

High-Resolution Irrigated Area Mapping in Dakhla and Kharga Oasis, Egypt, from 2015 to 2019 Using Sentinel-2 Data

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With over 95% of the country's land being a vast desert, Egypt's agricultural land is limited to the Nile Valley, Delta, Oasis, and some arable land in Sinai. Agriculture in the Nile Valley and Delta area is strongly related to the Nile River, whereas agriculture in the oasis area is based on groundwater. Egypt's groundwater resources depend mainly on the Nubian sandstone aquifer system.

Unmanaged groundwater extraction in Dakhla and Kharga Oasis had led to several changes which can be seen in the hydraulic head patterns, and noticeable cones of depression have appeared since the beginning of the new valley project in the 1960s. (Iwasaki, 2013, Gad M.I.,2011).

Water resources planning and managing in agriculture requires spatially specified information of irrigated area for various crop types and crop growing seasons. For arid areas like Egypt's oasis, making irrigation maps with the high spatiotemporal resolution is extremely paramount in formulating agricultural development, water resource utilization and management plans in this area.

Using a 10 m normalized difference vegetation index (NDVI) and normalized difference moisture index (NDMI) data from Sentinel 2, high-resolution irrigated area maps are developed for all the agroecological zones in Dakhla and Kharga Oasis in Egypt for the period of 2015-2019.

The irrigation maps were evaluated by using agricultural statistics from ground surveys and showed sufficient accuracy when compared to previously developed irrigation maps. It was demonstrated that irrigation was conducted twice a year in the study area, and the irrigation water volume relatively increased while the irrigation area increased year by year. According to statistical data, groundwater use in 2016 increased by 1.5 thousand square meters from 2015.

Based on this irrigation mapping, irrigation water usage on agricultural land in the study area can be determined, and information can be obtained which is useful for planning and managing water resources and building a sustainable water system in North Africa.

Keywords: Egypt, Oasis, Sentinel-2, Irrigation mapping