



15/06/2015

The Use of Remote Sensing Data to Monitor the Impact of Agricultural Intensification at Global Scale

Belgian Workshop, Space4Food, Expo Milano2015

Sven Gilliams & co, VITO-TAP

CONTENT

- » VITO in a nutshell
- » Introduction / The Challenge
- » Agricultural Monitoring Needs @ Global Scale
 - » Approach
 - » Data
 - » Tools
- » Examples

VITO IN NUMBERS



- » 750 employees
- » 26 nationalities



- » More than 400 patents worldwide



- » HQ in Mol, België. Offices in Ostend, Berchem, Ghent, Genk
- » Subsidiary in China



- » 200 scientific articles in 2014



- » 1000 research projects



- » 140 mio € turnover in 2014



- » More than 500 research partners

REMOTE SENSING PRODUCTS & SOLUTIONS

Platforms



UAV



AIRBORN

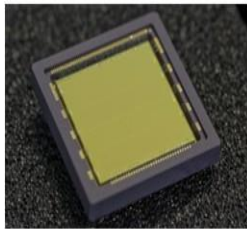


HALE UAV



SATELLITE

Sensors



Value Added Services & Information Products



Markets



Vegetation



Agriculture



Water



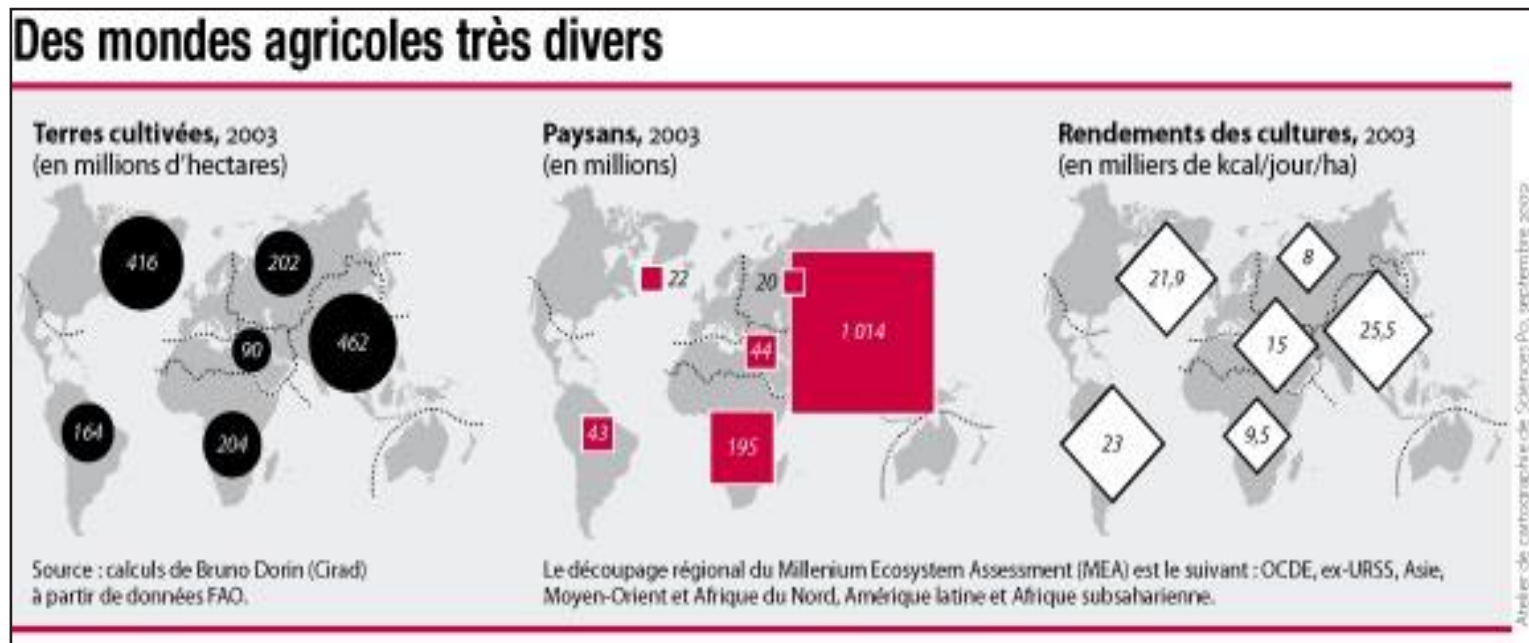
Forest



Environment & Security

CHALLENGE

- » 2050 – 70% increase in agricultural productivity!?
- » Sustainable *intensification of agriculture*:
 - » Agricultural Expansion
 - » Agricultural Intensification



GEOGLAM- SIGMA - FACTS

- » Funded By The European Commission
- » Improve remote sensing based methods and indicators to monitor and assess progress towards “sustainable agriculture”
- » Start 1 November 2013 – 30 March 2017
- » 22 partners, 17 countries
 - » VITO, CIRAD, JRC, IIASA, Alterra, RADI, NMSC, DEIMOS, GeoSAS, RCMRD, Aghrymet, RCMRD, Sarvision, Sarmap, INTA, Geoville , UCL, EFTAS, FAO, ITC, GISAT, IKI, SRI
 - » Argentina, Ukraine, China, Russia, Ethiopia, Niger, Kenya USA, Brazil, Vietnam, Belgium, ...
- » A Major European contribution to GEOGLAM
- » <http://www.geoglam-sigma.info/>
- » Coordinated by VITO



THE CHALLENGE

Global population has increased from about 2.5 billion in 1950 to more than 7 billion in 2012 and is projected to reach more than 9 billion by 2050. According to FAO, to achieve *food for all*, **global food production will need to grow by 70% and up to 100% in developing countries. Sustainable intensification of agriculture** is thereby imperative, requiring a thorough understanding of the impact of shifting cultivation practices on the environment. In this perspective, earth observation based information systems, which are currently mostly focused on **short term** agricultural productivity forecasts, will need to be enhanced with the capacity to assess **the dynamics of cultivation practises and their impact on productivity and the environment**. This is a key requirement to explore possible pathways towards sustainable agriculture in the **long term**.

PROJECT OBJECTIVES

The **GEOGLAM** Initiative (Global Agricultural Monitoring), a key component of **GEO** (Group on Earth Observation), aims to improve transparency in global agricultural monitoring. **SIGMA's** objective is to **actively contribute to GEOGLAM** and in specific to its **research agenda** through the development of methods and products that will enable to better formulate answers to the following sustainability questions:

How and where do changes in crop land distribution affect other ecosystems?

AT A GLANCE

Title: Stimulating Innovation for Global Monitoring of Agriculture and its Impact on the Environment in support of GEOGLAM

Instrument: FP7, Collaborative Project

Duration: 42 months

Start Date: November 2013

Consortium: 22 Partners from 17 countries

Project Coordinator: VITO

Project Web Site: www.sigma.info

Key Words: Agriculture, remote sensing, Global, Innovation, GEOGLAM, GEO

Contact: esiteSigma@vito.be



Photo Credit: Isabelle Piccard



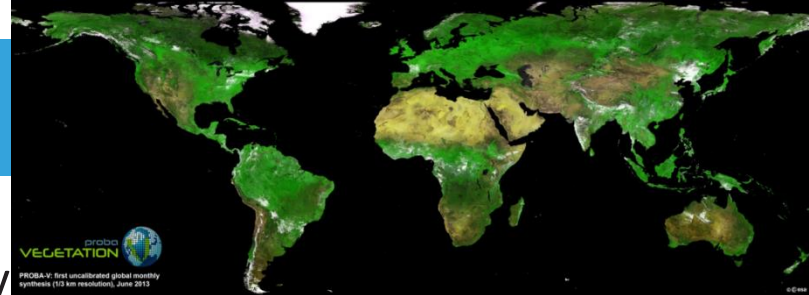
AGRICULTURE MONITORING NEEDS

» Key elements

- **Temporal / Spatial Resolution!!**
- **Time Series**
- Data access
(availability needs to be guaranteed)
- Reliability
- Ownership (& capacity) assured
- Ever evolving
(new satellites, better capabilities – R&D)



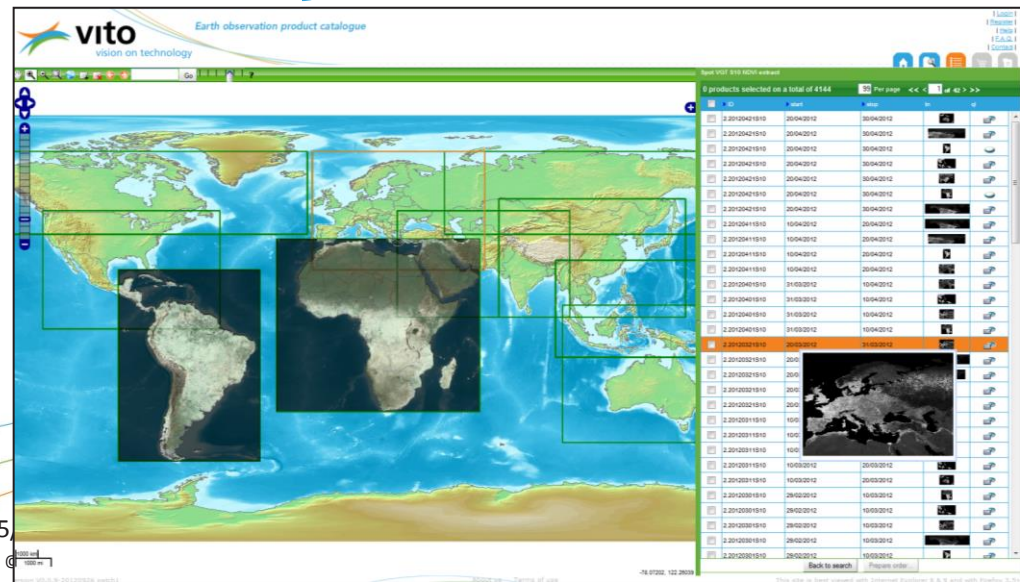
DATA SERVICES



- » Multi-sensor processing & archiving facility
 - » SPOT-VEGETATION (1998 – now)
 - » MSG (2005 – now)
 - » NOAA-AVHRR (1981 – now)
 - » METOP-AVHRR (2008 – now)
 - » MODIS (2000 – now)
 - » MERIS (2003 – now)
 - » PROBA-V (november 2013 - ...)



- » The Product Distribution Facility



PROBA-V 100M product



Ganges Delta

CROPWATCH SATELLITE PROGRAMME

- » Under Discussion!
- » A joint initiative by ESA, China & Belgium
 - » Daily global coverage of all land masses, including coastal areas
 - » Spatial resolution of 100 m over the full swath
 - » continuity PROBA-V and SPOT-Vegetation (20+ years)
 - » additional thermal bands
 - » 2 phases -> 2018-2020
 - » Crop monitoring (primary application)
 - » Food security (primary application)
 - » Vegetation monitoring
 - » Land cover / Land use change mapping
 - » Impact of climate change
 - » Coastal zone monitoring (including water quality)





Capacity building: supporting & training user communities

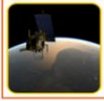

- » Improve access to data & catalyze operational use through capacity building: “get it there and get it used”
- » Supporting bigger programmes, with partners, ..
- » Partnership with EUMETSAT
- » > 15 Workshops in the past 3 years
 - » > 150 persons trained
 - » “Refresher” & more advanced courses
- » Training material
 - » Tutorials
 - » Exercises
- » Programme available online <http://rs.vito.be/africa>



 **Africa Platform**
for Knowledge and Data Sharing
on Earth Observation

Home . Data . Software . Workshops . Integrated Applications .

Africa > Data

 Image © CNES Almost 15 years of data from the family of	 © 2012 EUMETSAT Data from the Advanced Very High Resolution	 © 2012 EUMETSAT Composites of Land Surface Analysis SAF	 © ESA Coming soon
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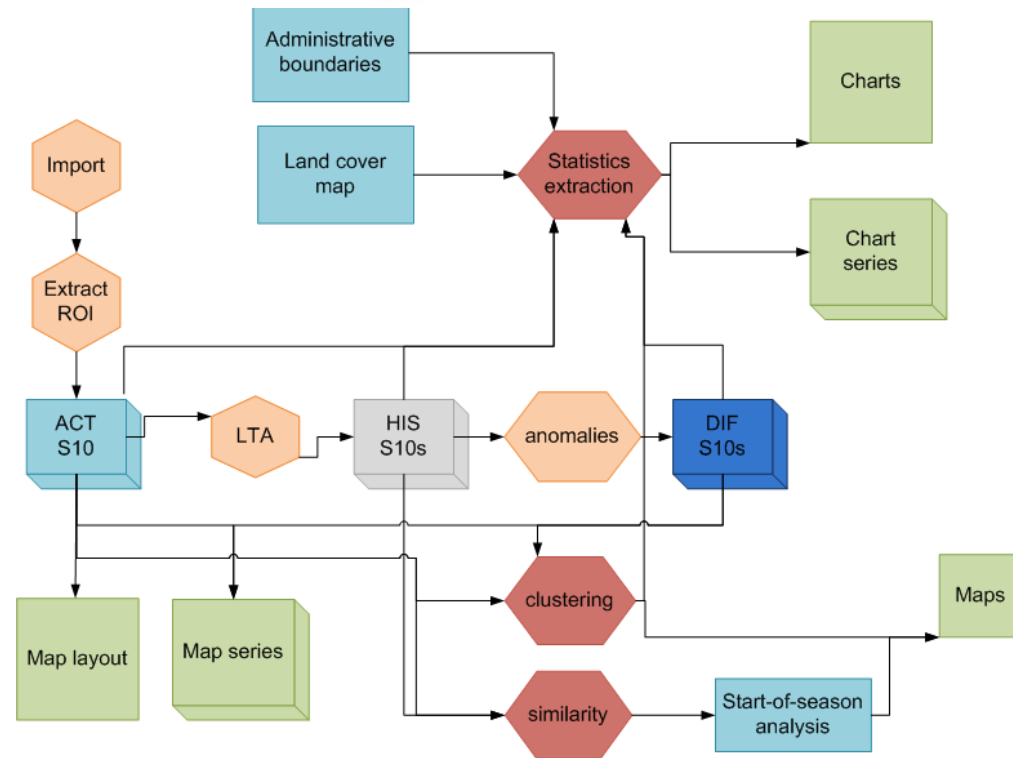
 **Crop yield and vegetation monitoring**
2 to 6 April 2012, Dakar, Senegal [French]
Short description
Organized by CSE, VITO, Ulg, GMFS and AGRICAB projects
This workshop is [open/restricted]. Contact: antoine.royer@vito.be
Download Agenda - Report - Materials - ...



 **Crop yield and vegetation monitoring**
26 to 29 March 2012, Maputo, Mozambique [English]
Short description
Organized by INAM, VITO, GMFS and AGRICAB projects
This workshop is [open/restricted]. Contact: sven.gilliams@vito.be
Download Agenda - Report - Materials - ...



- » Large availability of free remote sensing data, but:
- » Remote sensing and processing software not specifically designed for time series processing
- » Food security analysts are usually not software programmers
- » Tools developed in the past are no longer updated (e.g. WINDISP)
- » Online platforms don't allow high degree of customization (e.g. Crop explorer, Decision Support Interface (DSI), MARS Viewer)





USE?

» RS based information Uptake by user communities

10 | **PLANÈTE**

Sahel : quatre ans de sécheresse

De la Mauritanie au Nigeria, les conditions de vie sont devenues de plus en plus difficiles. Près de 100 millions de personnes souffrent de malnutrition. Il faut signaler qu'en plus de la sécheresse, il y a eu beaucoup de dommages causés par les inondations.

2010-2011 : deux années de sécheresse
ANOMALIE DE PRODUCTION DE VÉGÉTATION

Production inférieure 30 60 90 120 Moyenne

1. GAMBIE
Par rapport à la moyenne de 1998 à 2010.

Suivi des cultures et des pâturages au Niger : bilan à la fin du mois de septembre

GMFS
Généraliste des Météorologues de France

Centre de Suivi Ecologique (CSE)

CENTRE DE SUIVI ECOLOGIQUE

Suivi environnemental

Suivi de la croissance de la végétation

N°24 AOÛT 2011 - BILAN A MI-PARCOURS

RÉSUMÉ

Ce rapport analyse la situation de la campagne agricole et pastorale à travers l'état de la croissance de la végétation. Celle-ci est basée sur des indices de végétation calculés à l'aide de données satellitaires notamment le NDVI. À la date du 31 août 2011, l'installation de la saison des pluies a été effective dans tout le Sénégal. Cette installation s'est faite progressivement depuis le mois de juin dans la partie sud du pays jusqu'à la date du 20 août au nord. Le mois de juillet, correspondant à la date d'installation normale de plusieurs zones agricoles, a été déficitaire. Ceci a provoqué des difficultés dans l'installation des cultures et du tapis herbeux au centre et au nord du pays. Cette panne a affecté aussi les cultures qui étaient déjà installées surtout au sud-est du pays et dans la partie sud du bassin arachidier. D'une manière générale, deux types de contraintes ont affecté les zones agricoles et pastorales du Sénégal. D'une part, le retard dans l'installation de la saison des pluies pour certaines localités et d'autre part, la panne pluviométrique qui a affecté les cultures déjà installées. Cette situation laisse entrevoir des productions agricoles et pastorales qui s'alignent sur la moyenne pour la majeure partie des localités du pays. Il faudrait cependant s'attendre, pour les zones agricoles, à des rendements inférieurs à la moyenne dans plusieurs localités situées dans les départements de Mbacké, Mbour, Fatick, Matam, Hodar, Niour du Rip et entre Kebesour et Tivaouane. Concernant la zone tythro-pastorale, le déficit fourragère s'étend sur une superficie importante (Fig. 1) pouvant affecter le bétail des départements de Linguère, Daguana et Podor. Ceci laisse entrevoir un départ massif et précoce de transhumants vers le sud et les zones agricoles.

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- Le suivi de la campagne au CSE Page 8

Figure 1 : Situation de la saison de croissance de la végétation

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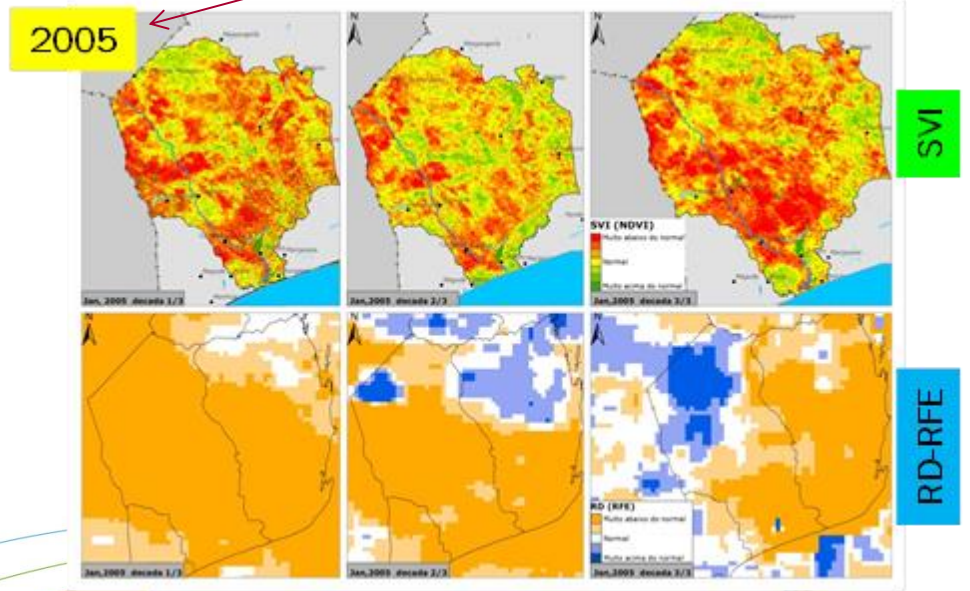
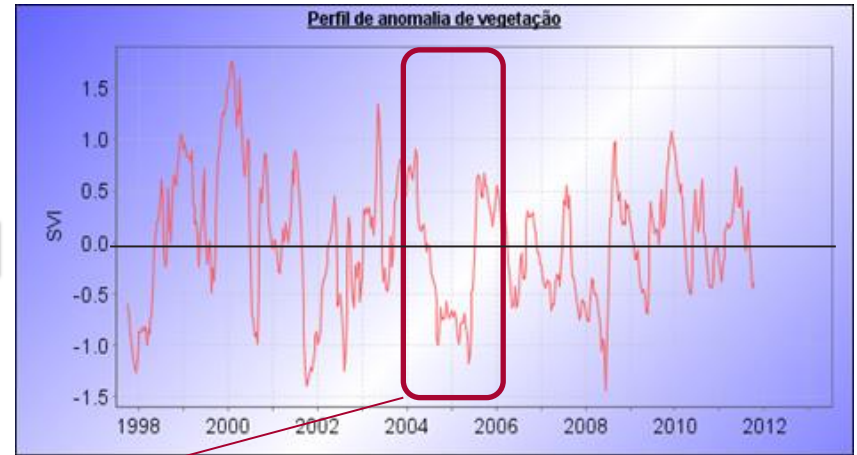
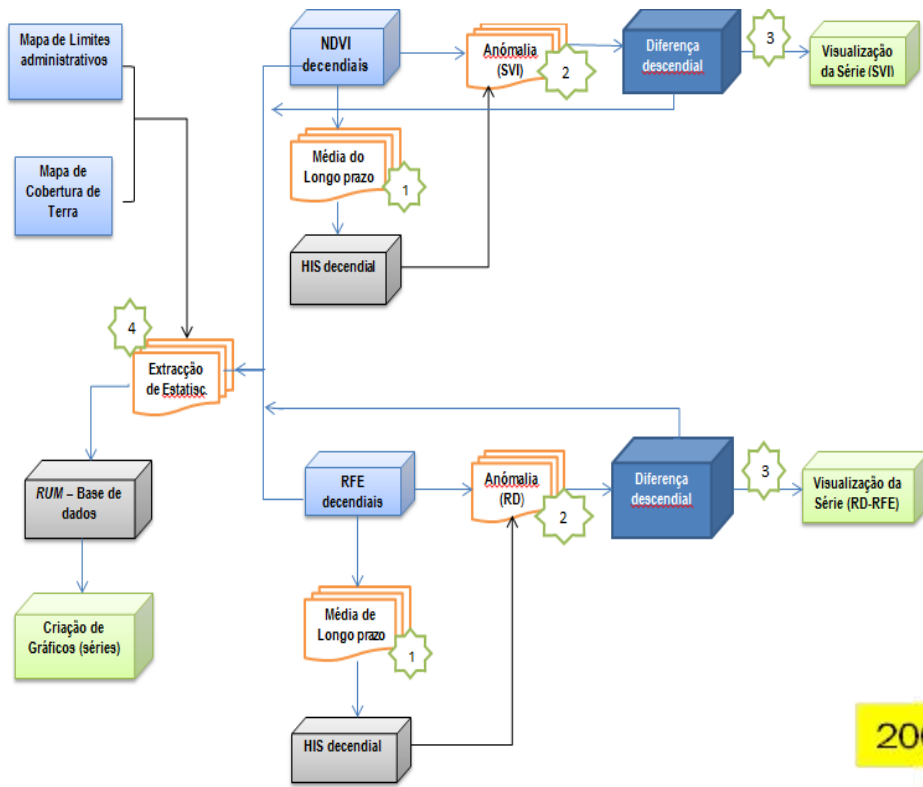
Early Warning and Response Directorate
DRMFSS, MoARD

Early Warning and Response Analysis, May 2011

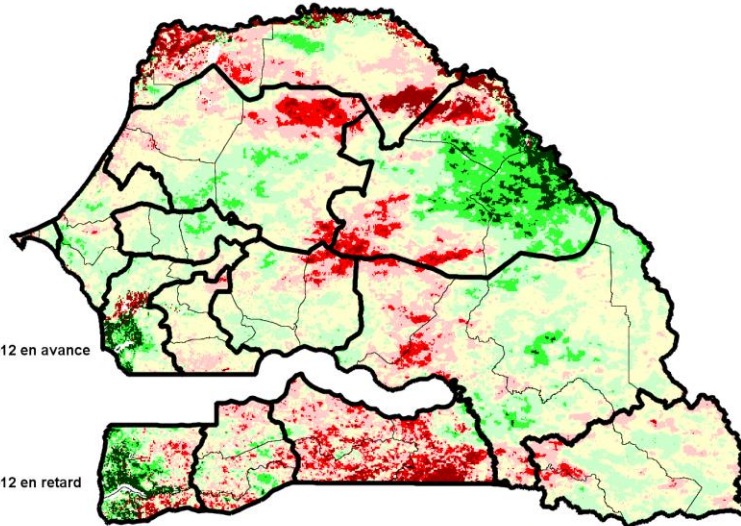
This bulletin is prepared by the Early Warning and Response Directorate to coordinate and disseminate early warning and food security information.

For any comments, questions or suggestions and/or to receive the bulletin on your email please write to info@dopw.gov.et

If you are planning to contribute to the response effort, please inform DRMFSS by writing to rahelsa@dopw.gov.et

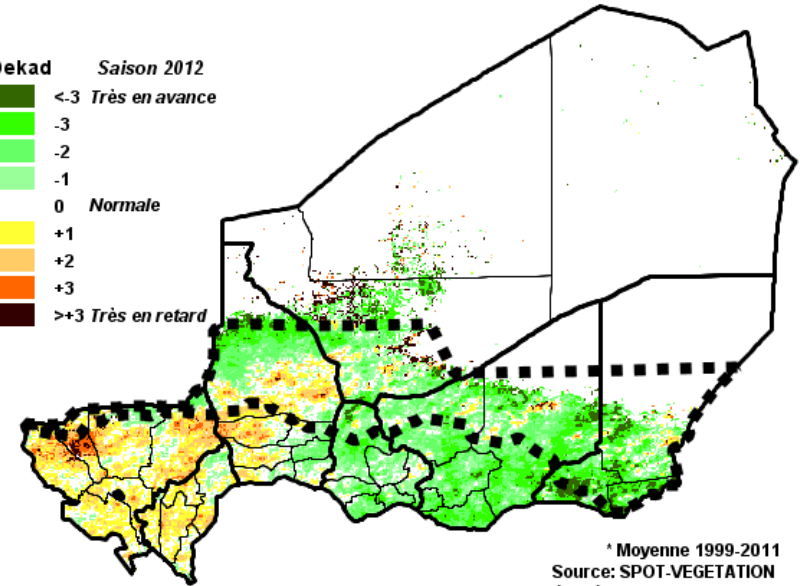


SENEGAL - Elements d'analyse de la campagne agro-pastorale
 Anomalies de démarrage de la saison du 01/05/2012 à 31/07/2012
 Comparaison des profils NDVI: 2012 avec la moyenne 1999-2011



Projection: Geographic Lat/Lon - Grid size: 1km
 Sources: 1)Analyse de données SPOT VGT- 2) Vecteurs de FAO-GAUL level 2 - 3) Produit par GMFS

Début de la saison 2012 par rapport à la moyenne*
 Période d'avril à juillet 2012



* Moyenne 1999-2011
 Source: SPOT-VEGETATION
 Réalisé par AGRHYMET/GMFS

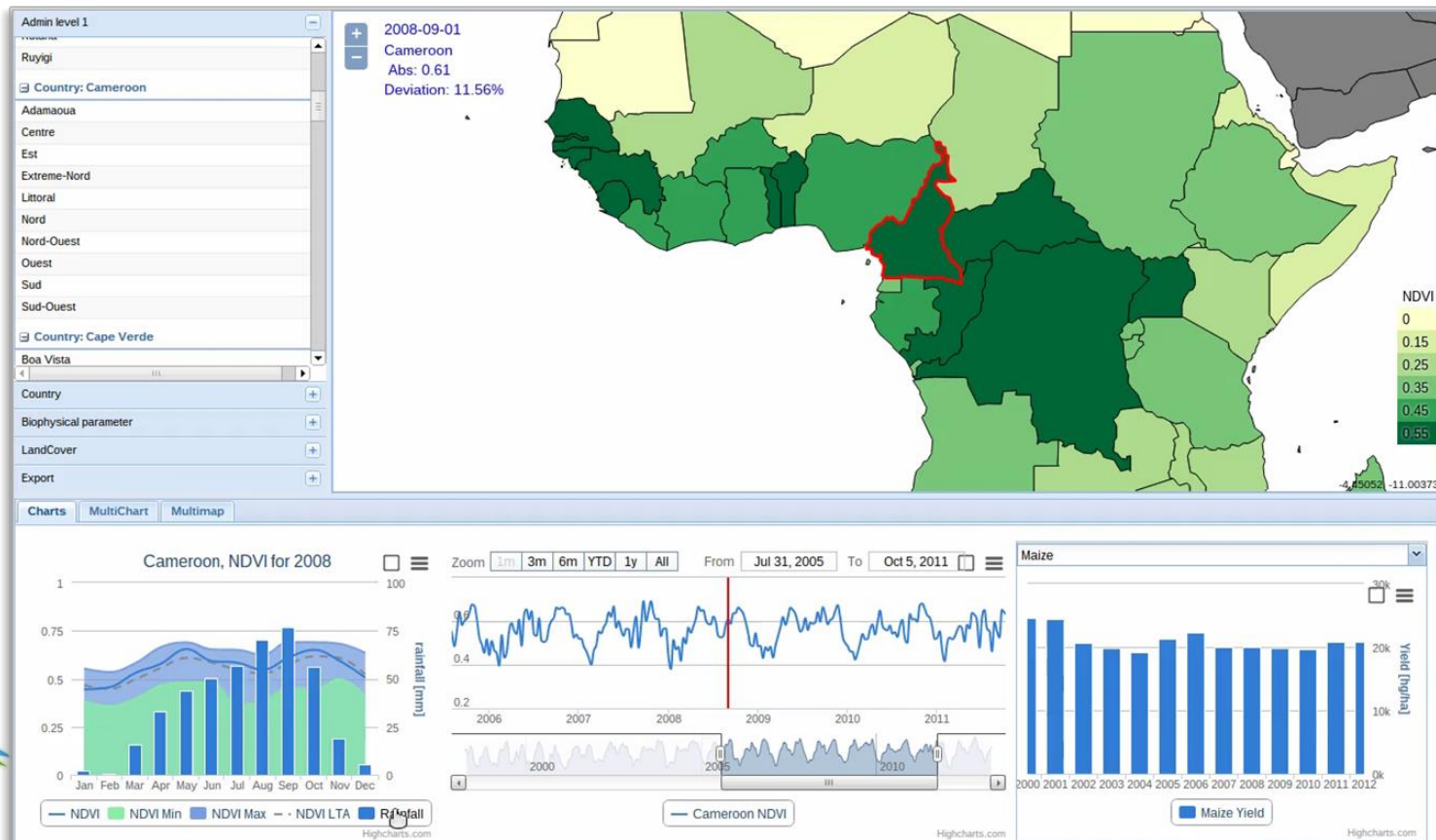
2012 Start-of-season shift compared to long term average (Senegal, Niger)

Online Applications / Viewers / Dashboards

- » 'Satellite Time Series Viewer' as first step:

<http://tsviewer.vito-eodata.be>

- » Aim: quickly explore & review satellite time series and complementary indicators for agriculture and environmental monitoring

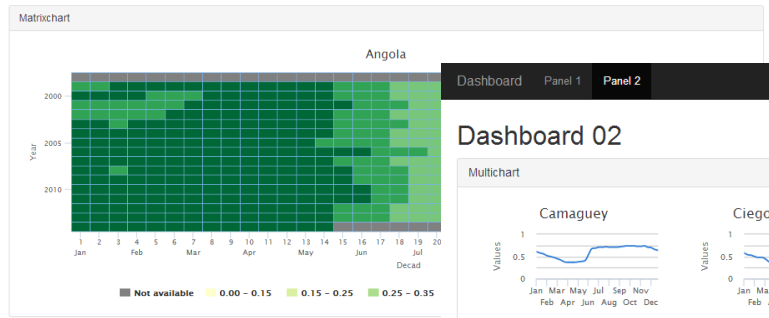


Current work: user-tailored dashboards

<http://ipot2.vgt.vito.be/rpas.html>
<http://ipot2.vgt.vito.be/>

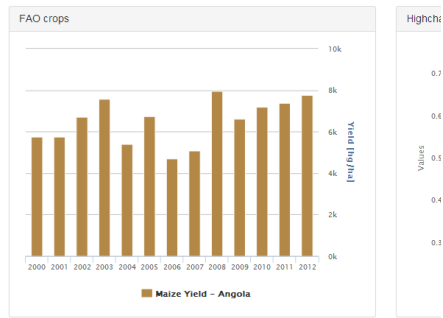
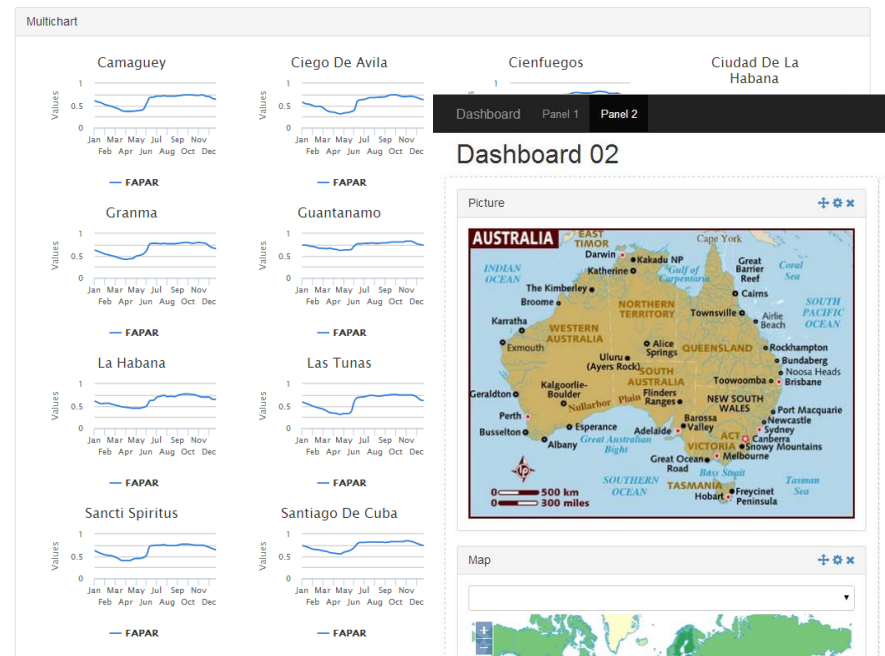
Dashboard Panel 1 Panel 2

Dashboard 01



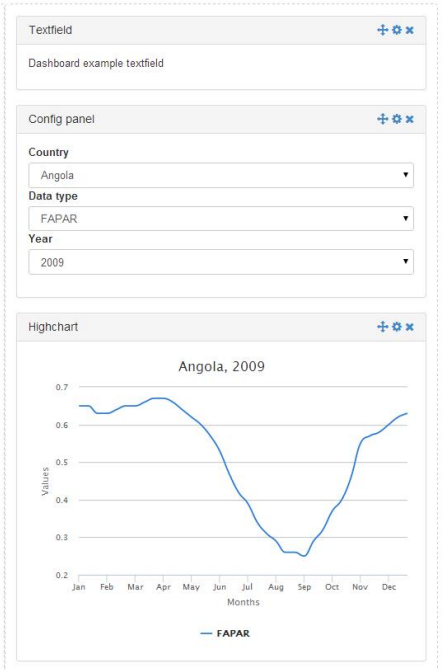
Dashboard Panel 1 Panel 2

Dashboard 02



Dashboard Panel 1 Panel 2

Dashboard 02



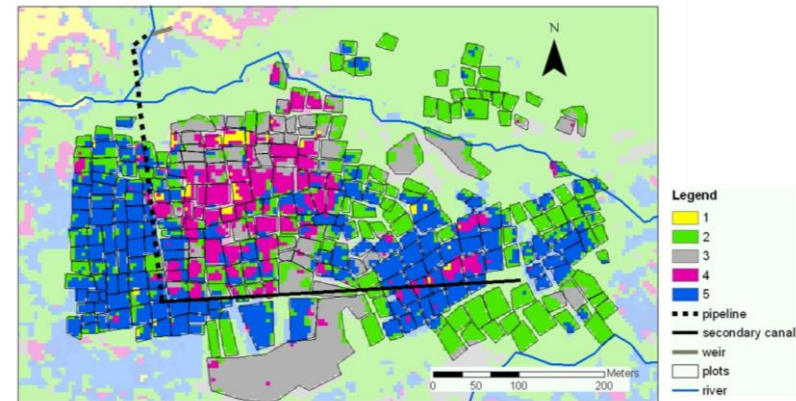
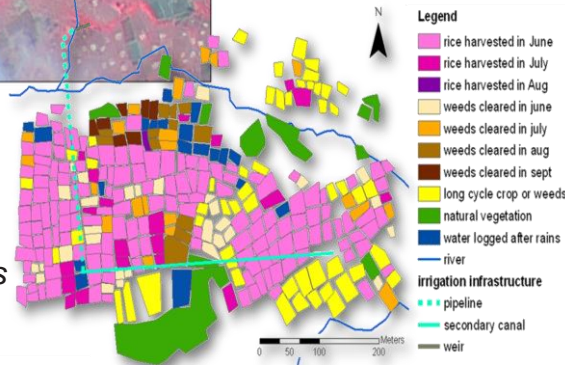
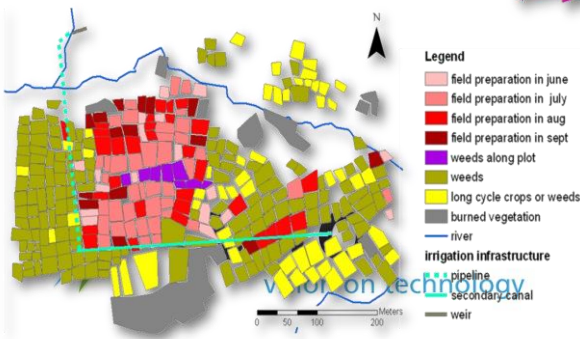
Project and Policy monitoring

An overview on the variety of information remote sensing can provide to support agricultural development initiatives in Malawi

» Monitoring small scale irrigation in Malawi

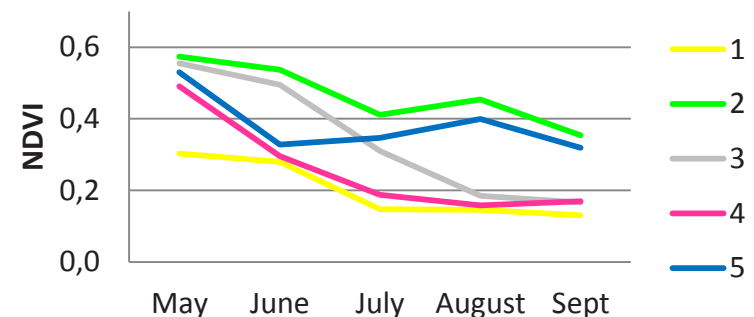


Dynamics: overview maps



Dynamics: NDVI clustering

Changes in vegetation health and density



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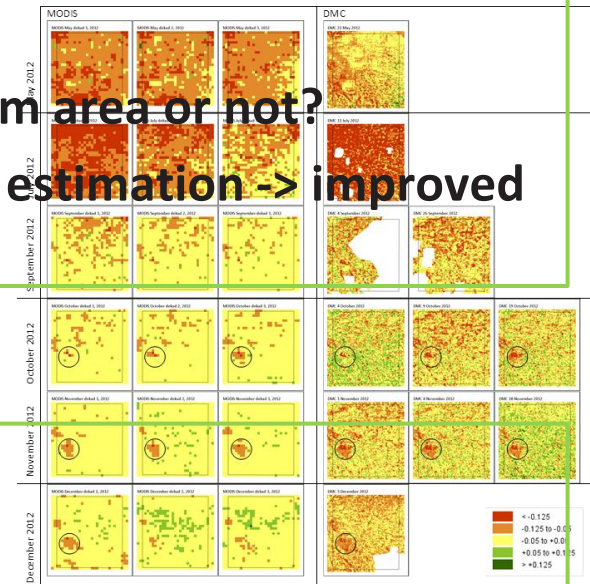
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Agricultural Insurance

» Crop monitoring, damage and risk assessment

= info to support traditional insurances

- » Problem detection in an early stage -> **where pay-out expected?**
- » **Guidance of field visits** by loss adjusters
- » Control of damage claims -> **claim in problem area or not?**
- » Information on **historical crop losses** -> **risk estimation** -> **improved premium calculation**

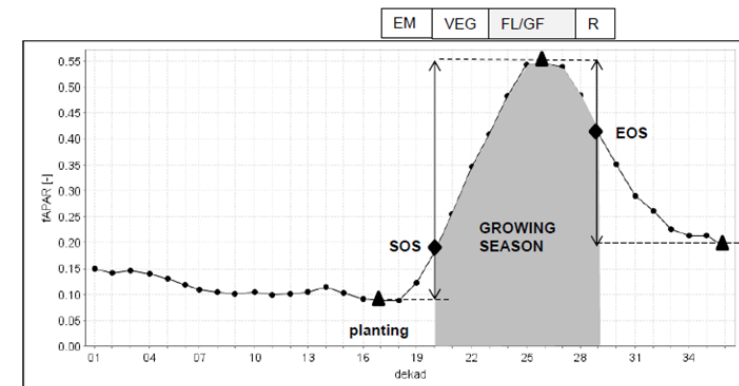
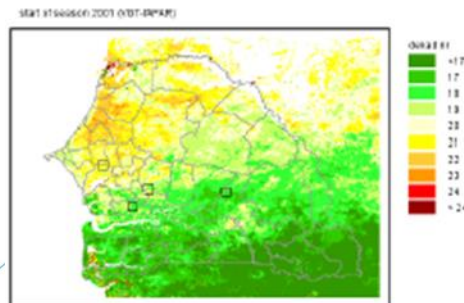
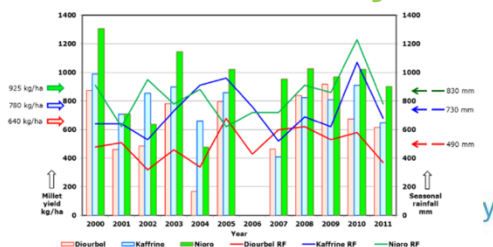


Feasibility studies in Morocco, Russia, China, ...
Remote sensing data provision

» Index insurance

- » **Satellite based index**

IFAD / WRMF study in Senegal Consultancy



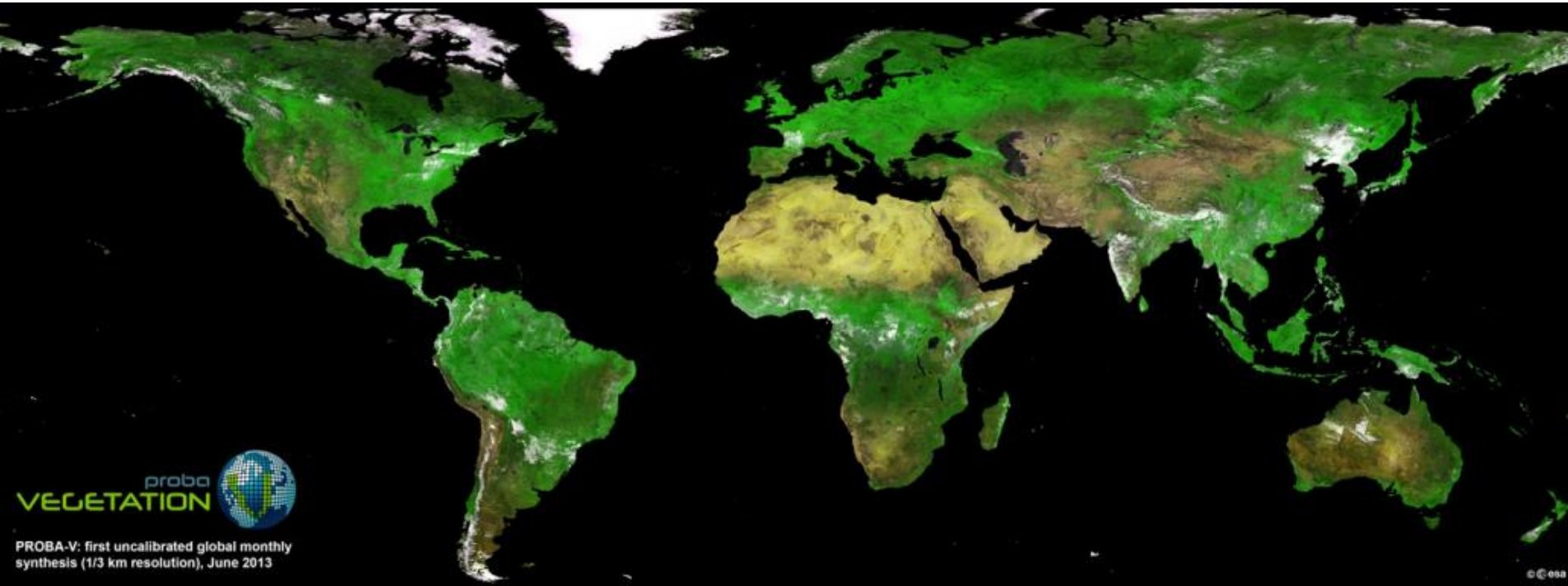


PROBA-V Symposium

Ghent, 26 - 28 January 2016

<http://congrexprojects.com/2016-events/16c01>

Thank you!



Questions?