# → SENTINEL-2 FOR AGRICULTURE

Towards the exploitation of Sentinel-2 for local to global operational agriculture monitoring

## First agriculture Sentinel-2 results

Only a few weeks after being sent in orbit, the Sentinel-2 sensor already provided observations demonstrating its unique potential for agricultural monitoring. First results highlight the mission's capabilities to enhance crop type separation, delineate single fields and follow dynamics of agricultural practices in an unprecedented manner. These first examples over Europe and Africa give already an indication of Sentinel-2's future contribution at global scale within the GEOGLAM initiative.

Sentinel-2 data will be freely available after the completion of the commissioning phase foreseen three months after launch. The Sen2-Agri project will soon after start its demonstrations from local to national scale with its core users.

More information about first Sentinel-2 applications is available at:
http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-2/First_applications_from_Sentinel-2A.

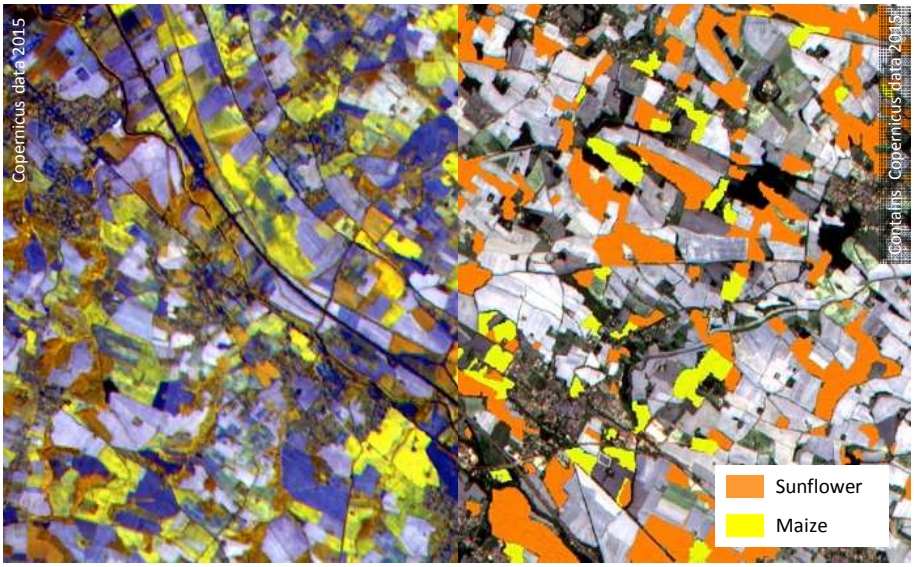
## Improving crop type separation

Crop identification through remote sensing is strongly related to the period of observations, which should be made at key moments of the growing season, but also to the ability of the sensor to ensure a proper discrimination of coexisting vegetation land covers, which characterises by its spectral band distribution.

The illustration below, corresponding to an area In the outskirts of Toulouse, France, observed by Sentinel-2 at the beginning of July 2015, shows a clear example of this: the left part shows a colour composition including one of the satellite red-edge bands, while the right one presents a classification result based on the visible, red-edge and NIR channels and discriminating the main summer crops - sunflower and maize - cultivated in this area.

This result, validated by local experts and which should not have been achieved using only the standard bands, demonstrates the relevance of Sentinel-2 spectral distribution, specifically customised to provide key information about the state of vegetation. With 13 bands from the visible and the near-infrared to the shortwave infrared, and more particularly the 3 ones selected in the red-edge domain to enhance the estimation of chlorophyll content, Sentinel-2 will thus take land monitoring to an unprecedented level.

This capability will find a direct application in the Sen2-Agri **Crop Type product** to map the main crop types or groups of crop types on a given area and supply corresponding area estimates.

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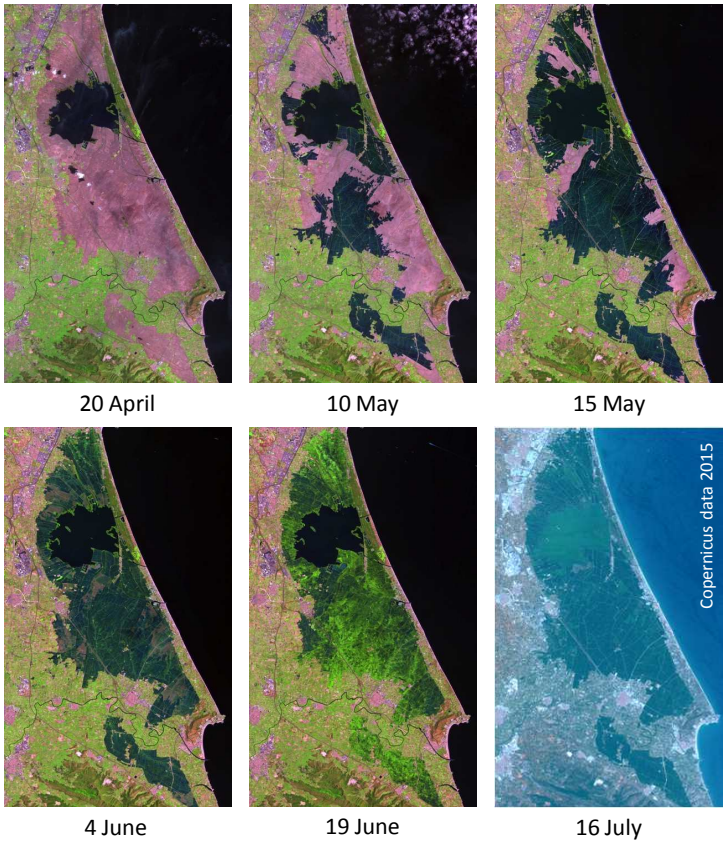



20 April | 10 May | 15 May

4 June | 19 June | 16 July

## Accurate monitoring of crop dynamics and agricultural practices

Observing the development of vegetation and appraising the health status of crops with remote sensing require to build consistent image time series at a steady pace.

Such a strategy is also relevant to monitor specific agricultural practices like **flooding of irrigated rice fields**, as shown on the image time series on the left. The latter, covering the northern area of Valencia, Spain, includes a simulated Sentinel-2 time series at a 5-day frequency built on the data collected during spring 2015 through the SPOT 5 Take 5 experiment and ends with an actual Sentinel-2 scene from mid July.

The **progress of flooding**, characterised by the extension of dark areas, can be easily delineated on the first images. The last ones put more the emphasis on the **development of the crop** itself, the dark areas turning then gradually green. Such a time series is obviously useful for an accurate assessment of the start of the growing season.

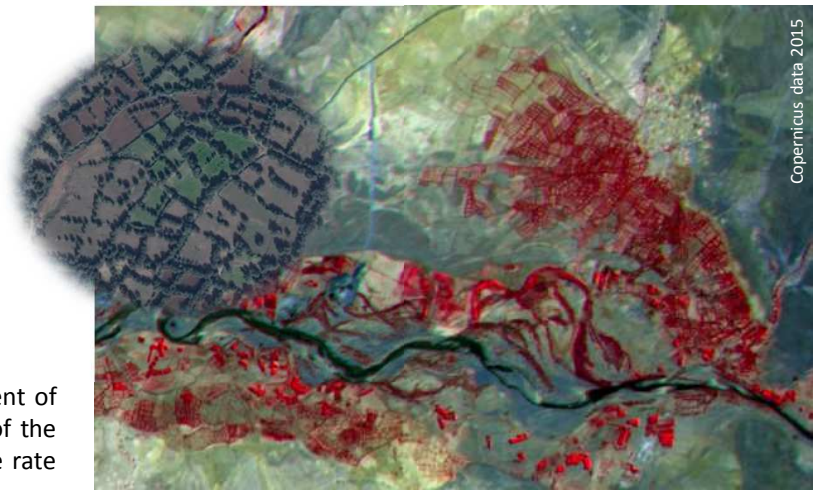
With its **short revisit frequency** (5 days after Sentinel-2b launch), the Sentinel mission clearly turns out essential to appraise crop growth and health. This capability will be extensively exploited in the **Vegetation Status product**, one of the Sen2-Agri portfolio components.

## Enhancing landscape characterisation

A major issue to monitor efficiently agricultural areas with remote sensing lies in the ability to map accurately **field boundaries**, which are key elements to derive subsequent information such as crop areas or yields.

Thanks to its 10-meter spatial resolution, Sentinel-2 can **capture field hedges** and thus separate **farmland** from **shrub and tree vegetation**, as shown on the right image covering the area of Marrakesh, Morocco, around mid July 2015.

This resolution will concretely benefit to the development of the **Dynamic Crop Mask product**, another component of the Sen2-Agri portfolio, to allow a proper assessment of the rate of cultivated areas and of its evolution on a given site.




**Sentinel-2 for Agriculture** is a 3-year project which aims at demonstrating the benefit of the Sentinel-2 mission for agriculture across a range of crops and agricultural practices. The intention is to provide the international user community with validated algorithms and an open source processing system to derive in an operational way Earth Observation products relevant for crop monitoring using Sentinel-2 data.

The project, funded by ESA, is carried out by a consortium involving the **Université Catholique de Louvain** (BE), the **Centre d'Études Spatiales de la Biosphère** (FR) and the companies **CS - Systèmes d'Information** (FR) and **CS Romania** (ROU), working in close collaboration with 18 organizations, centres, universities or companies belonging to the agriculture monitoring communities.