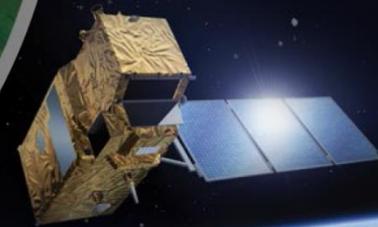


→ SENTINEL-2 FOR AGRICULTURE

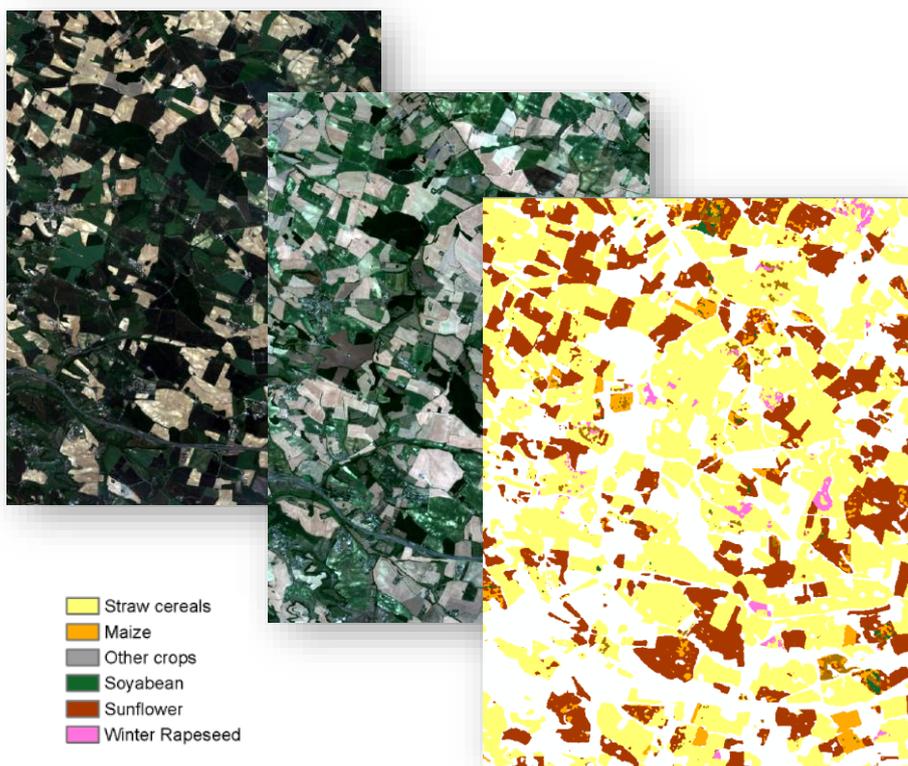
Towards the exploitation of Sentinel-2 for local to global operational agriculture monitoring



Crop Type Map: mapping crop types using an automated approach

The Crop Type product is a map of the main crop types or groups at 10 meters spatial resolution. The crop types are classified only over the cropland area identified in the Sen2-Agri cropland mask. The map is generated twice over the season, with a first delivery at the middle of the season and the second one at the end. The accuracy expected to increase along the season as long as new images are integrated and crops are growing.

The main crop types are defined as those covering a minimum area of 5 % of the annual cropland in the region, representing a cumulated area higher than 75 % of the latter. Four or five main crop types are usually considered.



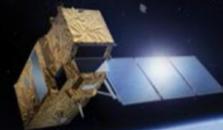
Exploiting Sentinel-2 and Landsat 8 time series to produce crop type maps at field scale over Occitanie region - France

Product specifications

- ▶ Local to national coverage
- ▶ 10-meter spatial resolution
- ▶ First product delivered at the middle of the season, then updated at then end
- ▶ Available 1 week after the end of the acquisition period
- ▶ Overall accuracy varies according to the landscape complexity and crop diversity and could be as high as 85 %. A minimum value of 50 % is ensured at the end of season, with the F1-score higher than 65% for the main class
- ▶ Geometric accuracy inherited from L1C input products accuracy
- ▶ DIMAP format including GeoTIFF raster images
- ▶ UTM-UPS/WGS84 projection, inherited from the L1C S2 tiles
- ▶ XML file metadata

→ SENTINEL-2 FOR AGRICULTURE

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



Input data

- ❖ A **Sentinel-2 L1C image time series**, optionally completed by an additional **Landsat 8 L1T image time series**, automatically downloaded from ESA and USGS facilities. These data are first turned into **L2A products** (i.e. bottom of atmosphere reflectance products, with snow, water, cloud and cloud shadow masks) through a specific processor of the Sen2-Agri system based on the Multi-sensor Atmospheric Correction and Cloud Screening (MACCS) algorithm (Hagolle et al., 2015, 2010, 2008).
- ❖ **User supplied in situ data** gathering samples of the main crops as well as of non crop areas spread throughout the considered site
- ❖ A **crop mask** previously generated by the Sen2-Agri system over the same period

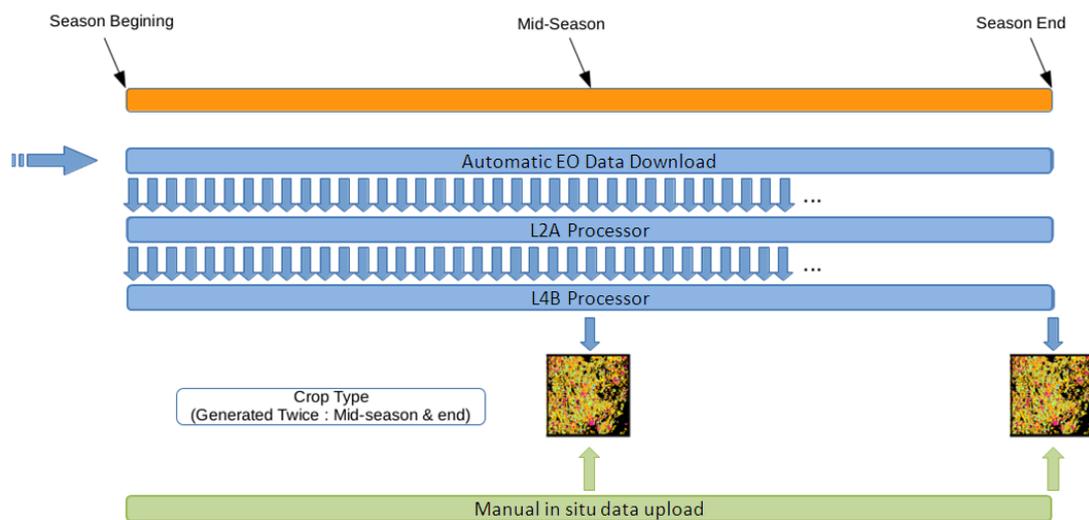
Data volume

- ▶ **600 Mb** for the whole season for a local coverage, i.e. an area corresponding to ~9 Sentinel-2 tiles (300 x 300 km²)
- ▶ **8 Gb** for the whole season for a national coverage, i.e. an area of 500 000 km²

Processing methodology

The Crop Type Map can be produced either using an **automatic operating mode** as the input images become available or in an **offline way** at the end of the growing season. The map is provided along with a quality flag indicating for each 10-meter pixel the number of cloud free image available during the acquisition period.

The development follows a supervised Random Forest classification approach built on in situ data to be collected during the concerned growing season. The in situ information is split between training samples used to feed the classification process and validation samples used to assess the product accuracy through the computation of several criteria (Overall Accuracy, F-Score). The detailed methodology is described in Inglada J. et al., *Assessment of an Operational System for Crop Type Map Production Using High Temporal and Spatial Resolution Satellite Optical Imagery*, Remote Sens. 2015, 7, 12356-12379.



Delivery schedule of the Crop Type Map product with regard to the user-defined growing season



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, centers, universities or companies belonging to the agriculture monitoring communities.

