

Mapping Irrigated Areas in the Tunisian Semi-Arid Context with Landsat Thermal and VNIR Data Imagery

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Our study area is the Merguellil semi-arid irrigated plain in Tunisia, where the water resource management is an important stake for governmental institutions, farmer communities and more generally for the environment. Indeed, groundwater abstraction for irrigation is the primary cause of aquifer depletion. Moreover, unregistered pumping practices are widespread and very difficult to survey by authorities. Thus, the identification of areas actually irrigated in the whole plain is of major interest.

In order to map the irrigated areas, we tried out a methodology based on the use of Landsat 7 and 8 Land Surface Temperature (LST) data issued from atmospherically corrected thermal band using the LANDARTs Tool jointly with the NDVI vegetation indices obtained from visible and near infrared (VNIR) bands. For each Landsat acquisition during the years 2012 to 2014, we computed a probability of irrigation based on the location of the pixel in the NDVI - LST space. Basically for a given NDVI value, the cooler the pixel the higher its probability to be irrigated is. For each date, pixels were classified in seven bins of irrigation probability ranges. Pixel probabilities for each date were then summed over the study period resulting in a probability map of irrigation. Comparison with ground data shows a consistent identification of irrigated plots and supports the potential operational interest of the method. However, results were hampered by the low Landsat LST data availability due to clouds and the inadequate revisit frequency of the sensor.