

Mapping of Small Agricultural Parcels from Single High-Resolution Multispectral Images of Sentinel-2A using SVM and RF Classifier

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The mapping of agricultural crops in arid and semi-arid regions is an essential application for better agricultural production and optimal management of water resources. Indeed, such an application allows decision-makers and farmers to ensure better agricultural planning (crop rotation, monitoring of crop health, yield estimation) and reasonable management of irrigation water resources by calculating water requirements for each crop. Crop type information is also useful for parameterizing crop growth patterns. In the last decade, space-based remote sensing has become an essential tool for crop mapping, often based on hyperspectral imagery or multitemporal series. However, few studies have used a single image to map crops at an early date of the agricultural season. In this sense, the present work demonstrates the feasibility of producing crop type maps using satellite (S-2A) satellite Sentinel-2A. This work has two main objectives. The first objective is the evaluation of the potential of Sentinel-2 data for crop mapping in the Tadla plain. While the second is the most favorable period for the discrimination of different cultures using a single S-2A image. In order to achieve these objectives, we have acquired a set of seven images of the S-2A satellite, which were corrected for atmospheric effects by applying the Sen2Cor algorithm. Maps of crop types were produced at a spatial resolution of 10 m. Support Vector Machines and Random Forest Classifiers were applied for each image. The favorable period for mapping was chosen with an overall accuracy of 96.35% and a kappa index of 0.95. The results obtained indicate a single S-2A image should be sufficient for the discrimination between cereals (wheat and barley), sugar beet, alfalfa, olive, citrus and arboriculture in an arid to semi-arid climate.

Keywords: Sentinel-2, crop mapping, vegetation index, Tadla irrigated perimeter, Morocco.