

## Paddy Rice cultivation in the northern Italian region of Piedmont

**Observation area:** In northern Italian provinces Vercelli, Novara and Pavia paddy rice cultivation has a long tradition of about 500 years. About 88% of the total national area and 90% of rice-growing companies are concentrated in this region.

The plots are irrigated in spring with water, that comes from the Alps over several streams like Ticino.

**Soil preparation:** Leveling is done with devices that are known from surveying and has to be exact up to 3 cm. Nowadays tractors with DGPS or RTK control can level the ground on its own. It is important that the water covers the whole plot and can run-off as well.

Before flooding farmers often use herbicides to clear the already grown-up vegetation.

Finally the water is pumped on leveled fields for rice cultivation up to an height of about 5 cm.



Image source: istock

**Sowing:** For sowing in early May, many use a tractor with GPS control. Orientation is difficult if the driver only sees a body of water in front of him. With this technology, seeding succeeds without gaps or overlaps. The rice is pre-soaked so it doesn't float on top but stays on the bottom.

The water layer acts as an insulation. Below that, there are only small temperature differences between day and night. The plant, originally from tropical regions, therefore germinates quickly at temperatures between 12 and 18 degrees Celsius. When plant protection measures are pending, the water may be temporarily drained.

**Growing phase and harvest:** Rice plants reach a height of 50 to 160 centimeters. After the flowering of the panicles, the grains grow. As soon as they mature, the farmers drain the water from the fields one last time. The grassy green of the plants quickly turns brown. The harvest takes place with a combine harvester in September. If possible, with a grain moisture content of around 14 percent - then the harvested crop can be stored.

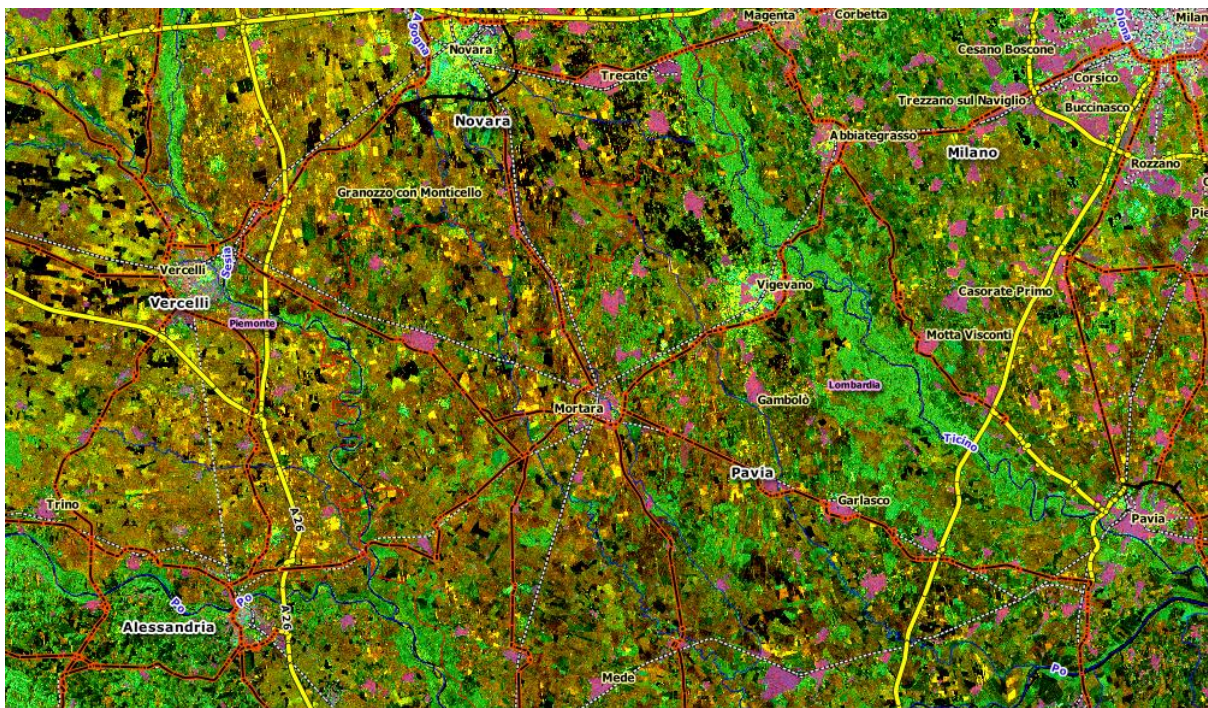
**Economics:** In total, Italy's farmers produced 1.59 million tons of rice in 2016 on an area of 234,000 hectares. Around 60 percent of this is exported. All other European countries such as Portugal, Spain, France and Greece add up to about the same amount. The European harvest looks very modest by international standards. China, the world's largest producer, imported around 210 million tons of rice in 2016 (source: crop volumes and area, FAO).

**Ecology:** Rice paddy fields can be considered as ecosystems for a rich fauna, composed by insects as well as mosquitos, amphibians and birds, which all find their habitat in the rice paddies when the ground gets flooded. The use of sustainable agricultural techniques can protect the habitats of numerous animal and plant species, and preserve the ecological balance of wetlands. Catch crops, the use of green manure and the winter submersion of the land are all part of a conservative agriculture that promotes the fertility of the land and enriches it with organic substances. But paddy rice cultivation is as well known to increase the emission of climate gases due to the methanogenesis in rice fields.

Nevertheless, the European Union considers rice as an agricultural crop that does not need to be subjected to surface area restrictions, because it already respects extremely strict environmental parameters.

The European Union has always recognized the environmental value of rice cultivation thanks to its close connection with the aquatic environment that allows it to create an authentic agro-ecosystem.

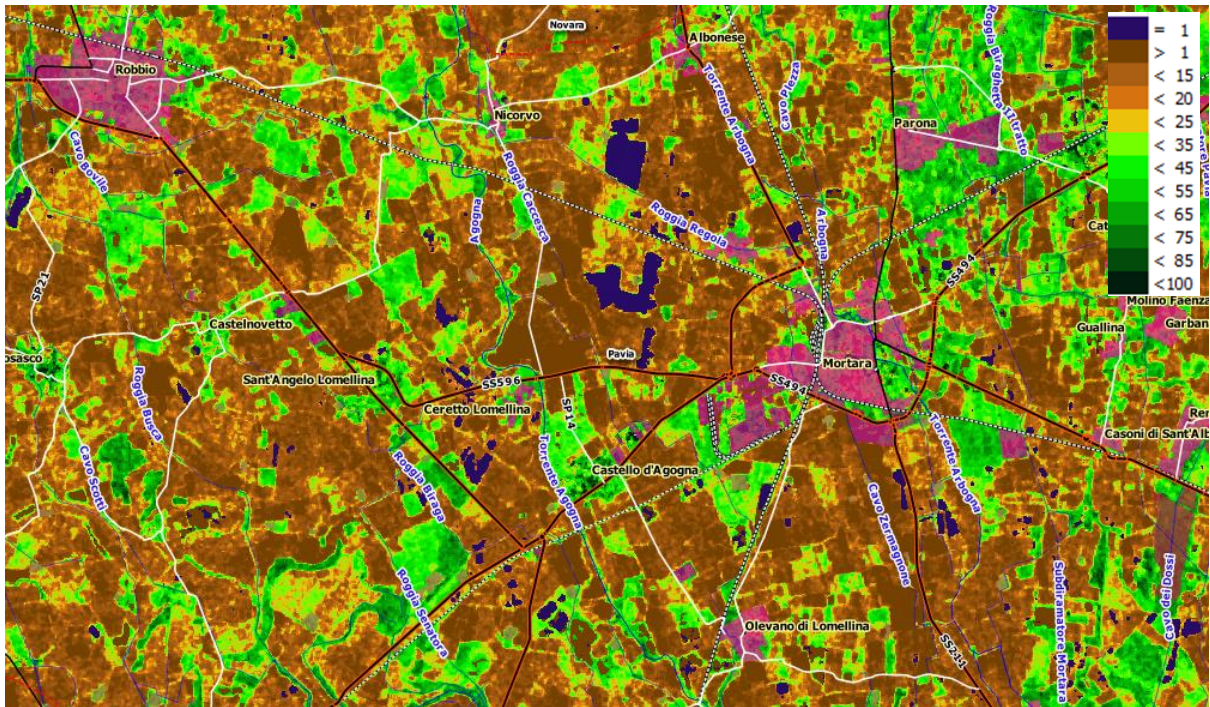
The map below shows the area over the 3 mentioned provinces with a pseudo-true Color Composite derived from a single date Sentinel-1 SAR image from May 4, 2023. Dark areas are flooded.



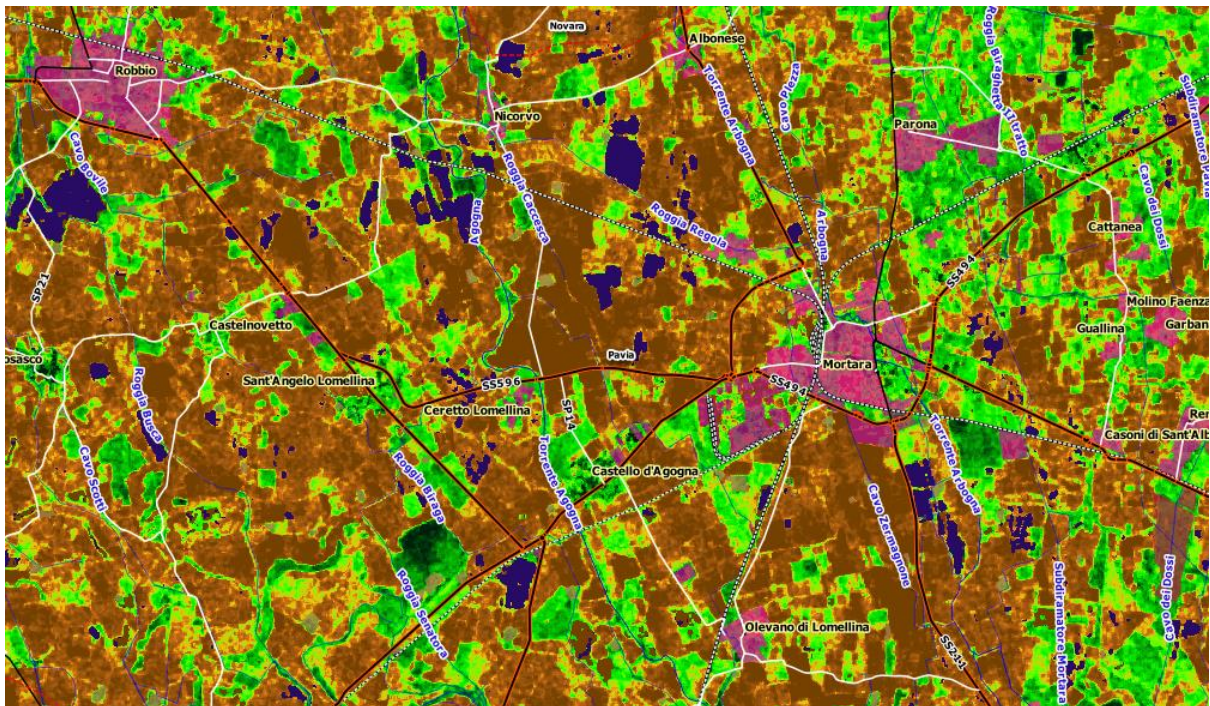
The map shows, that the plots are partly flooded, but the water supply has a shortfall due to the dry winter. The environmental organization Legambiente sounded the alarm and warned that 53 % less snow had fallen in the Alps in the past few months than the long-term average. And the problem is not only the lack of snow, but also the lack of rain. In the Po basin, Italy's largest river system, rainfalls have reached only 61 percent of what can normally be expected.

This will definitely negatively influence the irrigation regime of the current season.

In our WebGIS application **imap** you can follow up the flooding of single plots over the whole region. The map product ESVI (enhanced SAR Vegetation Index), does not only show baresoil and the variability of biomass development, but as well inundated areas, like rice paddies. The example below is from April 22, 2023



The second example is from May 4, 2023 and indicates the extent of flooded fields.



The map product is based on Sentinel-1 SAR and independent from clouds and daylight. It is available throughout the year and appears in a constant quality.