WHEN SPACE MEETS AGRICULTURE

14-15 November 2016 | Matera, Italy

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HOW CAN SPACE MAKE A DIFFERENCE FOR AGRICULTURE SECTOR?

Image from ESA Sentinel

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REGIONE BASILICATA

nereus
network of european regions using space technologies

in collaboration with

TeRN

and the support of

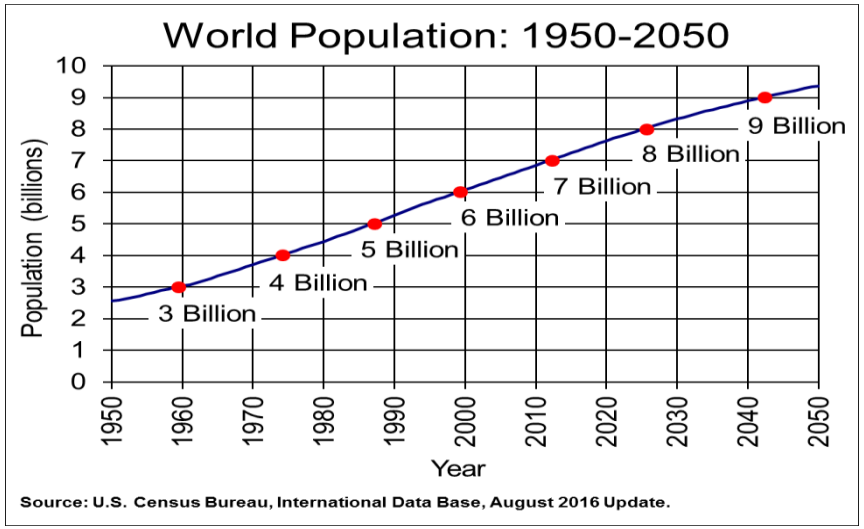
ERIAFF Network
European Regions for Innovation in Agriculture, Food and Forestry

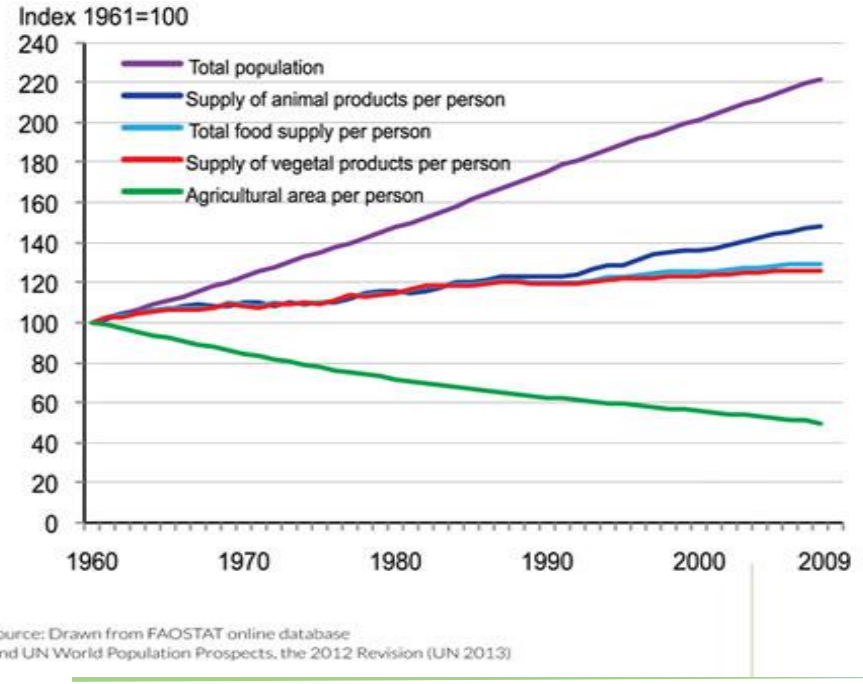
THE GLOBAL FOOD CHALLANGE

- **World Population Grow** (6.1 billion people in 2000, today 7.4 billion, in 2050 9.7 billion).

- **Increasing demand of food**: for animal products in 2050 it will be 76% more than 2005, 45% more for cereals

- **Strong increase of land use** for urbanization and abandonment of the agricultural sector



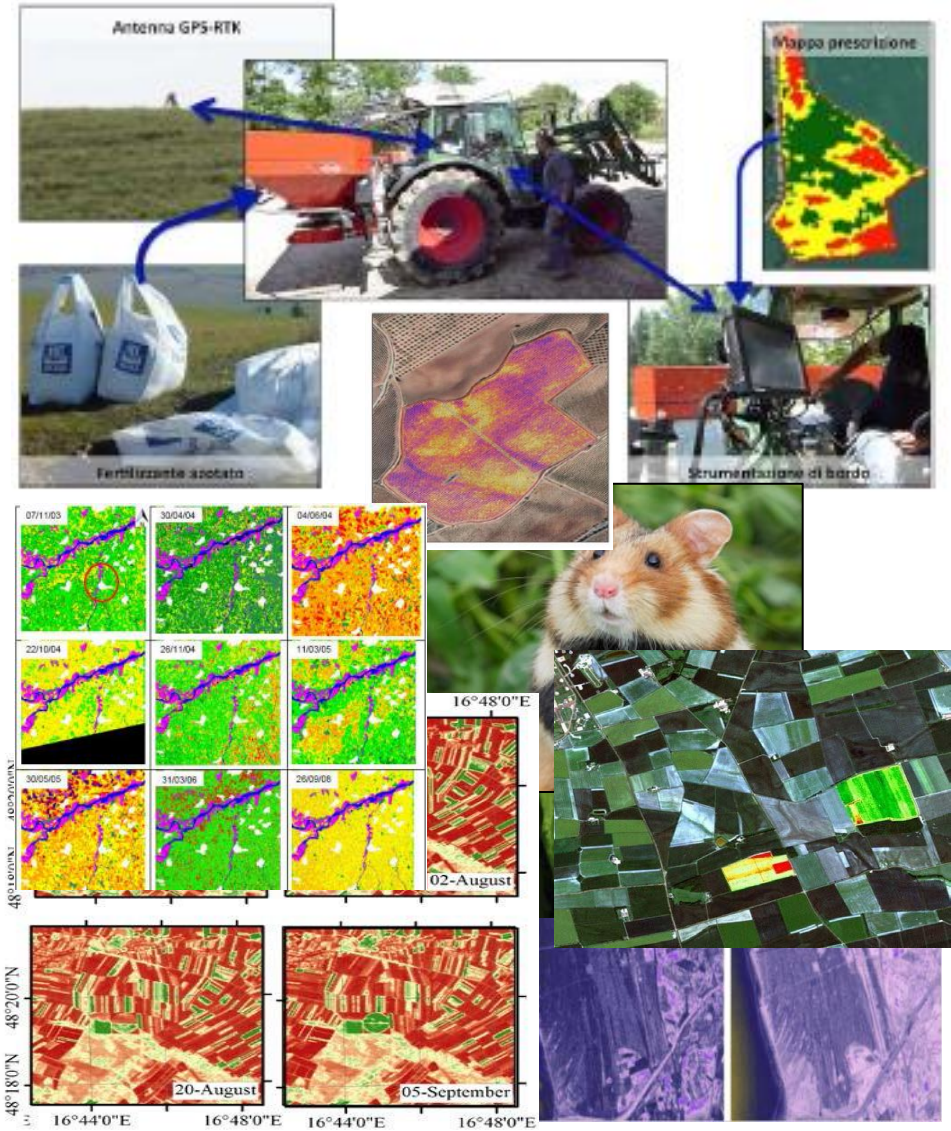


more people will need a lot more food having much less space to grow it !

TO DO MORE TO DO BETTER

Space technologies can make a difference

- Management of inputs for Precision Agriculture and Precision Livestock
- Crops monitoring and harvest forecast
- Risk management system for insurance purposes
- Natural Hazards Protection
- Soil Degradation/Soil Quality monitoring
- Drought monitoring
- Landscape Protection
- Biodiversity Protection
- CAP eligibility and Greening compliance controls
- Rural Development



THE NEREUS PILOT INITIATIVE TO BRING SPACE SOLUTIONS WITHIN THE EIP-AGRICULTURE

Agriculture was identified as the most promising sector for ST

- a **fully scalable market** from supranational up to individual enterprises/customers
- unprecedented capabilities of **new satellite systems** (e.g. Sentinels 1 & 2, Landsat 8, Galileo-GNSS, etc.) and the **open data policy** can guarantee returns in a huge and continuously increasing market
- **huge EU/National/Regional funds** available for acquiring new services

THE STUDY: HOW CAN SPACE MAKE A DIFFERENCE FOR AGRICULTURE SECTOR

published ONLINE on NEREUS website as a LIVING DOCUMENT
at: http://www.nereus-regions.eu

nereus
network of european regions using space technologies

How Can Space Make a Difference for the Agriculture Sector

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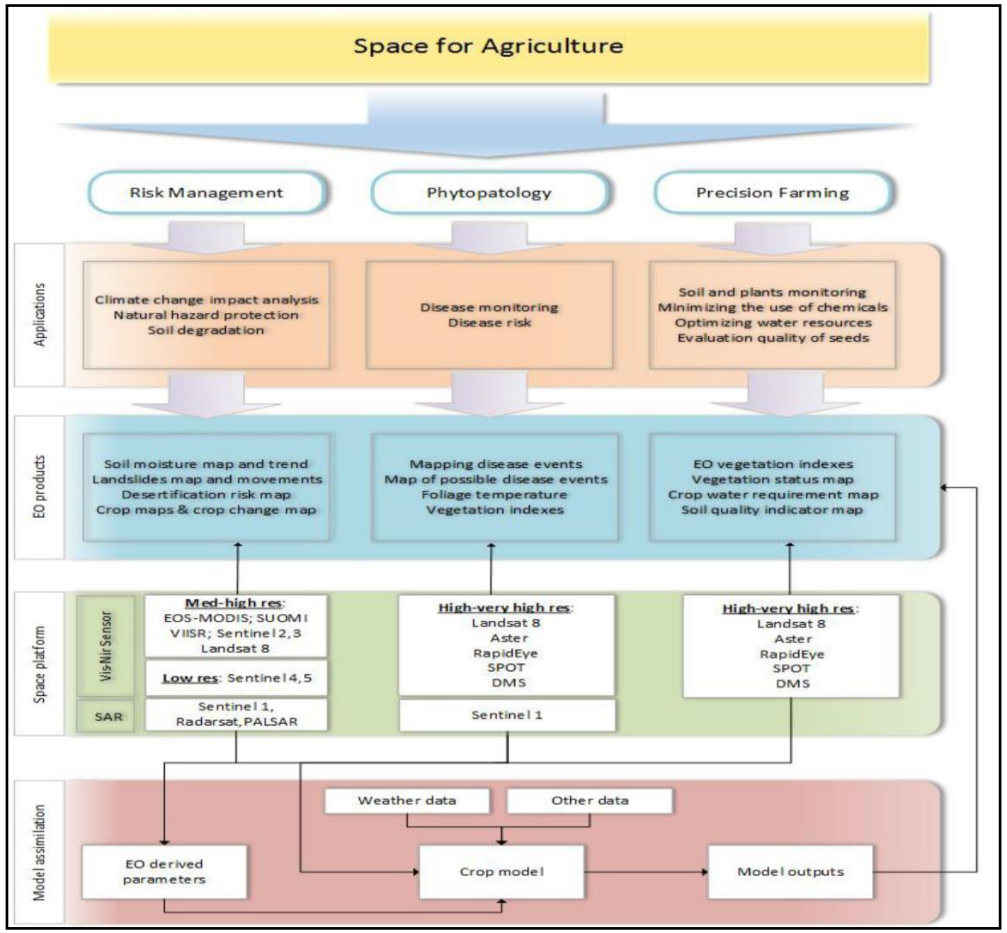
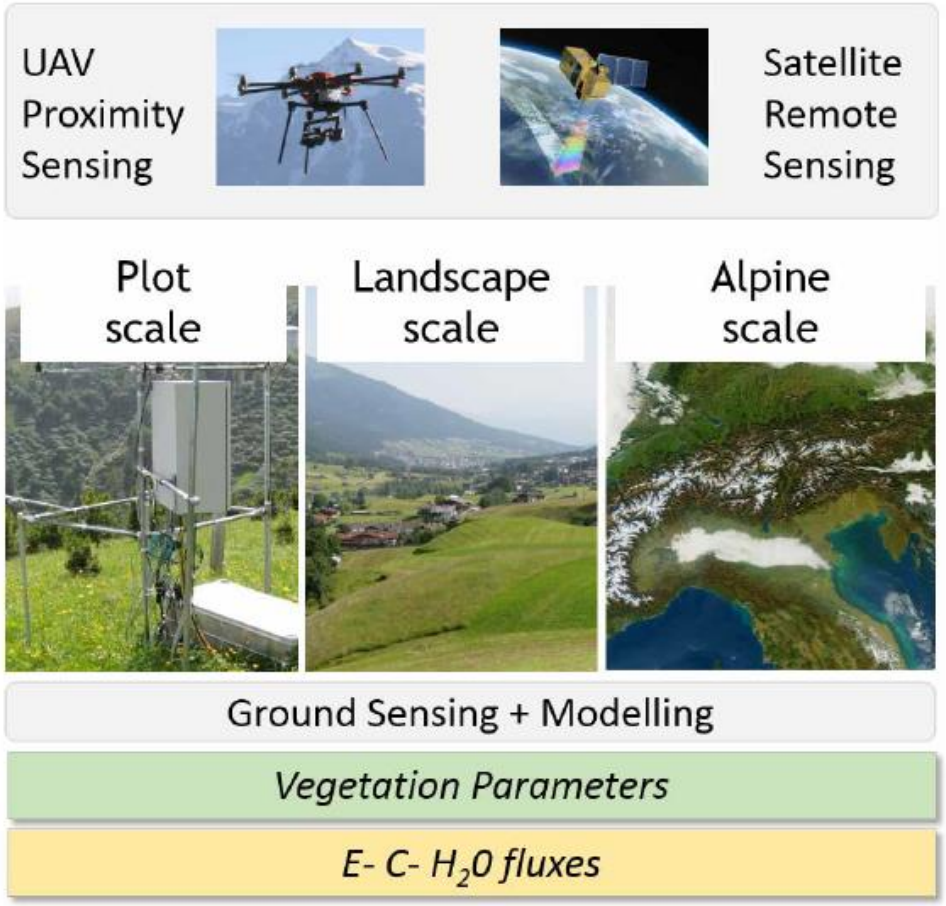


ALTO ADIGE/SÜD TIROL (Italy):

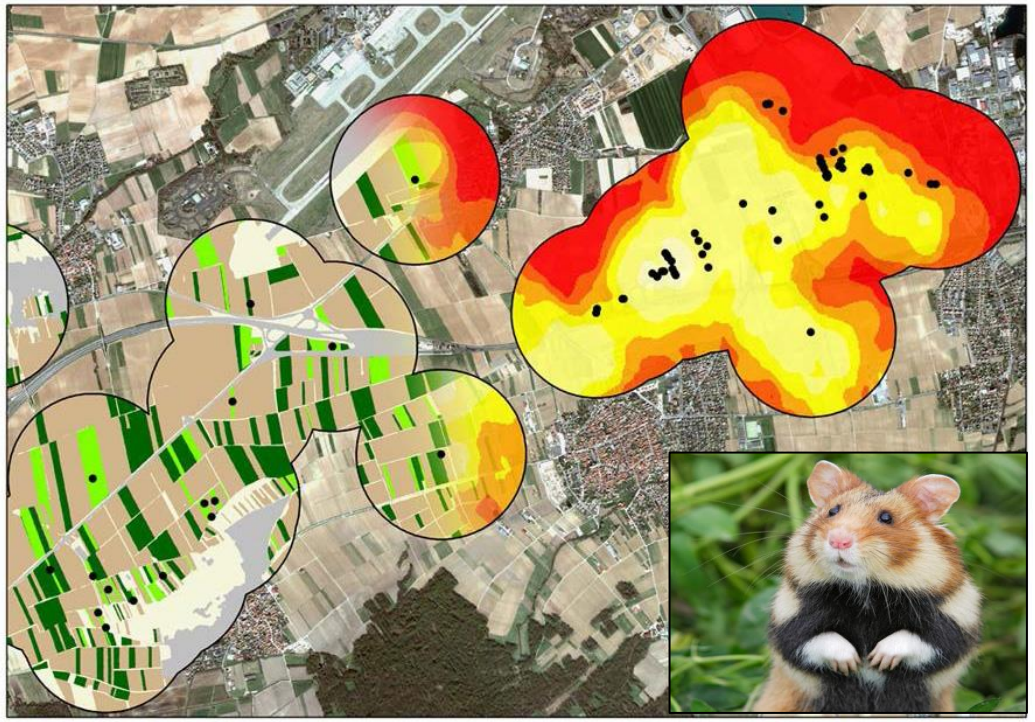
Monitoring mountain agricultural areas (grass and orchard) with remote sensing techniques integrating with proximal sensing, ground data and models

Main challenge:
to perform an effective **management** of economic activities in the Alps, like **grasslands and apple orchards**, an integrated system based on remote sensing, proximal sensing, ground data and model is developed.



ALSACE (France):
A tool for agricultural planning in the context of biodiversity conservation

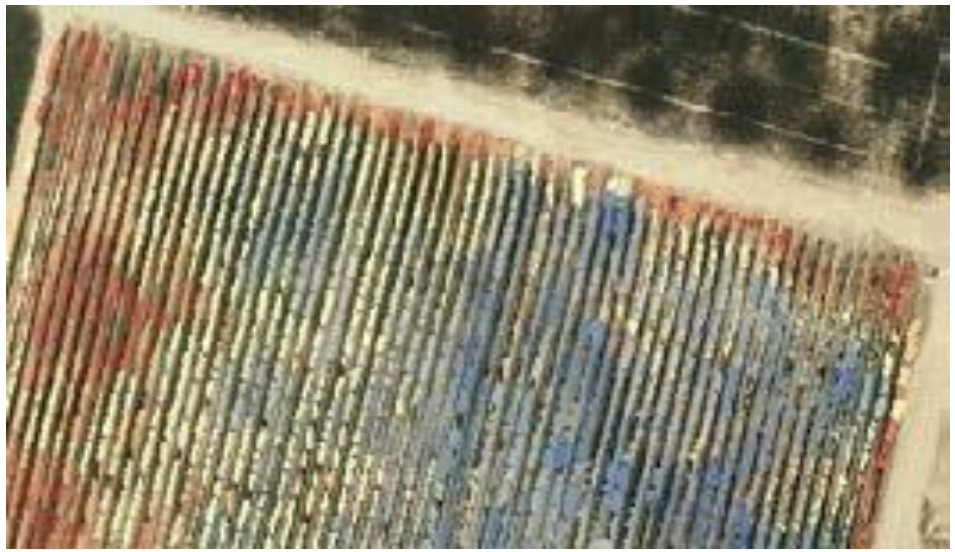
Main challenge:
The early spring landcover mapping of areas populated by hamsters in Alsace, using high or very high resolution satellite imagery (SPOT5/Pléiades, CNES), highlights **hamster-friendly crops as well as unfavourable areas** – such as bare soils and artificial features – giving an accurate idea of the situation at the end of the rodent's hibernation period, which appears as a key moment for hamster survival.

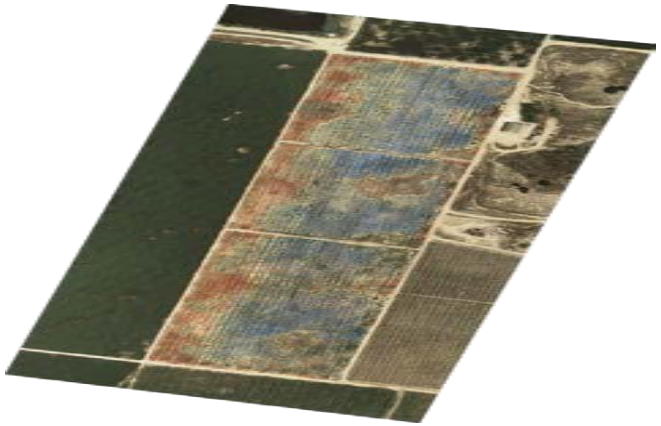


Satellite imagery, derived landuse mapping and ecological indicator over burrows areas [© SERTIT]

ANDALUSIA (Spain) :
GPS-EGNOS based precision agriculture using unmanned aerial vehicles

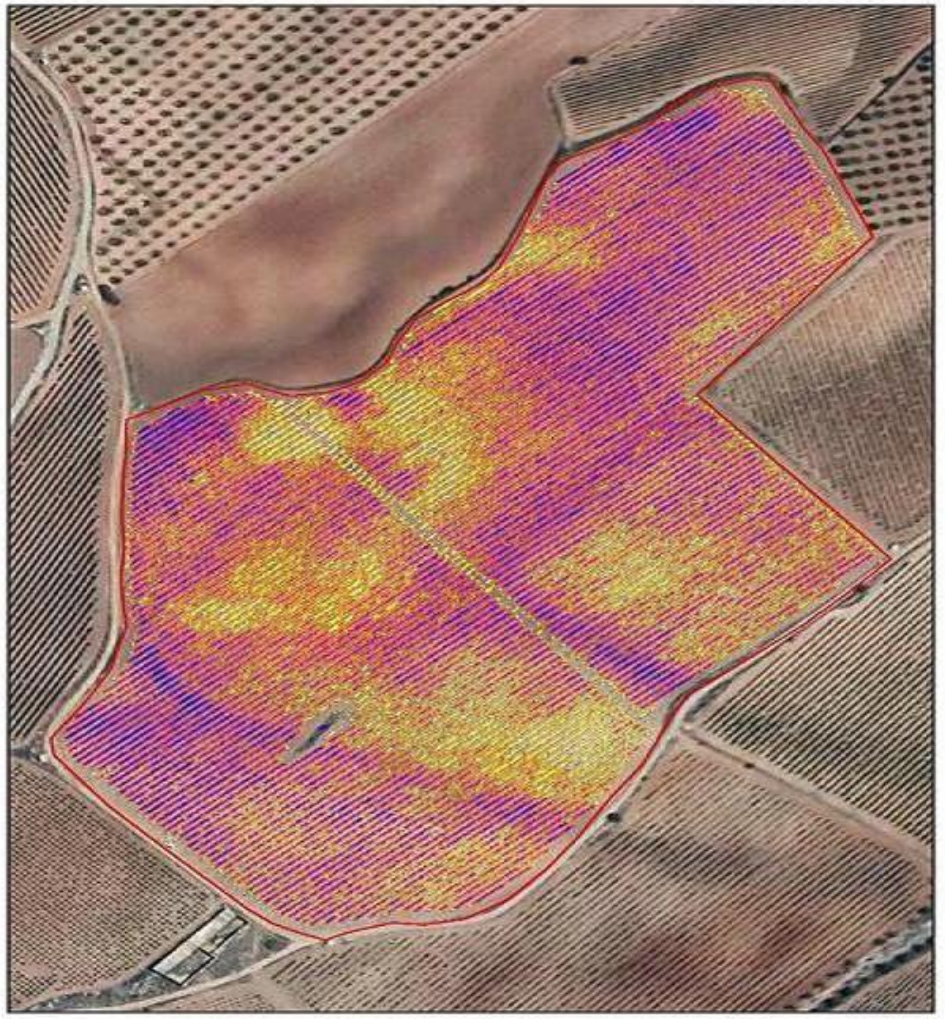
Main challenge:
to create an autonomous flying camera that follows a predefined pattern. FieldCopter has demonstrated its operational viability in two distinct cases: **potato growth & vineyard monitoring**. Next to potatoes and vineyards, the FieldCopter service has explored simultaneously for other promising high value crops, such as vegetables, flowers and orchards (apples, oranges).





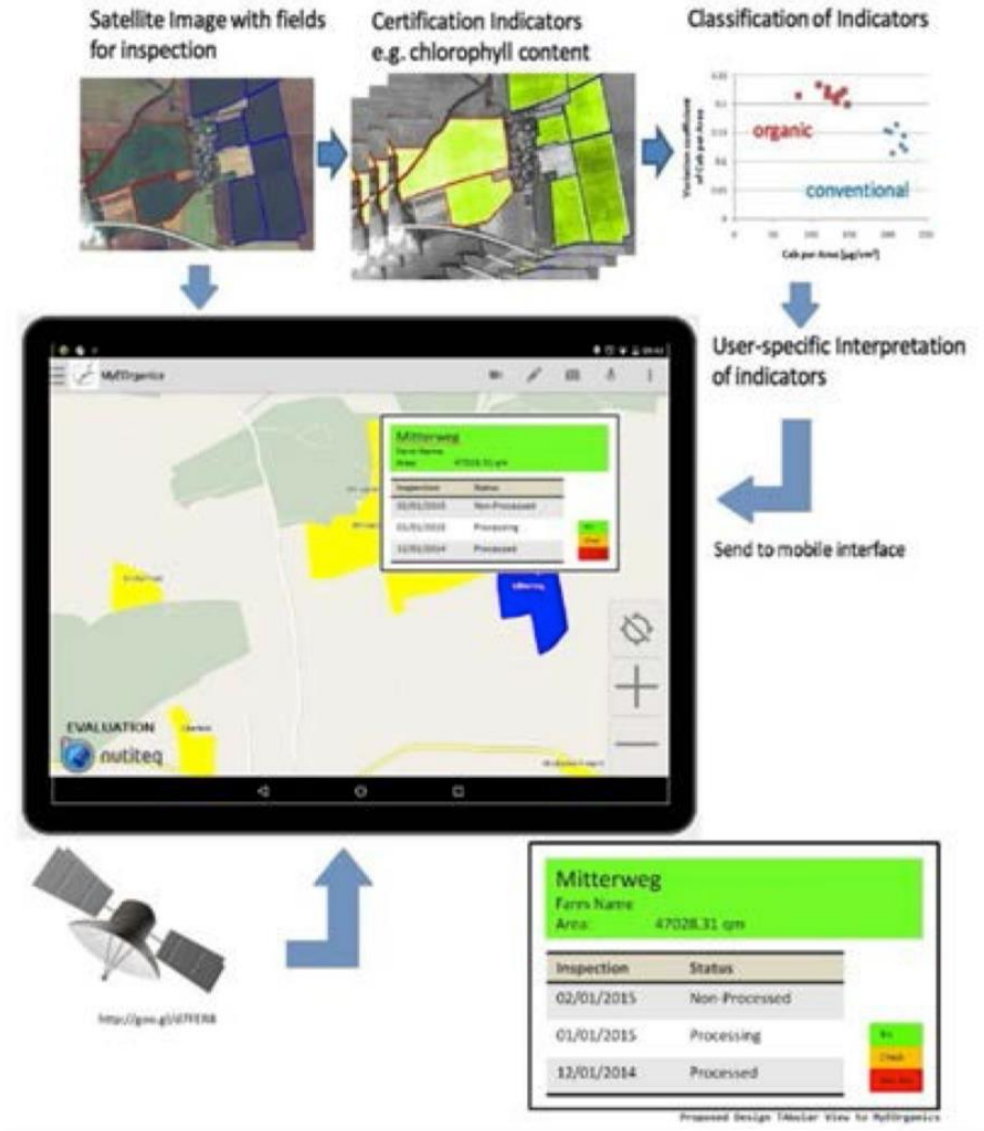
ARAGON (Spain):
Very high resolution imagery for vineyard segmentation

Main challenge:
to identify homogeneous units of territory in a wine protected denomination of origin area at a detailed scale in order to know the **characteristics of the wines produced in each unit of territory**. The results of this classification will be then used to define better **wine production and management strategies**.



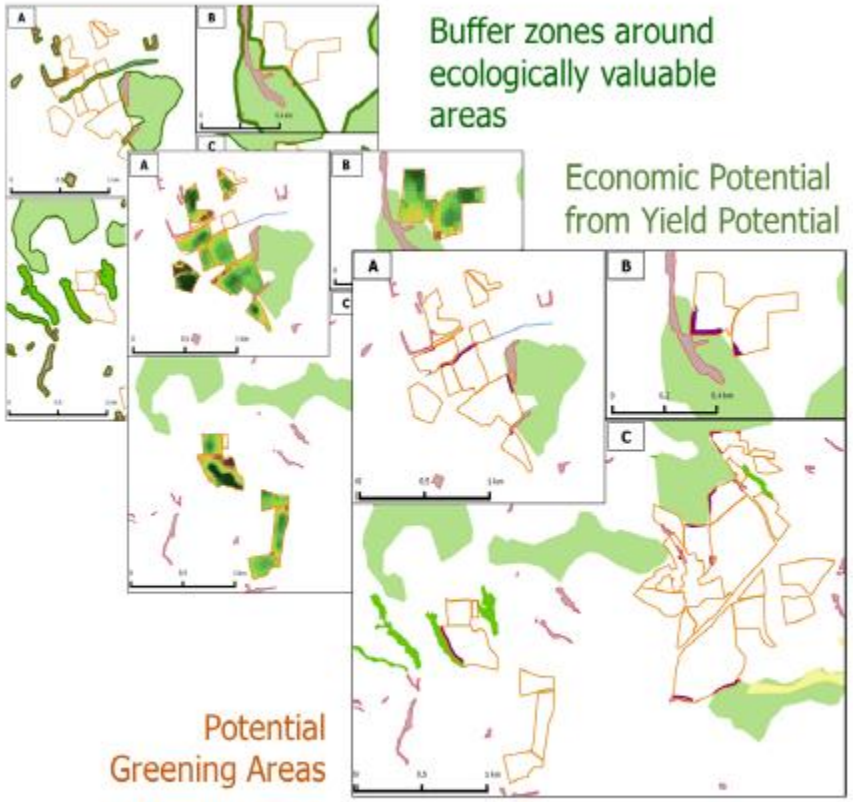
BAVARIA (Germany):
Mobile technology supporting sustainable agriculture

Main challenge:
to develop a mobile app that displays localised information on field, based on processed EO data, to support **certification of organic farming** which is a lengthy and cost intensive process and at the same time fundamental for food security and consumer trust.



BAVARIA (Germany):
Combining satellite imagery and open data to derive yield potential for greening

Main challenge:
One core point of the **Greening Directive** is the designation of 5% of the arable area of a farm as **ecological focus areas** on which agricultural usage underlies strict regulations or is terminated completely.
Using time-series of Earth Observation (EO) data we investigate plant-growth patterns indicating differing productivity within the agricultural unit providing decision support for farmers to help them to identify areas within their arable land that are especially suitable to serve as ecological focus areas.

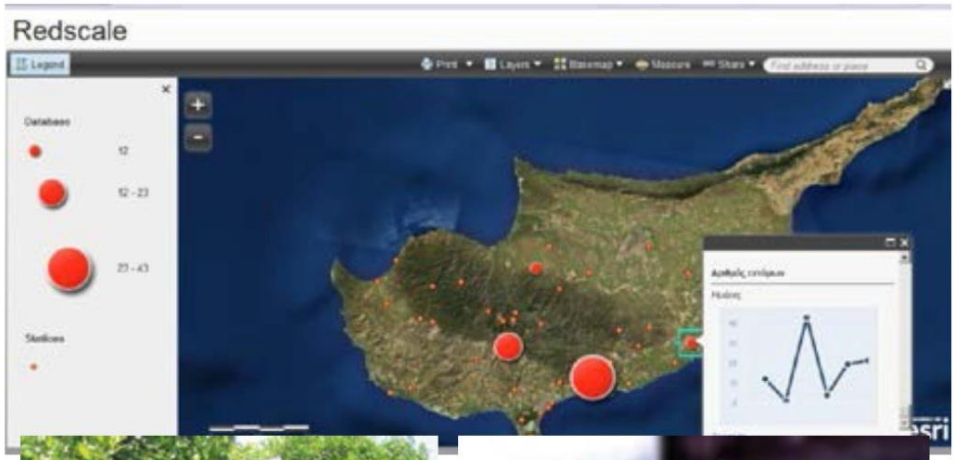


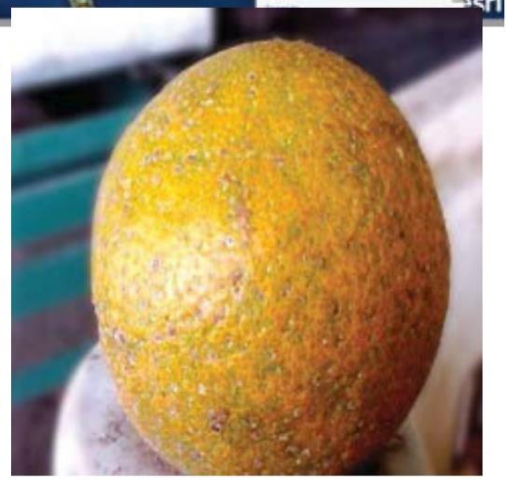
Calculation of potential Greening areas for a Bavarian farm.

CYPRUS :

Development of an automated system for monitoring redscale population using image analysis, wireless networks and GIS technologies

Main challenge:
to develop an automated, energy independent trap for **continuous monitoring/identification** of the RedScale (Aonidiella Aurantii) which is a major **citrus pest** on a worldwide scale .





EAST MIDDLANDS (UK) :
High-value crop monitoring

Main challenge:
to develop a proof of concept for a near-real-time, dynamic integrated **crop monitoring service** derived from Earth Observation and in-situ data.

Potato fields in Lincolnshire as imaged by Rapideye

LAGADAS (GREECE-BULGARIA) :

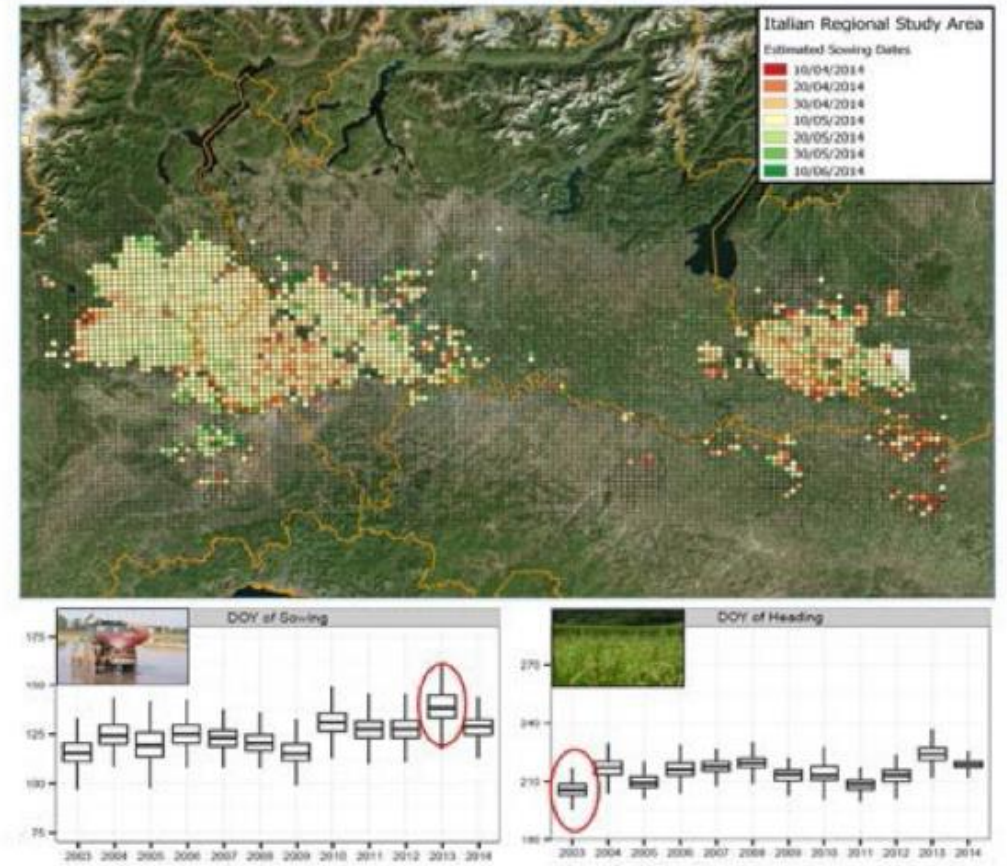
AGRO_LESS – Joint reference strategies for rural activities of reduced inputs

Main challenge:

to adopt a strategic reference framework in a cross-border region for the support of the rural population in the application of **reduced input agriculture** driven through the practices of agricultural activities (fertilization, irrigation and crop protection) leading to reduced impact of agro-products on the environment and maximising the product quality of agricultural goods.

LOMBARDY (Italy):
Earth observation technologies for rice crop monitoring

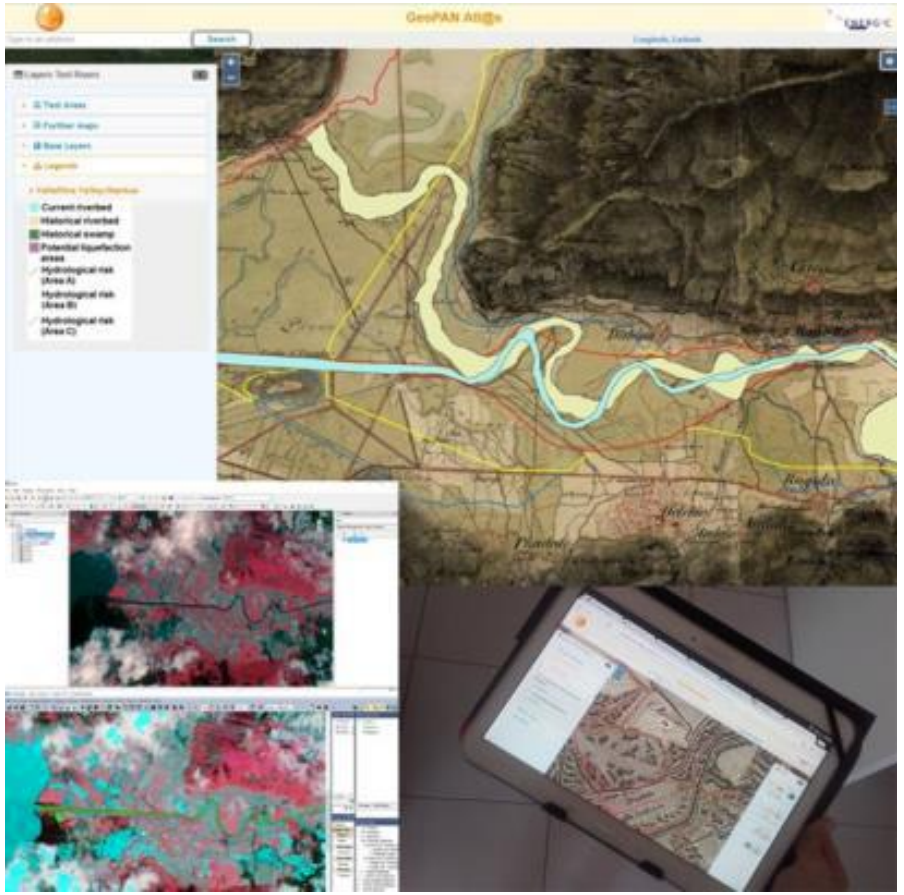
Main challenge:
Integrating in crop models, operational Copernicus core products, maps derived from SAR and optical satellite data and in situ observations to **estimate daily biotic and a-biotic risk and final crop yield**



Estimation of phenological dates from MODIS time series. 2014 sowing map (top panel) and 2003-2014 statisitcs (bottom panel)

LOMBARDY (Italy):
Satellite EO meets historical maps: GEOPAN ATL@S APP

Main challenge:
Putting together historic territorial maps (e.g. cadastre and topographic material) with analysis that derive from Sentinel-2 imagery, GeoPan Atl@s aims to contribute to **awareness rising on the changing riverbeds** in the area of Lombardy Region (Northern Italy) and on the importance of such features for agriculture purposes in terms of ordinary irrigation but also risk mitigation (e.g. in case of flooding events).

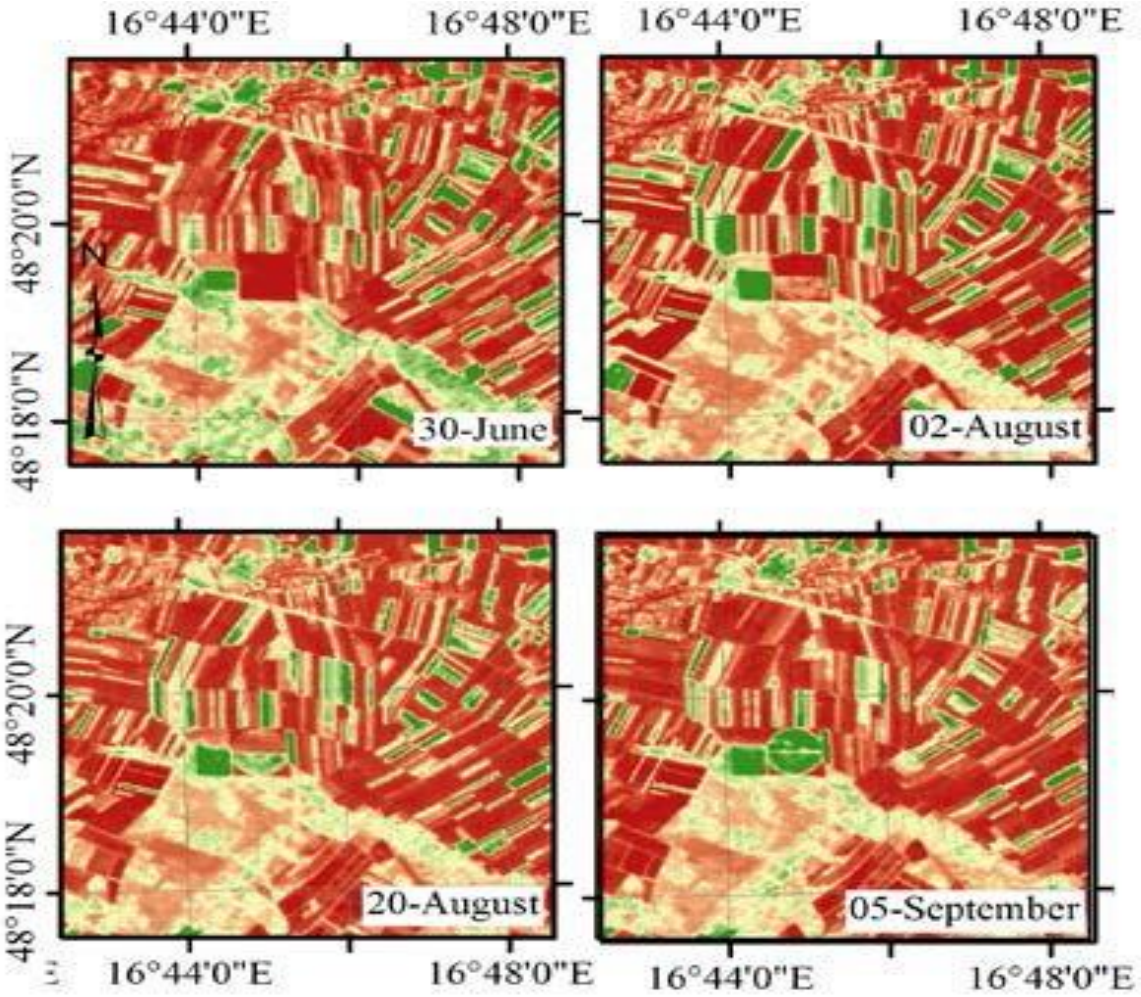


Adda Riverbed enhanced upon a historical map (above); thematic layers: NDW extraction (below left) and OBIA; multi-source data access via GeoPan using a mobile device (below right).

MARCHFELD (Austria):

Integration of low and high spatial resolution satellite data to predict inter-year variation of crop yield

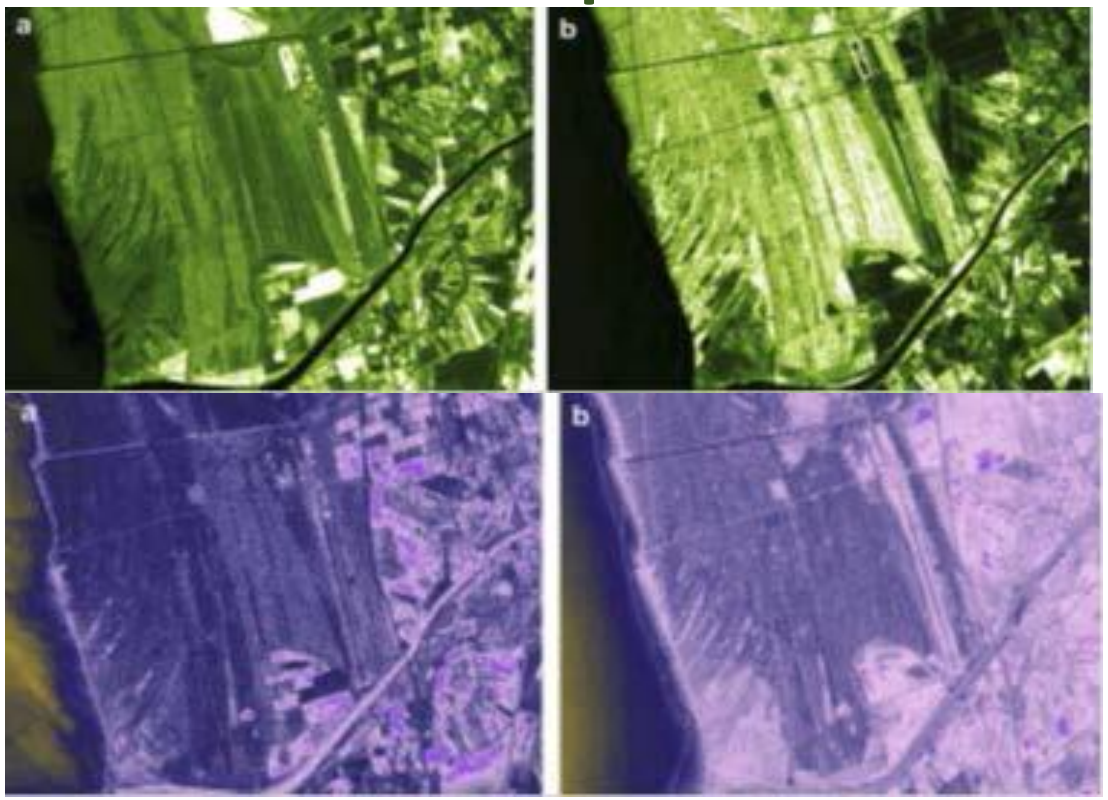
Main challenge:
to support **irrigation water management in** crop production areas like Marchfeld region, by means of Earth observation technologies.



TUSCANY (Italy):

Space technologies for monitoring crop - Assimilation of biophysical and biochemical variables in biochemical and hydrological models at landscape scale

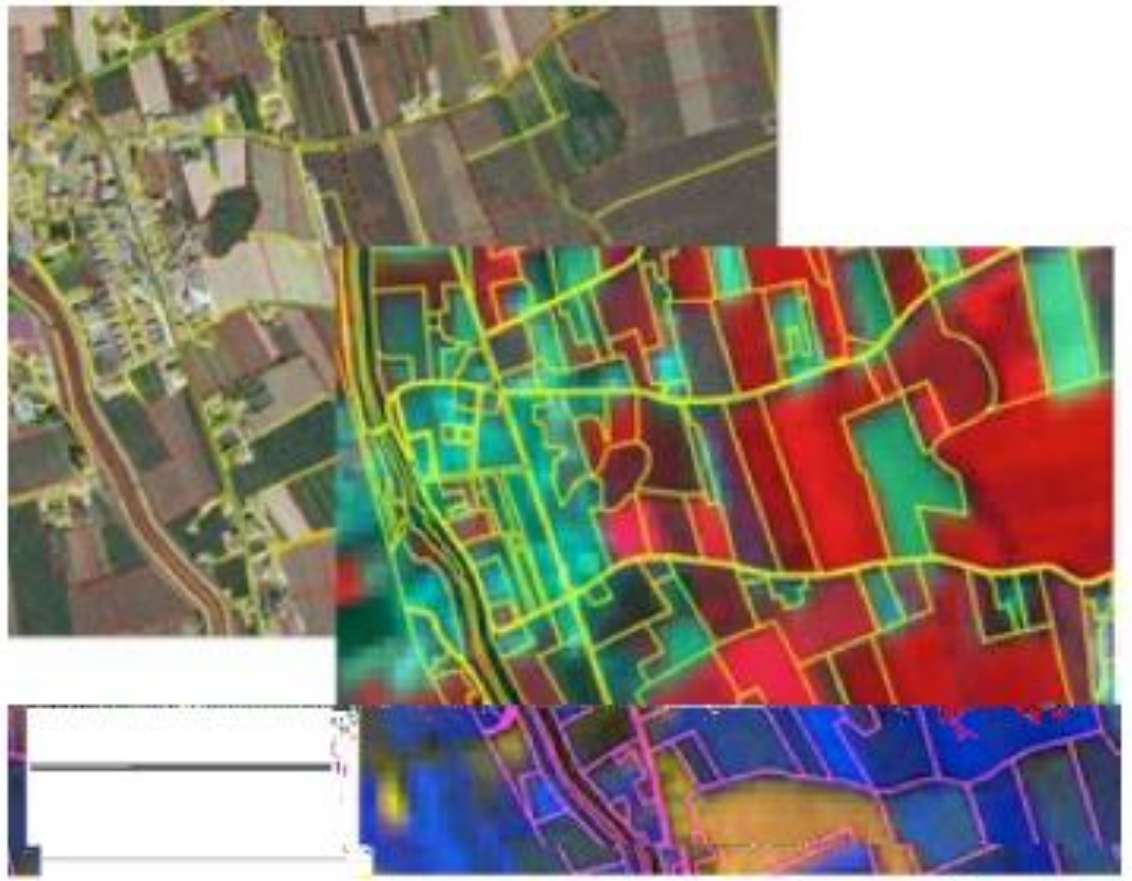
Main challenge:
to **monitor relevant changes of forestry, crops and seasonal wetland areas** at regional scale by means of remote sensed biophysical and biochemical variables.



NDVI (up) and PRI (down) images computed for the CHRIS acquisitions on: (a) 27 March 2004 and (b) on 8 September 2004.

VENETO (Italy):
A decision support system for water resources management in agricultural sector

Main challenge:
to develop a Decision Support System (DSS) for the **quantification of real water requirements of each agricultural plot**. The results could be visualized at different scale of representation: from the single plot to the entire study area (20.000 hectares).

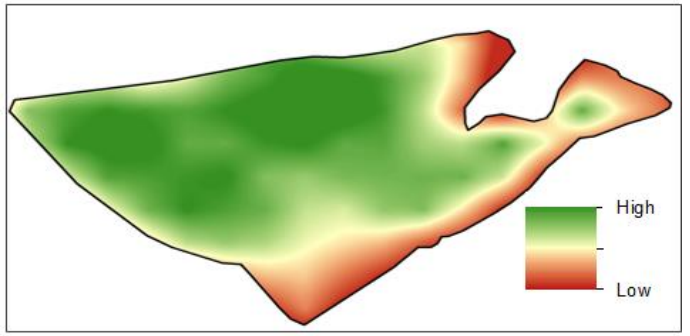


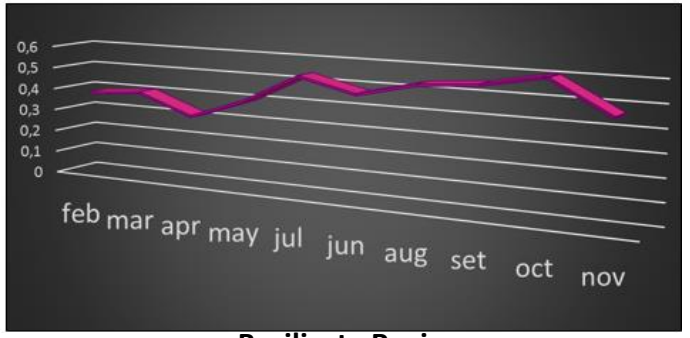
BASILICATA (Italy)

Space technologies for for vineyard management

Main challenge:

The main challenge was to develop a set of services and products, based on remotely sensed data, to improve farming operations and management decisions. In particular, the goal was to **monitor events of the vineyard's phenology, such as flowering and veraison, which are crucial for grapevine reproductive and maturity processes, through the use of space technologies.**



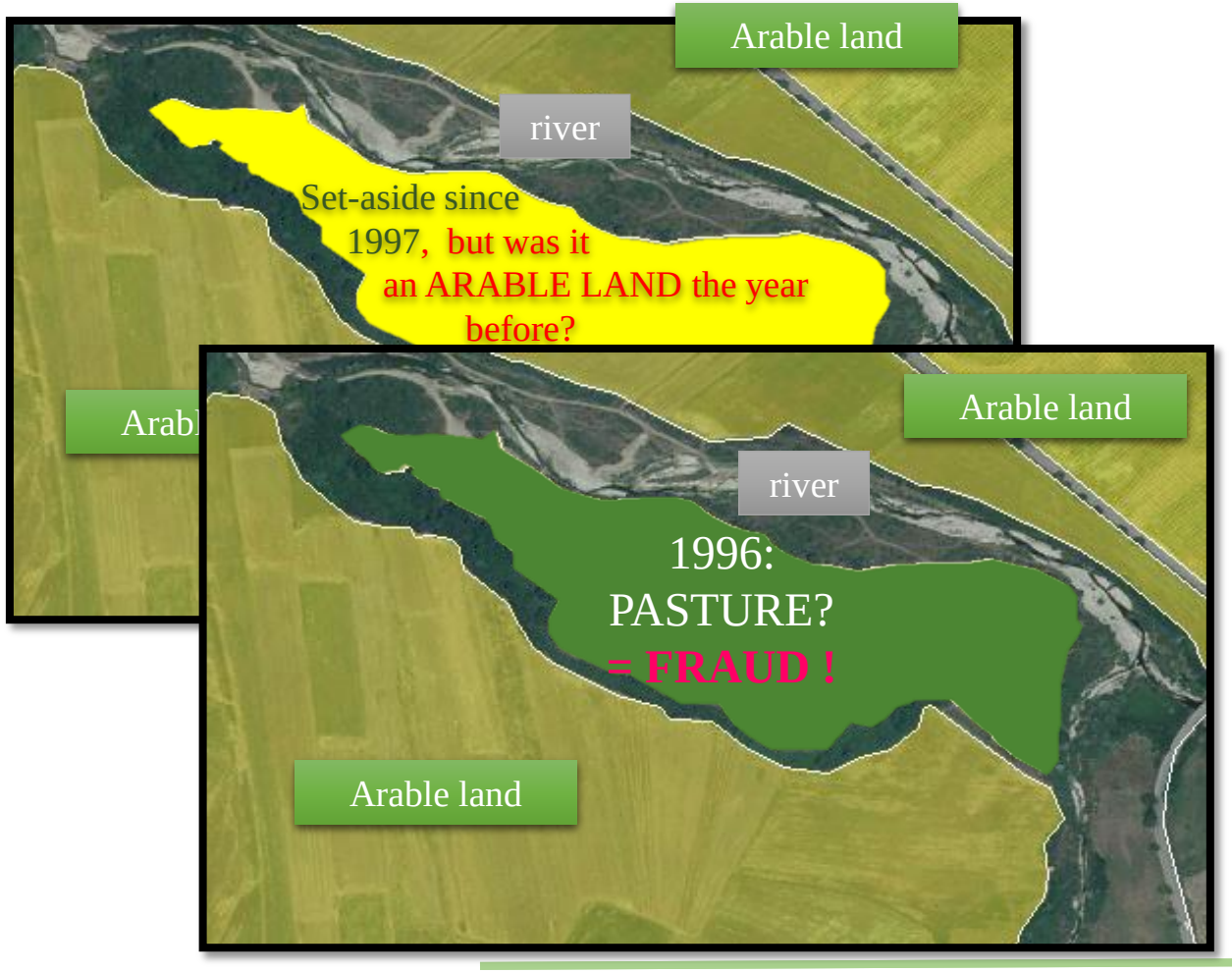


Basilicata Region
maps and time series of vineyard vegetative status

BASILICATA (Italy)

Space technologies for public administrations in charge of controls related to the eligibility of farmers for EU aids in agriculture

Main challenge:
to offer an **independent, objective method to evaluate the status of some regional agricultural areas** in the 1990's (i.e. **15 years before !**) in order to support Basilicata Region in clarifying the position of some farmers whose eligibility to receive EU aids (according to EEC N. 2078/92) was in doubt.



SUMMARY

Agriculture as a strategic sector for the development of the Space Technologies Sector

- **Scalable Market** for Customers & Providers (from supranational up to individuals), Technologies (from Satellites to micro-UAV), Services demand (with different level of aggregation), etc.
- **Well supported** by appropriate EO systems, data policies and huge EU/National/Regional funds.
- **The role of Regions fundamental**
  - ✓ as prime and/or intermediate customers
  - ✓ to promote the routinely use of ST
  - ✓ to sustain education and training
  - ✓ collaboration NEREUS-ERIAFF-EIP/AGRI…

MANY THANKS!

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