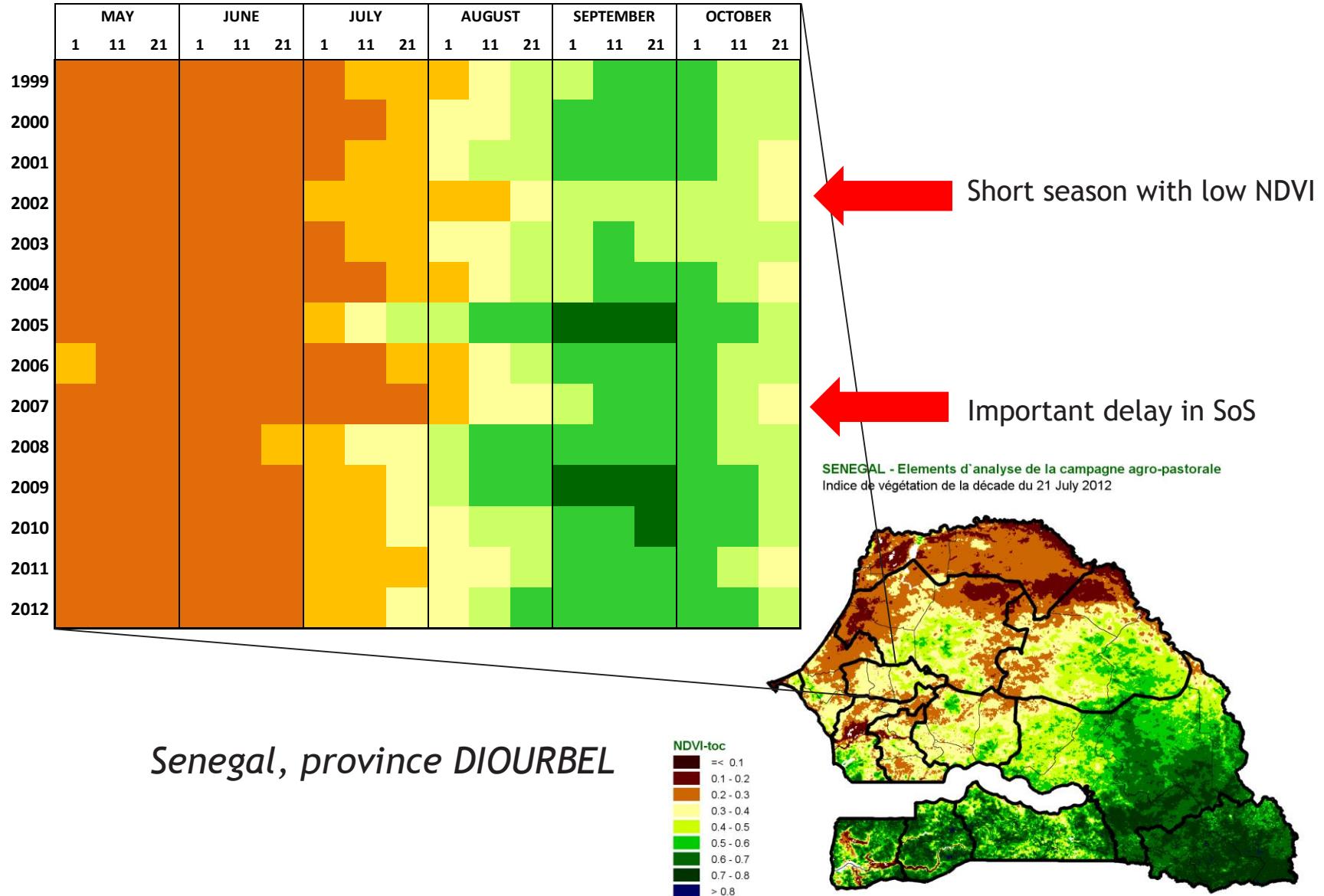


The screenshot displays the SPIRITS software interface. At the top is a menu bar with options like File, Basic Tools, Time Series, User Tools, Databases, Quick, and About SPIRITS. A sub-menu under 'Basic Tools' shows 'Scaling and Resampling', 'BandMath', 'Spatial', 'Spectral', 'Biophysical', 'TimeConstr1', 'TimeConstr2', and 'Unmixing'. Below the menu is a 'QuickLook' window showing a map of a region with green and yellow areas, labeled 'vito' and 'SPOT VEGETATION January 2009 Global 10'. To the right of the map are color calibration sliders for 'Digital', 'FromColor', 'ToColor', 'Legend', 'Tolerance', and 'Intensity'. In the center is a 'Ram Chart' window showing NDVI values from Jan to Jul for the years 1999, 2000, 2001, 2002, 2003, and the average (Avg. 1999-2009). To the right of the chart is a 'Tasks' window listing processing steps: Run new task (radio button selected), Pause new task, and several Extract BandROI tasks (1999-2009) with status 'READY 0%'. Below these is an 'Extract BandROI' dialog with fields for Input and Output files, Region of Interest (ROI) coordinates, and processing parameters like 'Smooth Window' and 'Operation Average'. At the bottom is a 'Progress' bar.

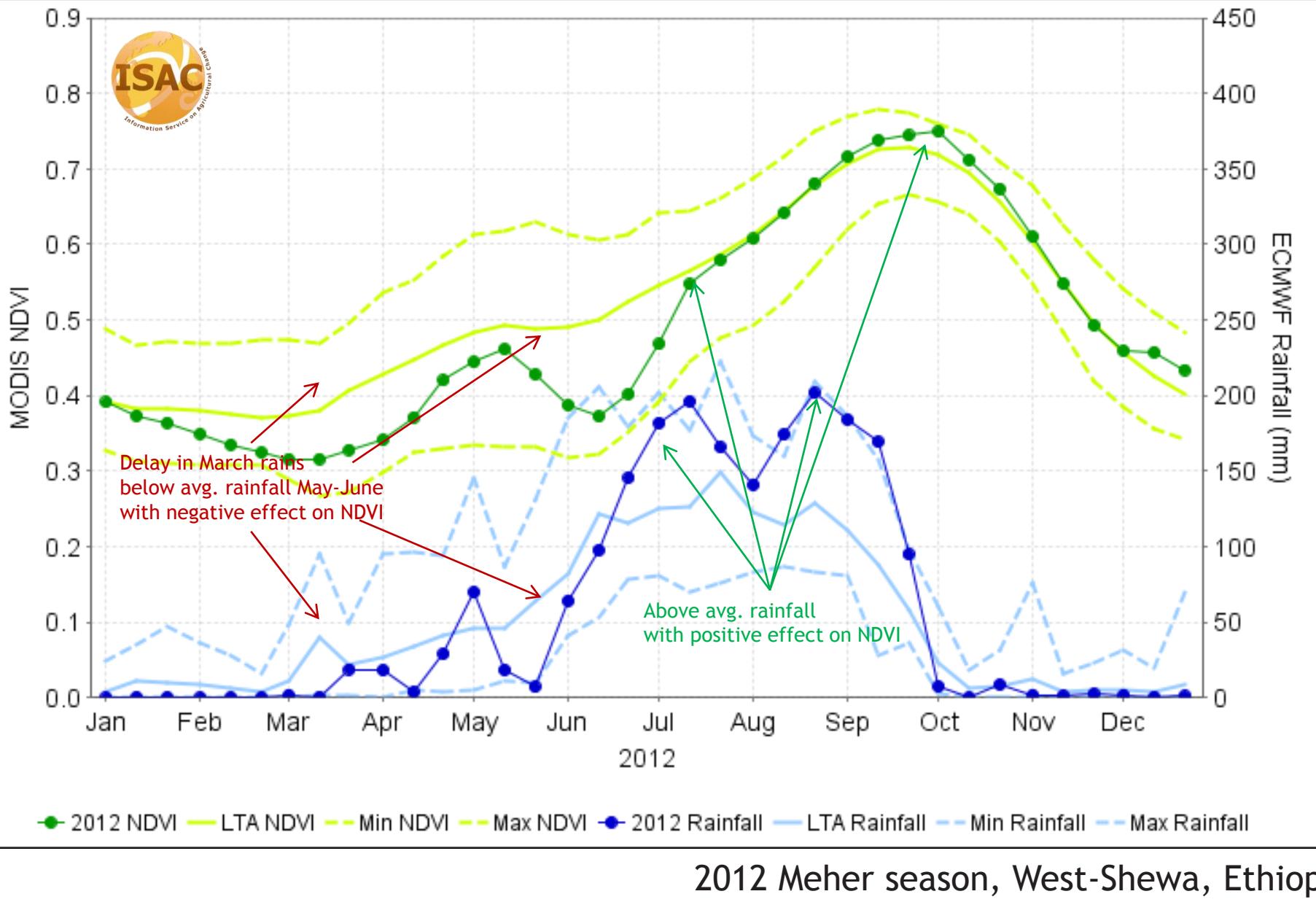
The screenshot shows the SPIRITS website. The header includes the URL 'http://spir...', a search bar, and links for 'service - Google zoeken' and 'Spirits | Software for the Pro...'. Below the header is a navigation bar with links for 'Home', 'Overview', 'Download', 'Support', 'Publications', and 'Links'. The main content area features the SPIRITS logo and the text 'Institute for Environment and Sustainability European Commission > JRC > IES > Spirits'. It also includes a map of Africa with vegetation indices overlaid. At the bottom are three buttons: 'Download it' (orange), 'See what you can do' (green), and 'Get data' (blue).

SPIRITS is an integrated and flexible **free software** environment for analyzing satellite derived **image time series** in crop and vegetation monitoring. With this toolbox, you can process and examine time series of low and medium resolution sensors such as SPOT-Vegetation and MODIS-Terra/Aqua. It can be used to perform and to automate many spatial and temporal processing steps on time series and to extract spatially aggregated statistics. Vegetation indices and their anomalies can be rapidly mapped and statistics can be plotted and interpreted in seasonal graphs to be shared with analysts and decision makers.

Comparison of seasons: matrix display



Example of combining vegetation indices and rainfall data

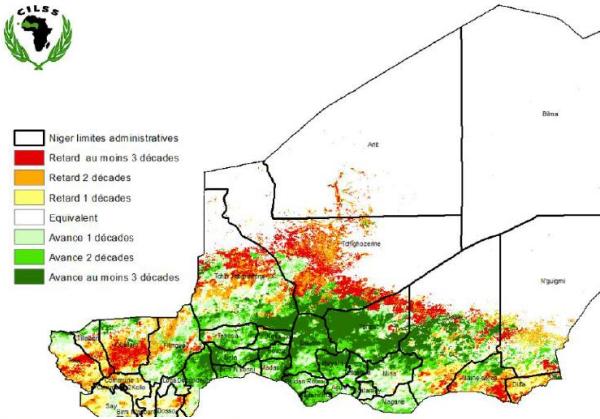


Vegetation monitoring for food security

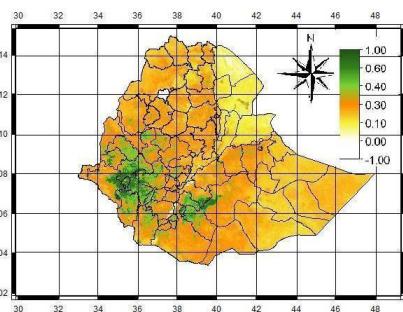
GMFS, AgriCab projects for JRC, FAO, WFP, national and regional authorities



- Niger limites administratives
- Retard au moins 3 décades
- Retard 2 décades
- Retard 1 décades
- Équivalent
- Avance 1 décades
- Avance 2 décades
- Avance au moins 3 décades

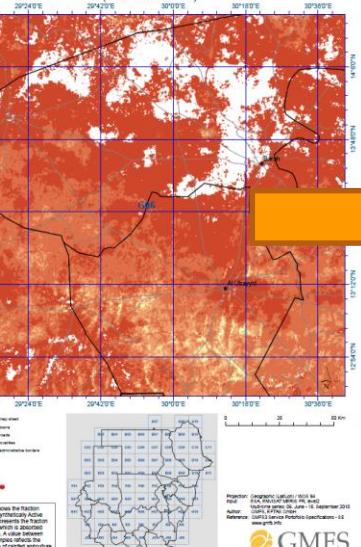


Indicative fAPAR in North Sudan
Growing Season 2010
(until 15/09/2010)

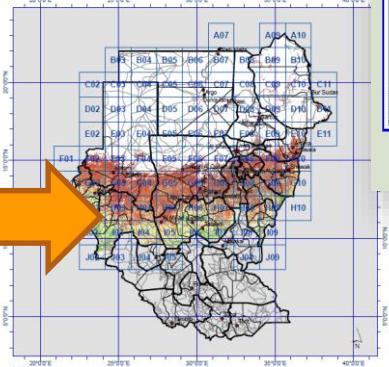


NDVI for the 3rd decade of March 2012
Source: GEONETCast near real time data
from SPOT_VTG, processed by ILWIS GEONETCast Toolbox

Indicative fAPAR in Sudan
Growing Season 2011
(until 14/05/2011) Sudan State



GMFS



Projection: Pseudo-Mercator (EPSG: 900913)
Input: ENVSTAT_MERIS FR_2010
Author: FMA
GMFS



Federal Ministry of Agriculture Sudan

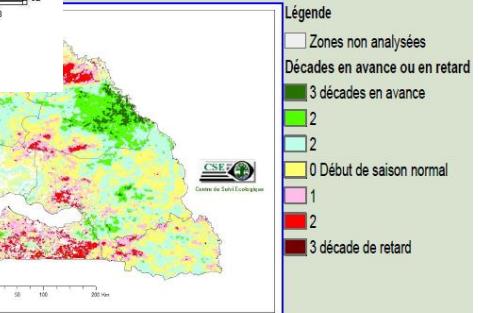
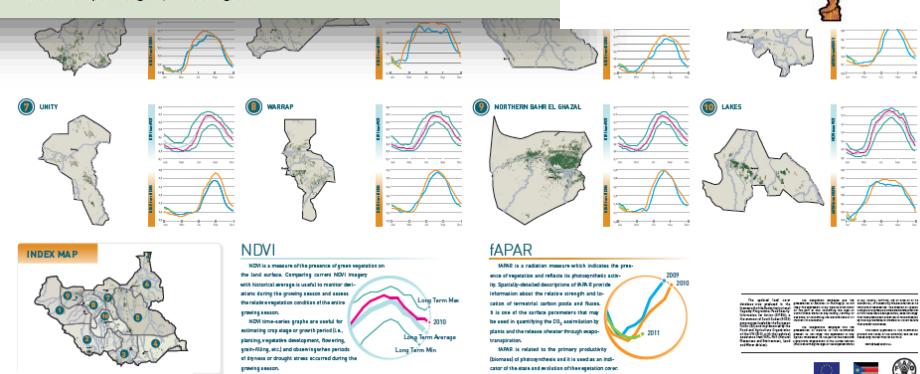
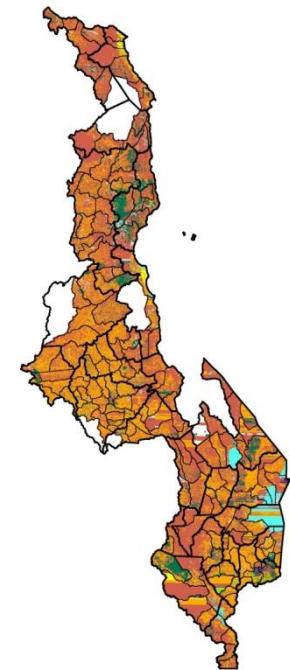


Figure 1 : Anomalies de démarrage de la saison de croissance des pâtures, hivernage 2012



EU

SD

Analysis of long term time series of EO data

Vulnerability mapping - drought frequency returning period

Trend analysis

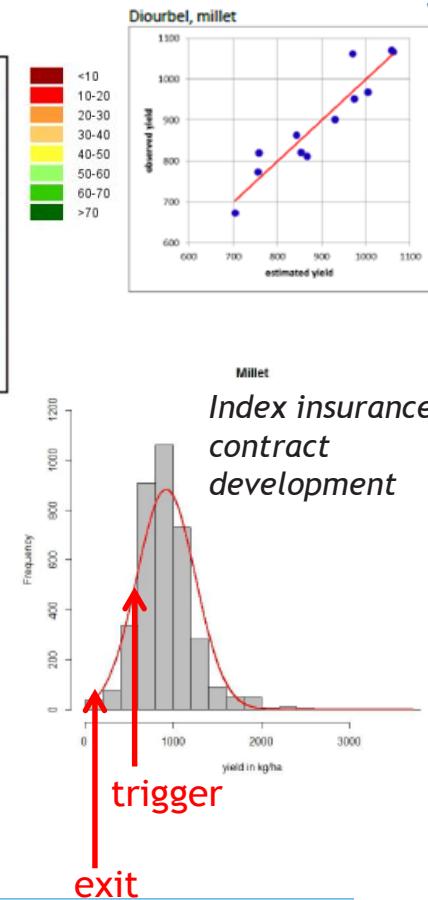
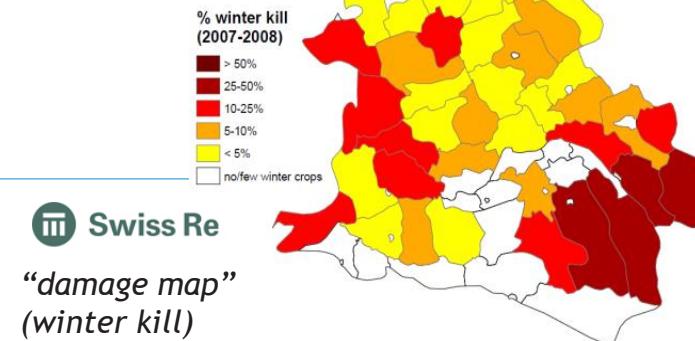
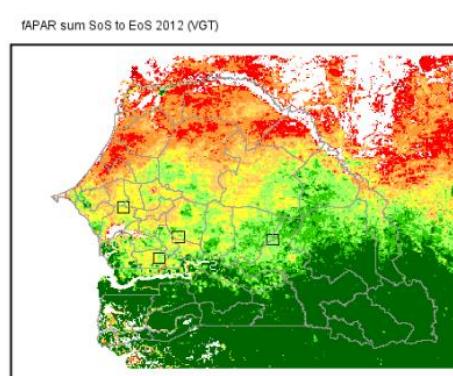
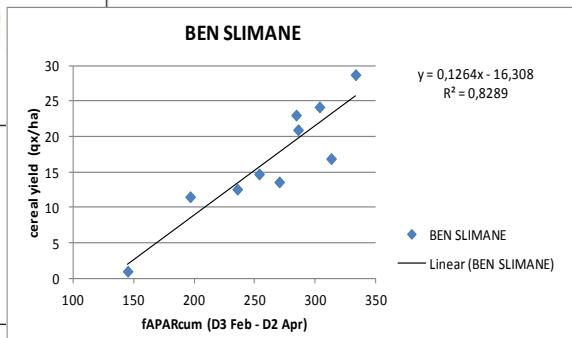
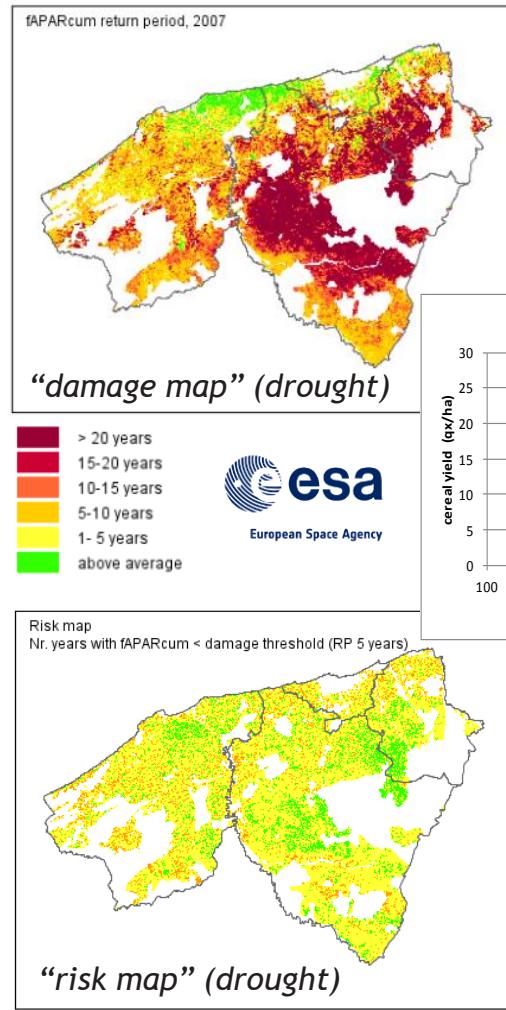
Phenology mapping

Probability of production deficit at end of season

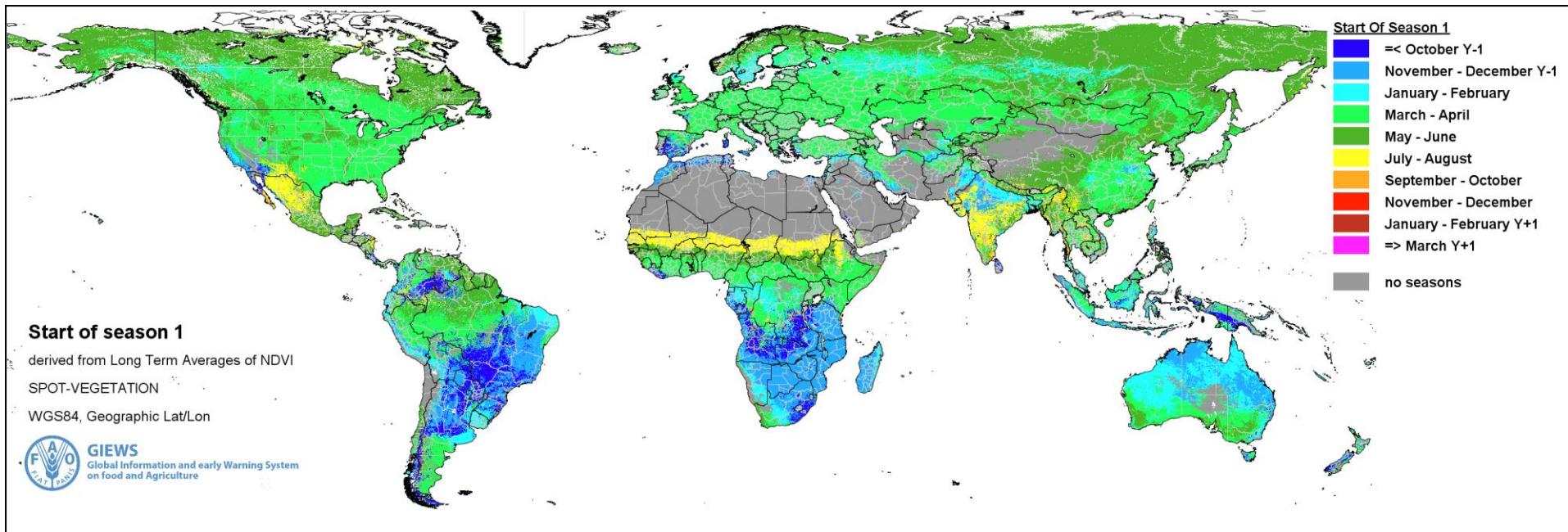
Agricultural index based insurance

Agricultural insurances

- Use of RS for crop monitoring, damage and risk assessment for the insurance sector: studies for ESA and Swiss Re for parts of Ukraine, Russia, Morocco.
- Development of RS based index insurance products for IFAD-WFP in Senegal

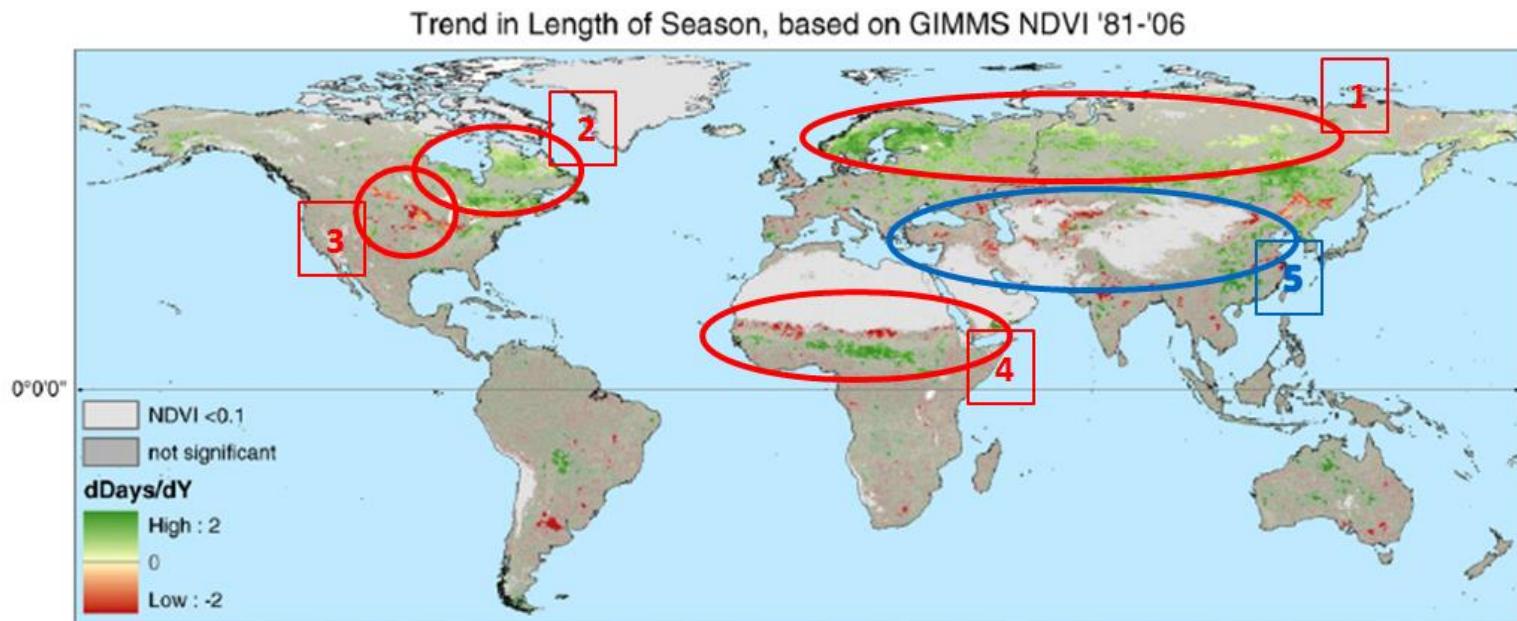
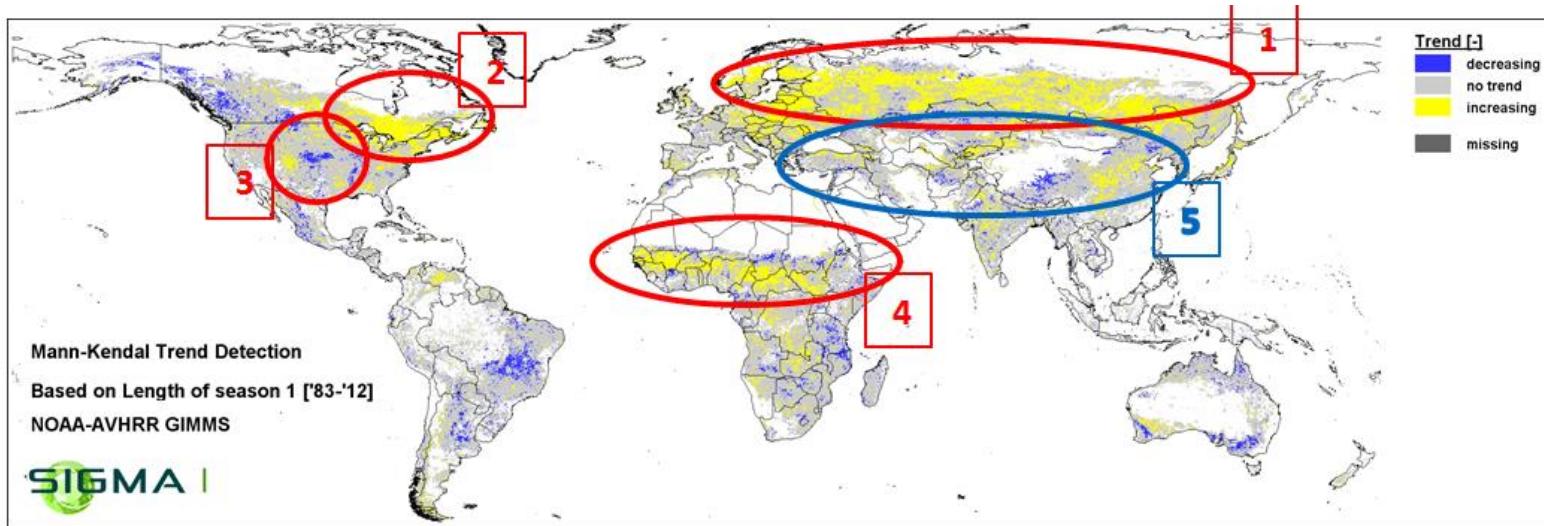


EO based phenology



GIEWS
Global Information and early Warning System
on food and Agriculture

Analysis of global EO based phenology Global results - GIMMS - '83-'12



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