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THE EVER GROWING USE OF COPERNICUS ACROSS EUROPE'S REGIONS

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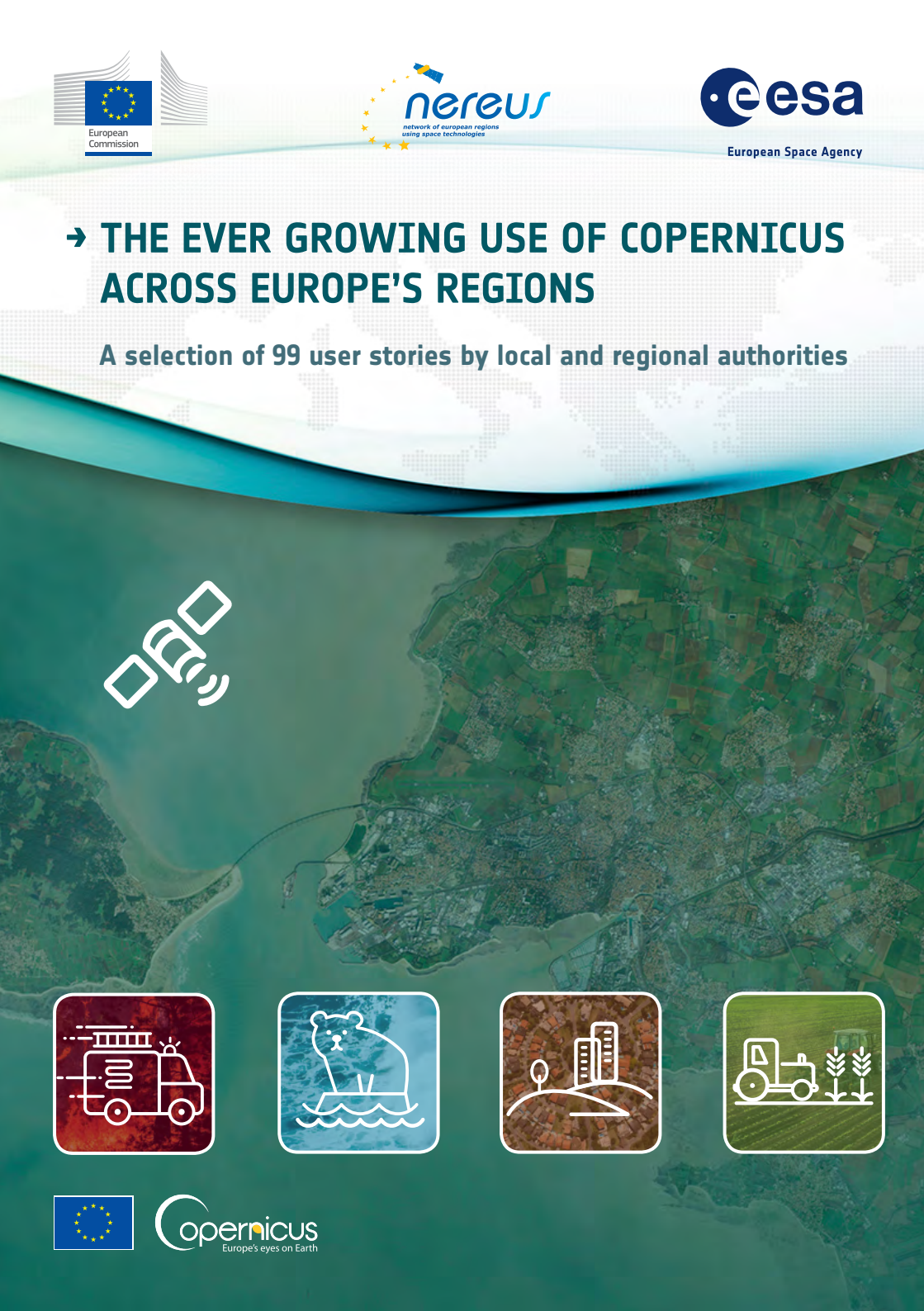

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USING SATELLITE MAPS TO SUPPORT VARIABLE RATE FERTILISATION

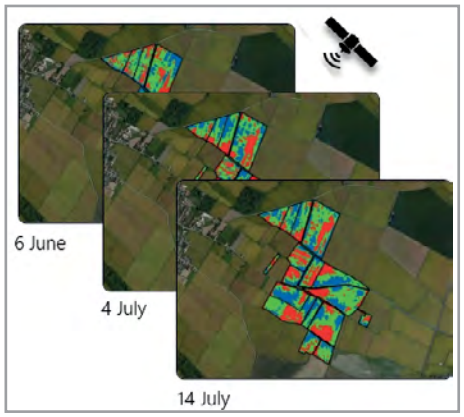
Services developed in the ERMES FP7 project can provide farmers with high quality information for performing Variable Rate Fertilisation practices.

The challenge

Availability of high-quality information concerning spatial and temporal variability of crops' distribution and status is of paramount importance to support precision agriculture solutions for improving productivity and reducing costs, whilst minimising environmental impacts. Multi temporal satellite images, in fact, enable the variability of crop status to be depicted in key periods of the crop growth cycle over large areas. This may facilitate the improvement of existing agricultural management practices through a more rational application of fertilisers, with both environmental and economic (due to the reduction of costs) advantages. In this context, within the ERMES FP7 project (An Earth obseRvation Model based RicE information Service - www.ermes-fp7space.eu), we aimed at developing operational workflows for the creation of prescription maps to be used for Variable Rate nitrogen fertilisation over rice fields, based on the analysis of High Resolution satellite imagery.

The space based solution

We used archive decametric/sub-decametric satellite imagery to characterise spatial variability related to soil properties and Very High Resolution imagery acquired in key stages



Images acquired in critical moments of the season highlight the internal variability of single rice parcels, in different moments.
Credit: Contains modified Copernicus Sentinel data [2016]

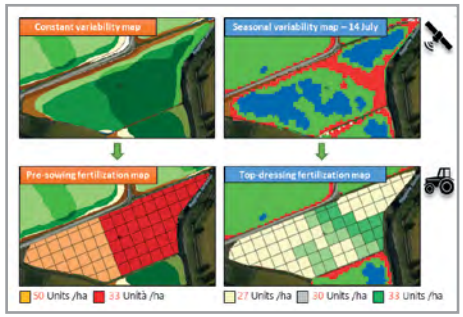
(both optical and SAR) to characterise within-field crop status variability in the ongoing growing season. Images were processed using statistical methods in order to be able to identify homogeneous areas characterised by different soil properties or crop conditions, for each field. Starting from these within-field variability maps, farmers in the ERMES study areas, with the assistance of ERMES personnel, were able to derive accurate prescription maps for nitrogen fertilisation, for both the pre-sowing and the top-dressing phases to be used in variable rate technology (VRT) cultivation practices. Full-field experiments conducted between 2014–2016 in Italy, Greece and Spain demonstrated that these prescription maps allowed for better farm management, leading to yield homogenisation and optimisation of the use of fertilisers.

Benefits to Citizens

Adoption of the services for precision agriculture developed within ERMES could surely benefit European farmers. For example, it is worth highlighting that the need for nitrogen fertilisation is a major expense in

> "A potential reduction in production costs of about 70 €/ha can be achieved using ERMES services."
>
> ***Dimitrios Katsantonis, Researcher at Hellenic Agricultural Organization – Cereal institute***

modern rice production, typically accounting for 15% to 30% of total production costs. Experiments conducted during the ERMES project demonstrated in fact the usefulness of satellite-based solutions for optimisation of production costs through a more economical use of fertilizers, and improving yield through the better management of intra-field variability. For example, the Hellenic Agricultural Organization (DEMETER) estimated that adoption of the proposed services could lead to a potential reduction in production costs of 70 €/ha in Greece. Besides, demonstration in the Italian context proved that when VRT technologies are adopted a rise in production is possible, leading to a potential increase in income of around 72 €/ha. Proper management of nitrogen fertilisation is also essential to avoid negative environmental impacts, and to help farmers comply with European agricultural and food safety policies focused on promoting



ERMES spatial variability maps were used to derive prescription maps for nitrogen fertilization.
Credit: Contains modified Copernicus Sentinel data [2016]

more environmentally friendly and safe farming practices.

Outlook to the future

The ERMES system is currently being further developed through several follow-up projects, including a demonstration project framed in the "Rural development Programme" initiative to support adoption of precision farming in Italy. IT solutions and remote sensing products are also being used by Italy's largest agricultural group, Bonifiche Ferraresi, and by Italian insurers aiming to include EO data in operational workflows for crop monitoring and damage assessment.

Acknowledgements

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