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GIS and Remote sensing approaches toward sustainable management and production of rapeseed (Brassica napus L.) in Tunisia

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Dryland farming in the north and the center of Tunisia is largely monocultural. Producers grow wheat, with some limited integration of legumes. Recently, an industrial program is carried out by the private sector and supported by public sector where rapeseed has been identified as an additional candidate for diversifying and improving the sustainability of wheat-based cropping systems in the region, and mitigating the national vegetable oil and feeds deficits. However, little information was available on crop requirements, productivity and resource use efficiency to ensure sustainability of this new rapeseed sector.

The main objective of this study is to characterize rapeseed growth and production variabilities under various agroclimatic conditions and cultural practices. We addressed this by combining multitemporal multispectral remote sensing data, field surveys and complementary information in a GIS-based Multi-Data Approach

The established GIS comprises 233 plots distributed over 141 farms, divided into 12 governorates from northern to central Tunisia and covering an area of 3,044 ha, whether 58% of total rapeseed area during the 2017-2018 growing season. The study indicates that the average yield of the four commercialized rapeseed varieties in Tunisia: Trapper, Pioneer 73, Jura and Solar was 19.1 q/ha, 14.8 q/ha, 4.0 q/ha and 18.1 q/ha, respectively with an annual rainfall ranging from 202 mm to 454 mm.

From multitemporal multispectral SENTINEL-2A images, the general variation of the reflectance spectrum of the rapeseed crop, as well as the evolution of the NDVI (Normalized Difference Vegetation Index) for the different plots throughout the crop cycle have been characterized.

The NDVI temporal profiles showed two peaks, one before flowering and other after flowering, thus characterizing a specific rapeseed behavior compared to other annual crops. This also made possible to identify the different NDVI profiles of the four commercialized varieties in Tunisia and to show the difference between their spectral responses. In addition, these NDVI profiles also allowed us to study the impact of different biotic (weeds, diseases) as well as climatic factors (temperature and rainfall) on rapeseed NDVI curves.