

Leaf Area Index (LAI) mapping

V1.1

For training purposes, a suitable processing job to be cloned and repeated is job #7141 that produced an LAI product over Ireland from October 2019.

Service description

Leaf Area Index (LAI) is defined as half the total area of green elements of the canopy per unit horizontal ground area. The satellite-derived value corresponds to the total green LAI of all the canopy layers, including the understory which may represent a very significant contribution, particularly for forests. Practically, the LAI quantifies the thickness of the vegetation cover.

LAI is recognized as an Essential Climate Variable (ECV) by the Global Climate Observing System (GCOS). LAI provides information on vegetation health and vegetation dynamics. The service can be used on natural vegetation like forests to assess health and density, as well as on agricultural fields to determine starting dates, phases of crop growth and the time of harvest. Using optical Sentinel-2 images, the produced output is one image which shows the percentage of chlorophyll content.

Processing methodology

This service, provided by **GeoVille**, creates the Leaf Area Index based on a Sentinel-2 L2A scene using a Neural Network that originates from Brockmann Consult. Hence, the resulting LAI is similar to the output of ESA's SNAP software, but yet much faster. The result is a GeoTIFF with two bands. The first band contains the Leaf Area Index, while the second layer indicates invalid pixels (1=invalid).

Input data

The **Leaf Area Index** service is designed to work with Sentinel-2 L2A images. Users simply search for imagery using the search functionality and *drag & drop* the desired image into the service.

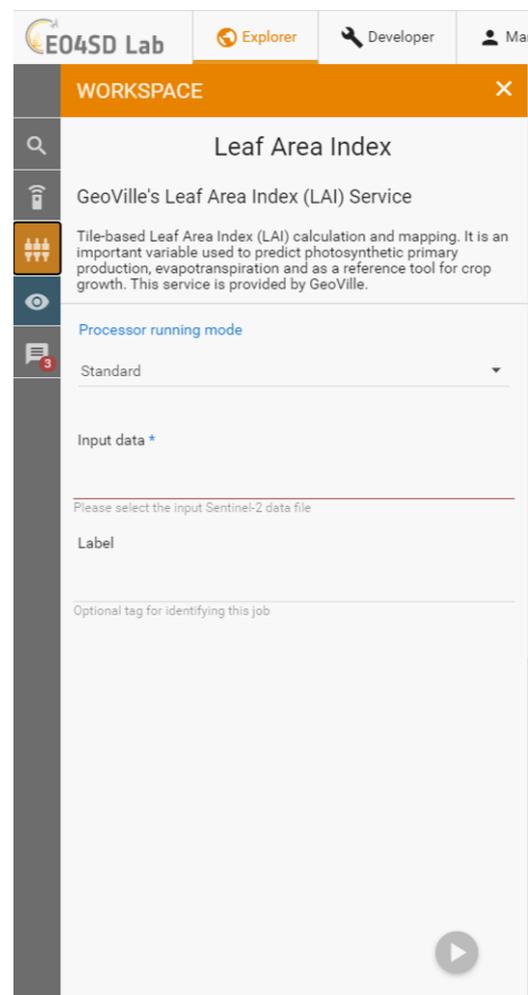
Selecting the service

The **Leaf Area Index** service is selected by clicking on the services  icon on the left of the screen on the *Explorer pane*. This opens up the Service list, which can be filtered by service type (such as application or processor). Scroll down or type into the search interface the name of the service and after selection the *WorkSpace* panel will open.

Parameters

The service does not require user input beyond the selection of the satellite scene that should be processed.

- **Processor Running Mode:** The Processors can be run in two modes **standard** or **systematic**. Most users will just require standard processing i.e. processing of one or more products in a single processing run. For advanced users, systematic processing allows the service to be run periodically based on user-defined criteria.



- **Input Data:** this is the input Sentinel-2 image to be processed. Drag the input Sentinel-2 image (grabbing from the horizontal lines to the left of its name) from the Results tab at the bottom of the screen to the Input data field.
- **Label:** An OPTIONAL field for free form tagging for later identification of this processing job.

Service Outputs

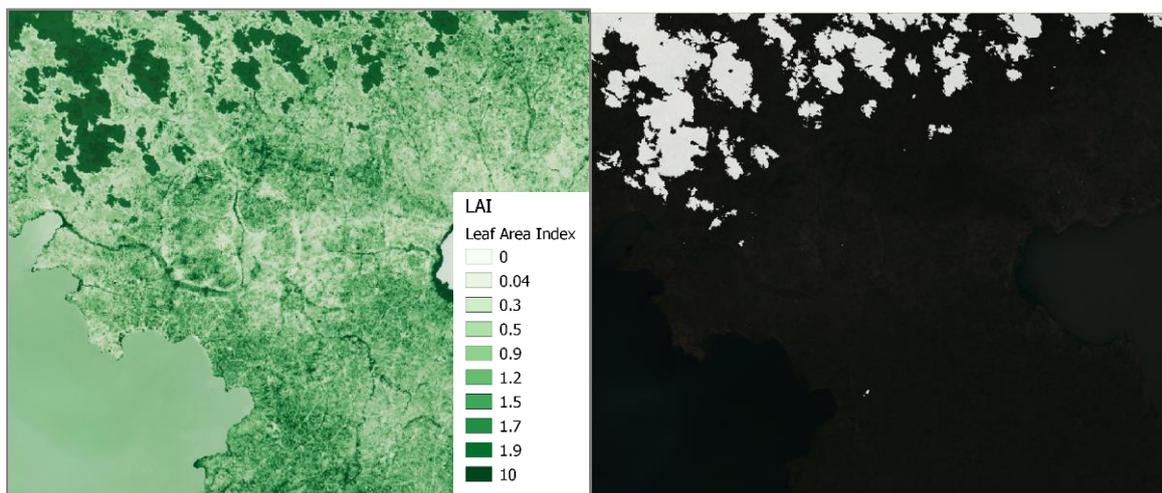
The LAI service produces a single image with two bands. One with the actual LAI information and one with a data (0)/no-data (1) mask that indicates for which areas within the satellite scene valid observation were available.

The output image has the following characteristics.

Correspondent file	Optical EO data at full resolution
Information type	2-bands raster layer
Raster format	GeoTIFF
Resolution	10m
Projection Type	EPSG: 32XXX – WGS84 / UTM zone of the input scene
Bit depth	32-bit floating point
Processing level	Geometric re-projection and geometric / radiometric correction depending on input data

Service Execution

Once the scene is assigned to the service, the service is launched by clicking the round play button at the bottom right corner of the input dialogue area. The resulting outputs GeoTIFF file can be downloaded, re-used or visualised in the GeoBrowser. The image below shows the two band of the output product, with Band 1 (the LAI values) on the left and Band 2 (the data / no-data values on the right). To add interpretation a colour scale is applied to the LAI product when its displayed in the GeoBrowser. The colour scale shows the range of values between 0 (low LAI) and 10 (high LAI).



Further analysis can be undertaken in one of the GUI applications, such as SNAP, QGIS or Monteverdi. Soon after desired application process (e.g. QGIS) is started, a 'Go to GUI'  icon appears in the job description. The desired GUI application can then be accessed by clicking this icon, which opens the GUI in another browser tab.