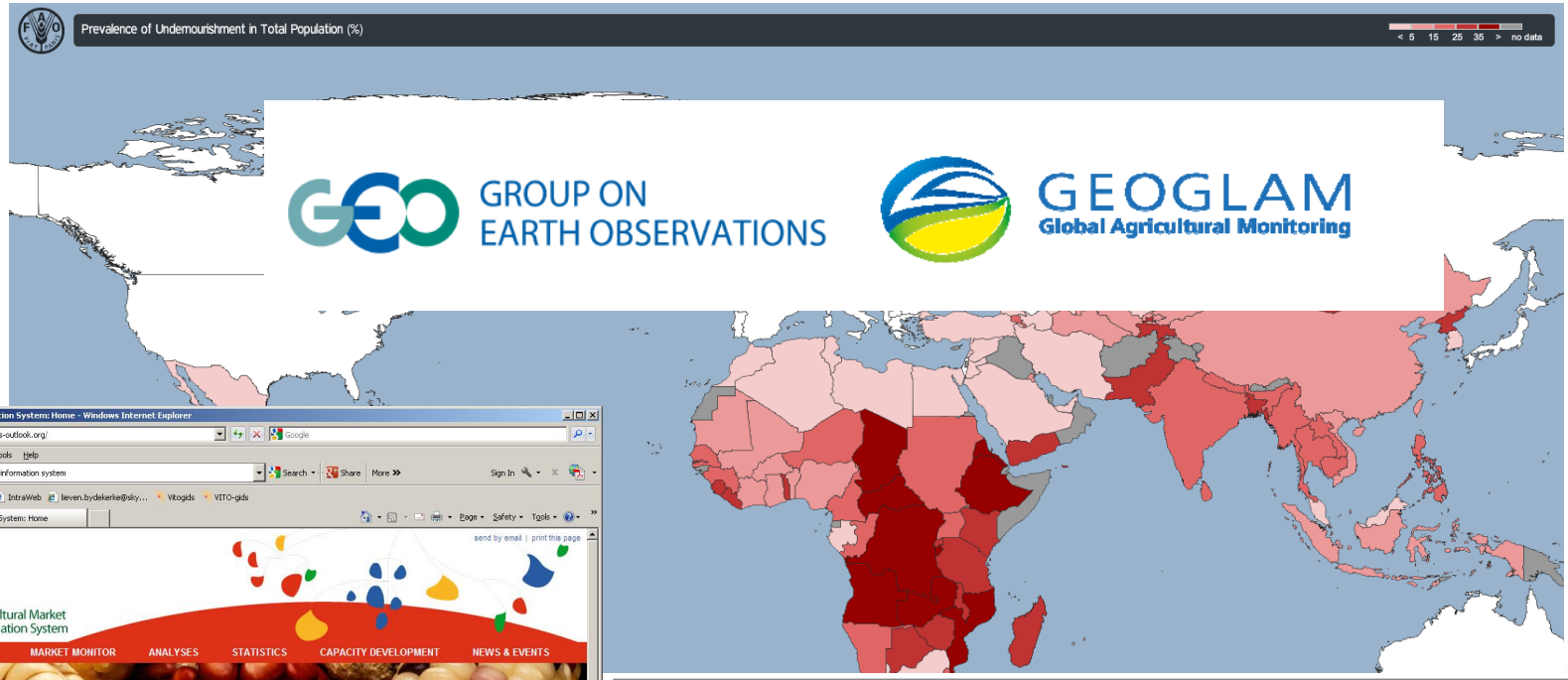
SIGMA

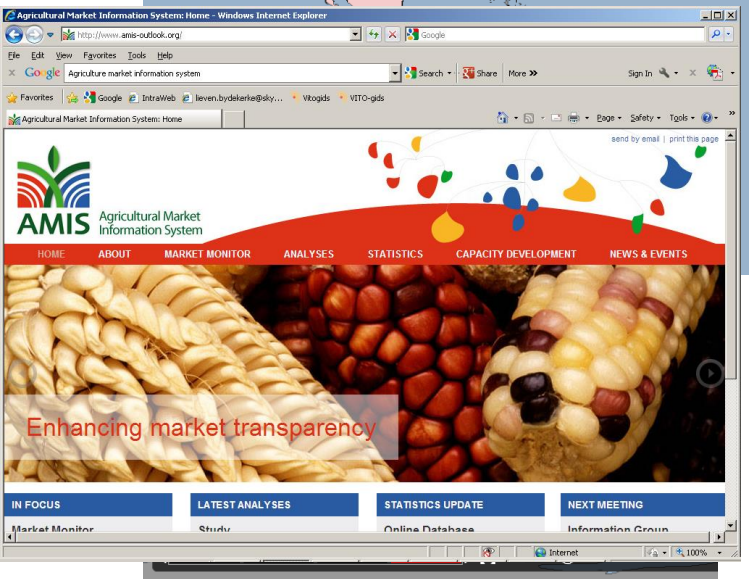
Stimulating Innovation for Global Monitoring of Agriculture

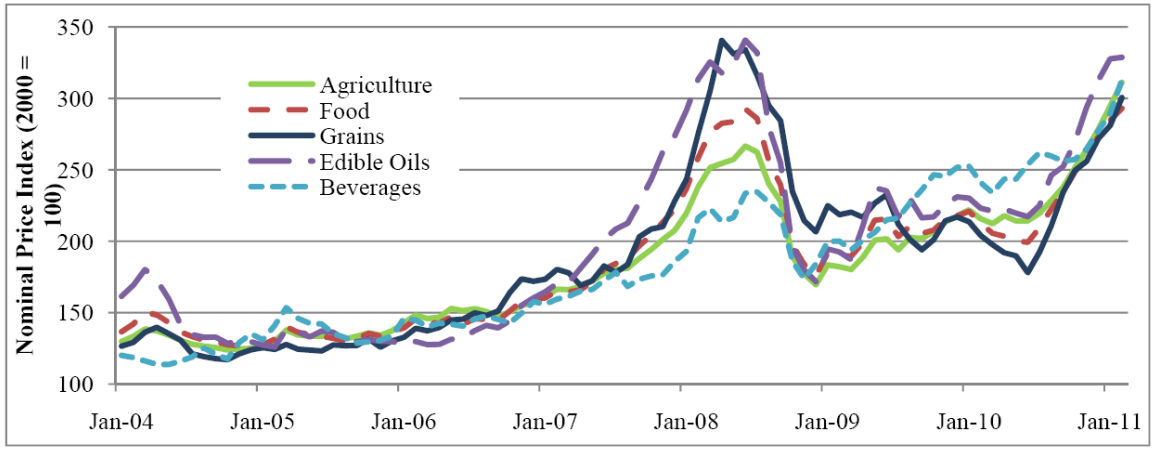
SIGMA project

Overview

Background







Source: World Bank.

SIGMA
Stimulating Innovation for
Global Monitoring of Agriculture

SIGMA - Facts

- Start 1 November 2013 – 30 March 2017
- Agriculture AND Environment
- 22 partners in 17 countries

SIGMA
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SIGMA Partners

VITO, CIRAD, JRC, IIASA, Alterra, RADI, NMSC, DEIMOS, GeoSAS, RCMRD, Aghrymet, Sarvision, Sarmap, INTA, Geoville, UCL, EFTAS, FAO, ITC, GISAT, IKI, SRI

SIGMA Partners Coordinated by

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- Argentina, Ukraine, China, Russia, Africa, USA, Brazil, Vietnam, Belgium, …
- 9 M EUR
- GEO! (& GEOGLAM)

EUROPEAN COMMISSION / European Research Area / Environment

EARTH OBSERVATION

SIGMA
Stimulating Innovation for Global Monitoring of Agriculture

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

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?

Earth observation

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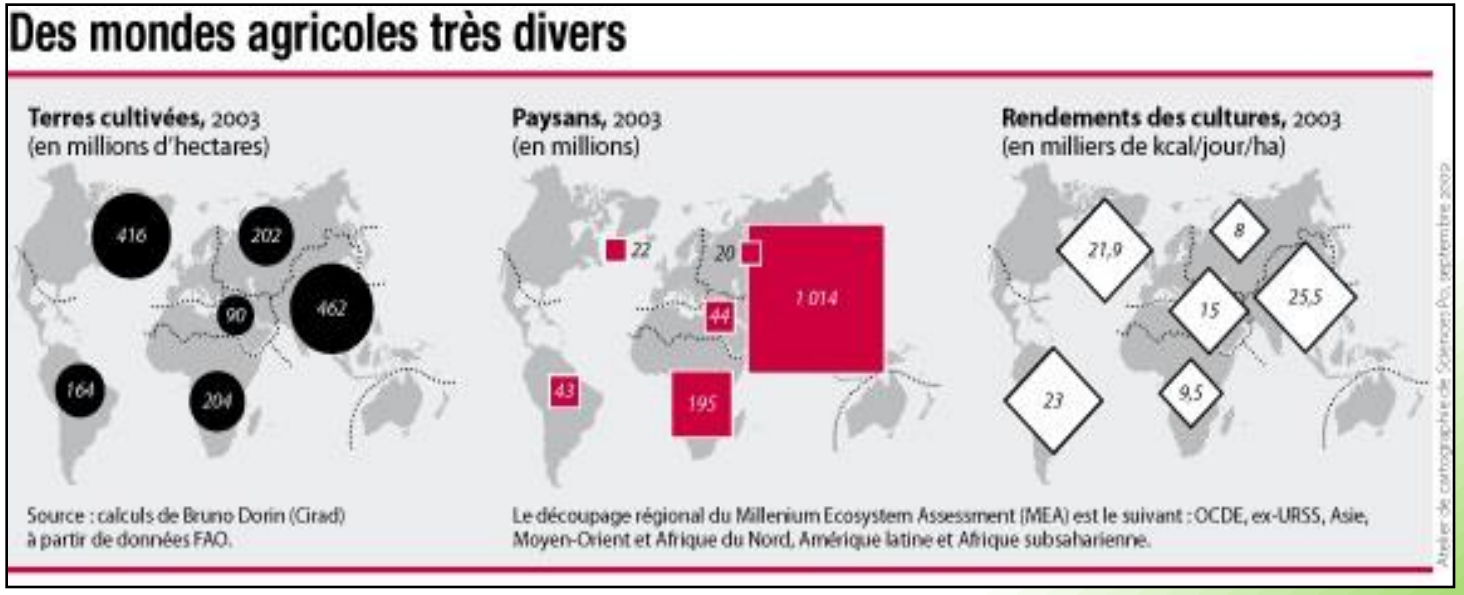
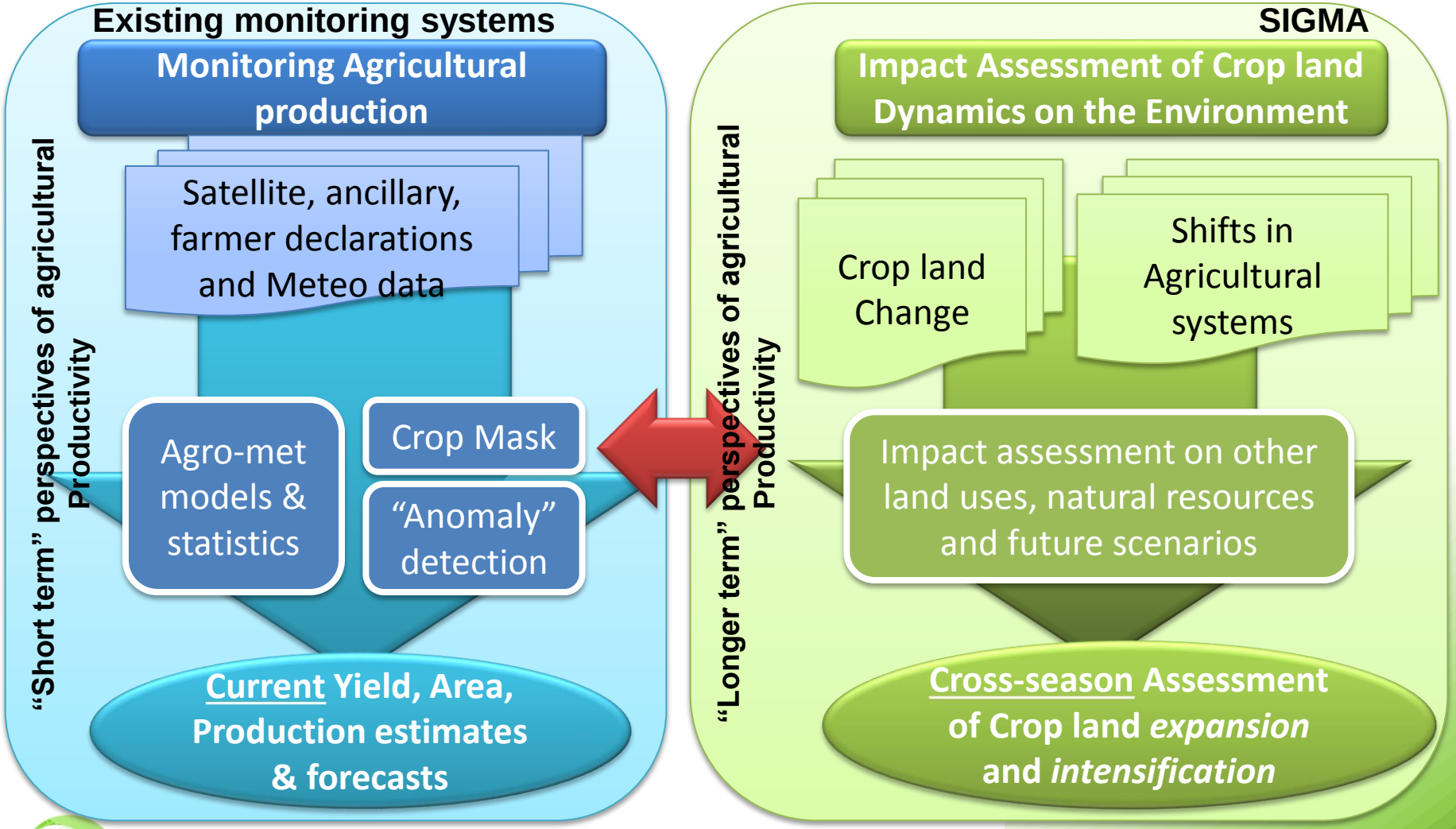
Challenge

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



SIGMA Concept



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Activities

Land cover & crop land assessment

(UCL)

Agricultural Productivity

(Alterra)

Env. Impact Assessment of Land use change

(IIASA)

Sites: IKI RAN, SRI, RADI, CIRAD, INTA, VITO, UCL, GEOSAS, AGHRYMET

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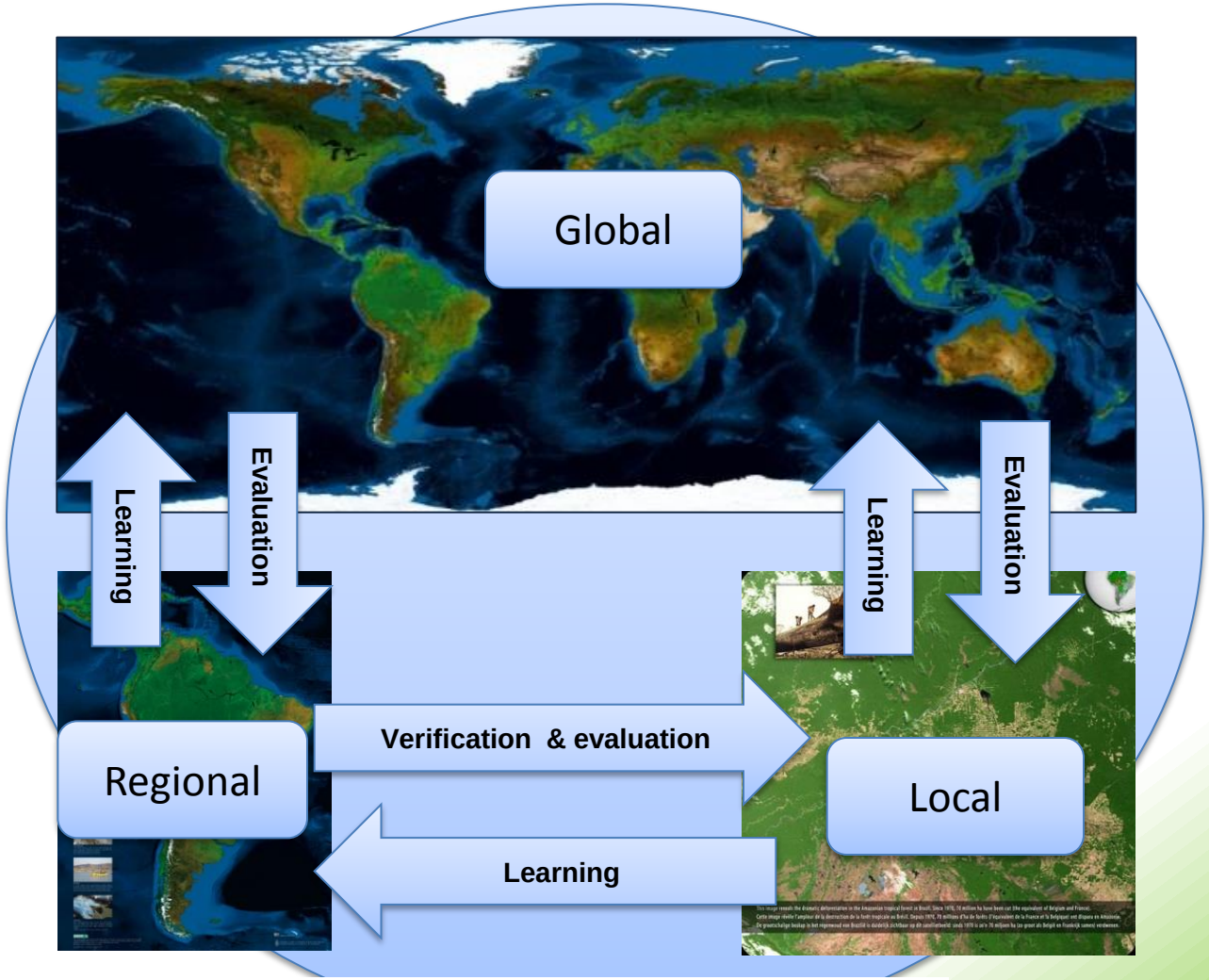
Global?



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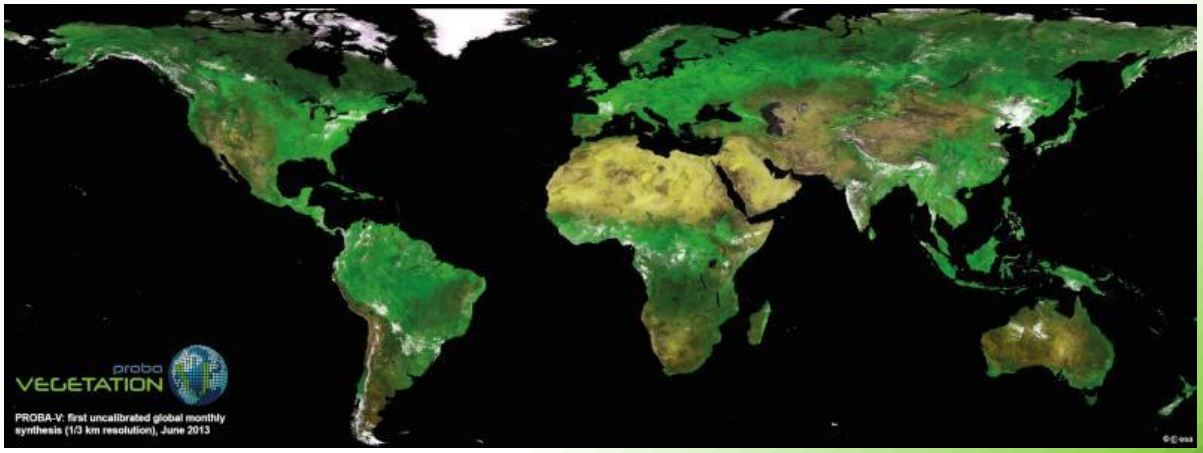
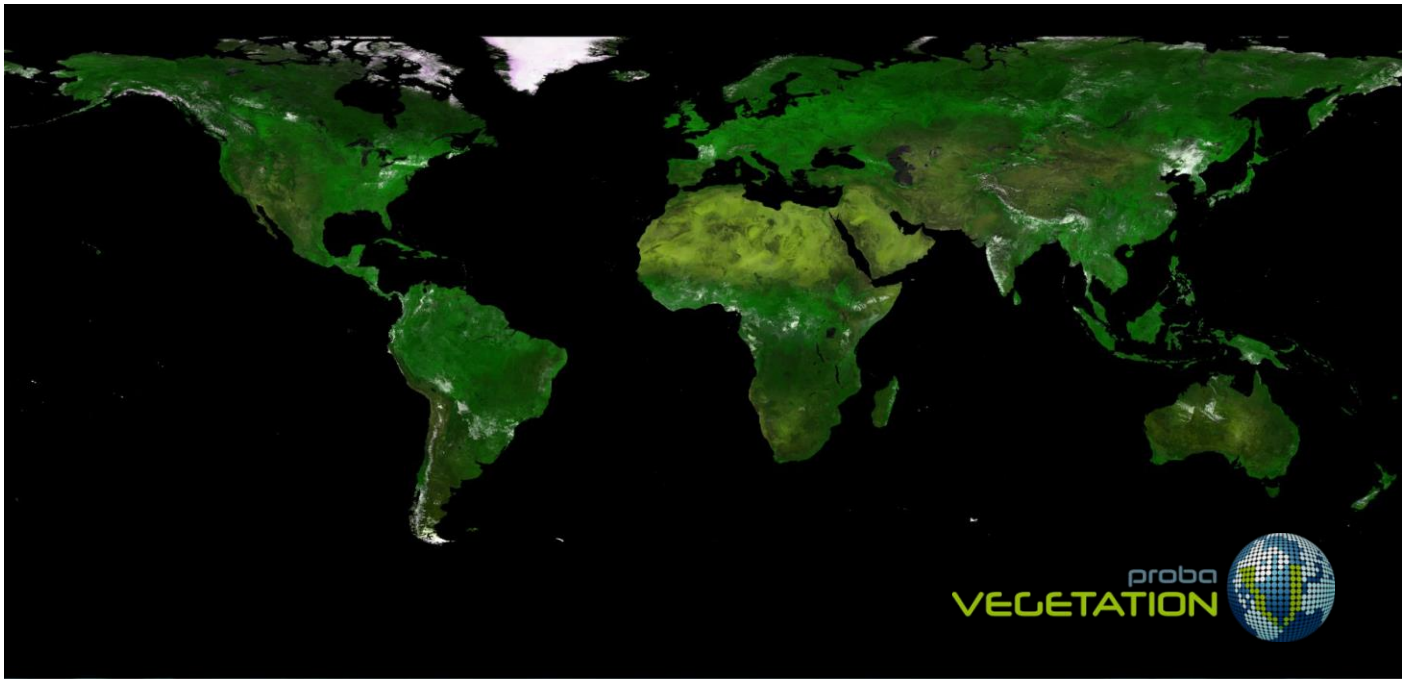
Dataset Coordination

- With JECAM Coordination office & GEO Sec
- Baseline data sets
  - Sites
    - Field data
    - Satellite data (SAR, Landsat, Sentinel, DEIMOS, DMC, VHR, ..)
  - Regional, Global. Time series of:
    - FY-3
    - PROBA-V
    - MODIS / VIIRS
    - Sentinel-3
    - Metop
    - …



Variety of data sources



- FY-3, DEIMOS-1, PROBA-V, Operationally available since November 2013
- To come: Sentinel 1-2-3
- Very High Resolution
- CEOS through GEOGLAM

JECAM
Joint Experiment for Crop Assessment and Monitoring

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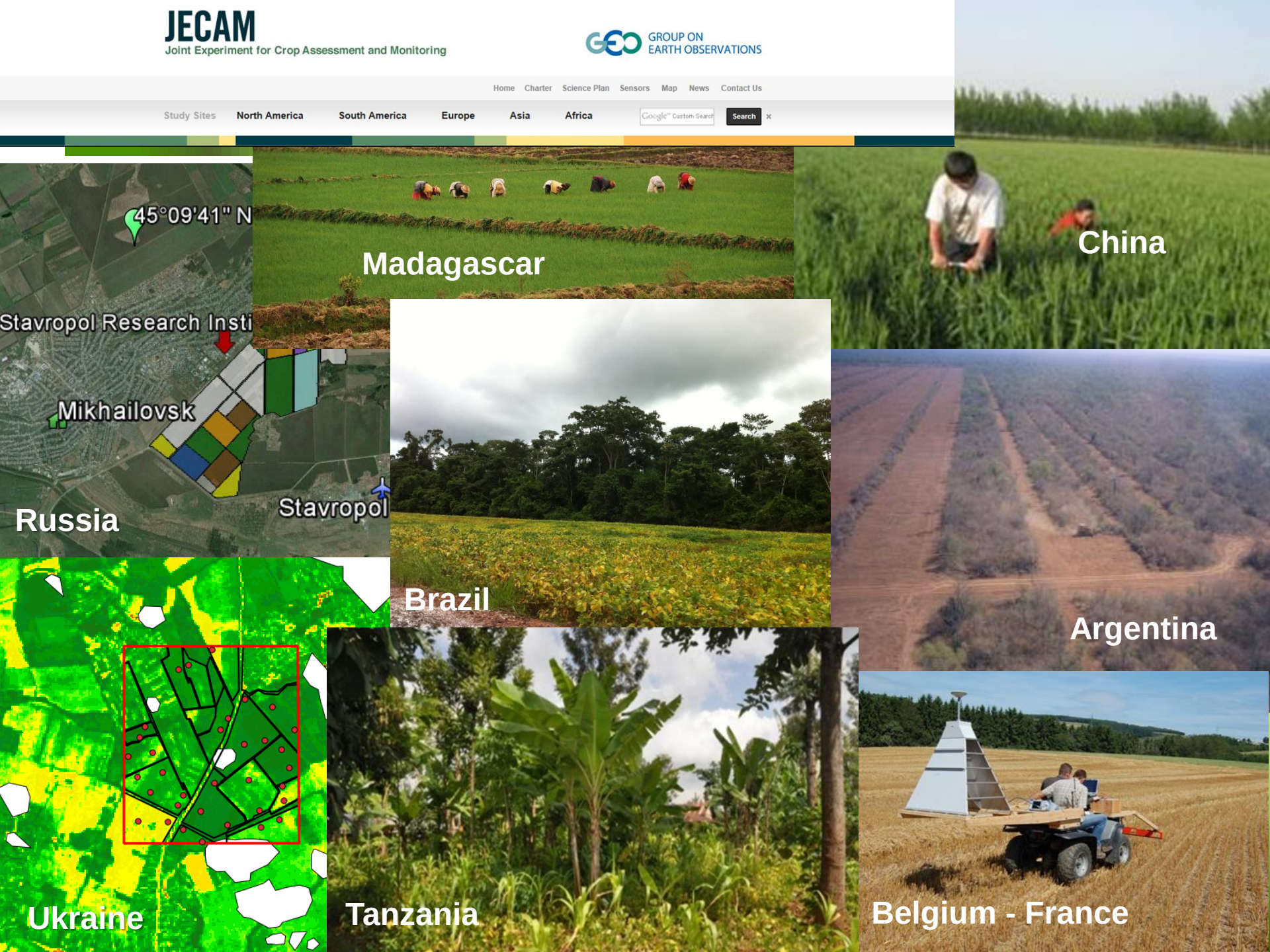
JECAM
Joint Experiment for Crop Assessment and Monitoring
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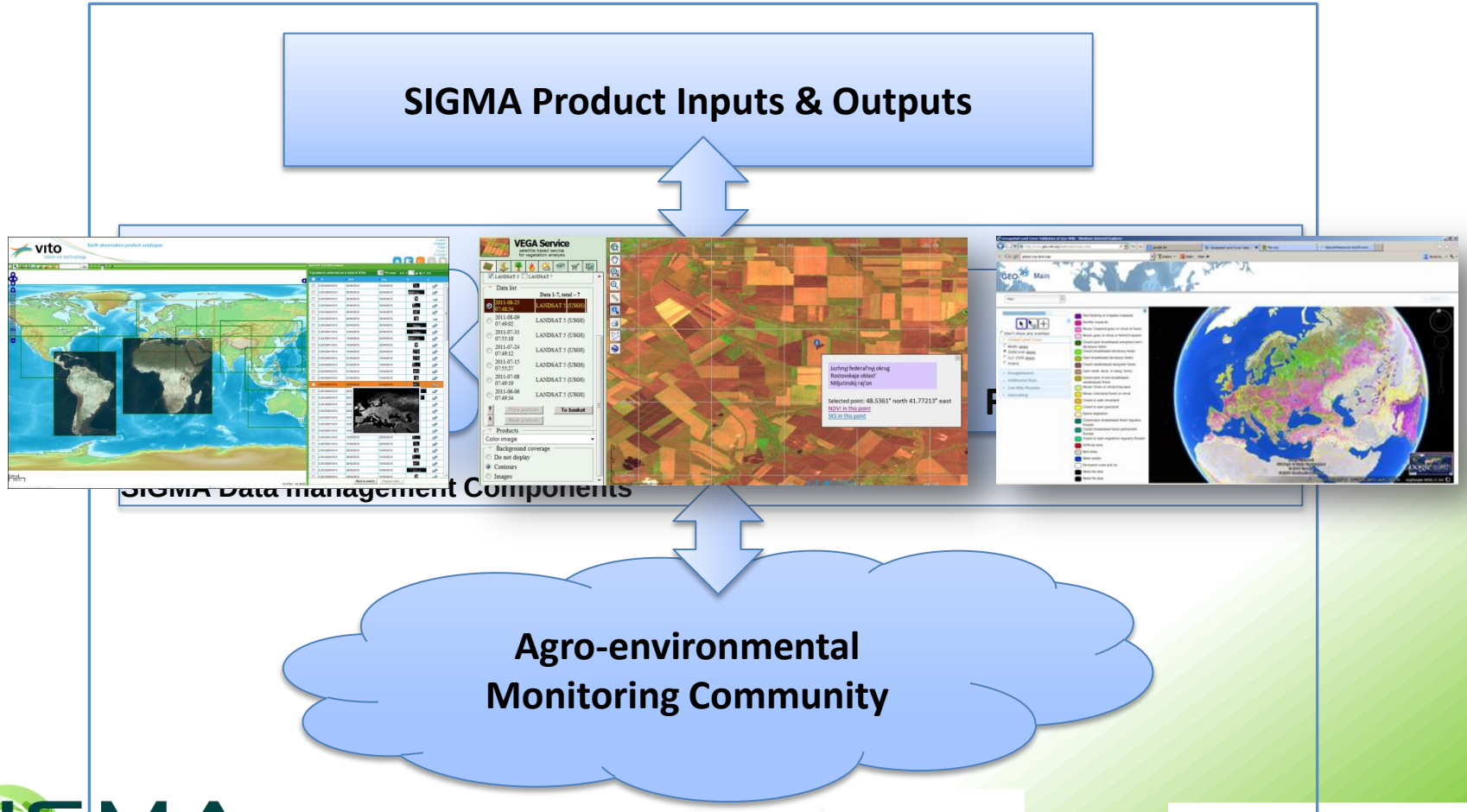
Mikhailovsk
Stavropol
Russia
Madagascar
China
Brazil
Argentina
Ukraine
Tanzania
Belgium - France

Field data collection

- A priori information: maps, statistics, crop calendars
  - Topography, soil (texture, type, rooting depth), climatic data (rainfall, radiation, temperature), yields (5years)
- Survey:
  - GPS coordinates
    - Points: Road, stratified grid
    - Field boundaries
  - Landcover information:
    - Land cover;
    - Crops: crop type
    - Crops: ancillary
      - » rainfed, irrigated, partially irrigated
      - » Main cropping practise (tillage management, rotatoin, multi-cropping, use of chemicals / fertilizers, mechanization, sowing/flowering/harvesting dates, livestock)

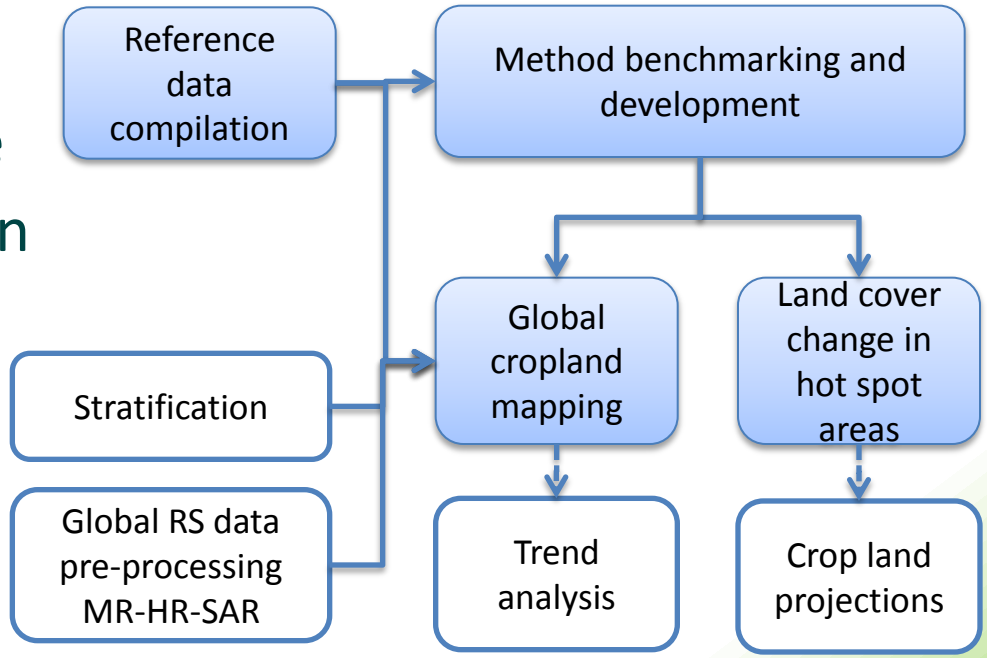
Data management

- GEOSS standards



Land cover & crop land assessment

- Challenge:
  - Diversity of systems
  - Variable field sizes, scale
  - Landscape fragmentation
- Approach
  - Agro-env stratification
  - Reference data
  - Method benchmarking
  - Site, Regional, global, hotspots
  - Agricultural statistics

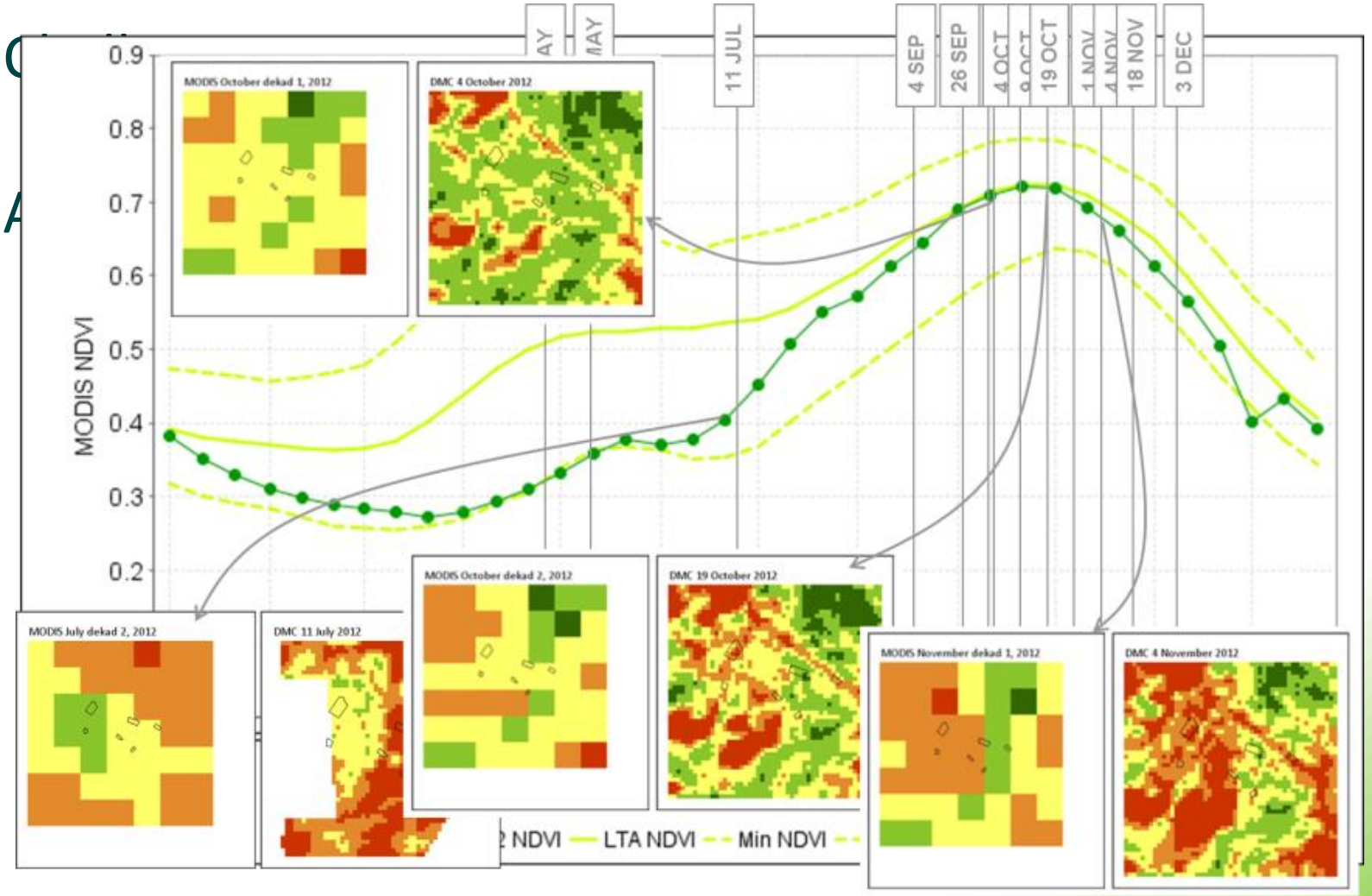


Agricultural Productivity

- Challenge:
  - Agricultural systems dynamics & management practises
- Approach
  - Trend analysis of environmental parameters
    - Multiple data sets & Compatibility
    - Soil Moisture, evapotranspiration
    - High resolution + Low resolution
    - Change detection
  - Agricultural systems analysis
    - Characterization
      - » Cropping system, species, rotation
  - Analyze Yield gaps using crop models & EO

Agricultural Productivity

- C
- A



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Env. Impact Assessment of Landuse Change

- Challenge
  - Methodology
- Approach:
  - Local
    - Impact analysis of land use and management changes
    - Identify stress factors of yield gap analysis
  - Projections
    - Projections of cropland and major systems for 2030, 2050
    - Assess impacts on agricultural productivity
  - Global
    - Impact of crop land changes on other land cover types, water use and nutrient balances

Capacity building

- Capacity needs assessment
  - Agricultural Statistics
  - Global/national Agricultural land use and crop yield assessments
- Design curriculum
  - Modules
- Training and E-learning materials
- 4 international workshops / seminars

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Expected output

- Scientific
- Products
  - Global agro-environmental stratification Database
  - Multi-resolution annual cropland maps
  - Country Land cover analysis database for selected areas
  - Time series of satellite derived parameters
  - Hotspot maps identifying zones with high variability and agro-environmental changes and description
  - Maps of potential/actual yield and gaps
  - Training materials
  - SIGMA Data Management Portal

Thank You!

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