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Optimizing of alternative water resources reutilization on extreme sandy soil

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All agricultural areas in the European Union, as one of the largest water-using sectors, are under increased threat from the growing frequency of extreme water-holding events due to climate change. These focus on alternative water resource management, spectral data integration and soil moisture modelling. Furthermore, the irrigated area in Hungary covers 2% of agricultural land, mostly with outdated irrigation technology. This research will evaluate farm-level water resource management and irrigation technology developments and research results based on the results of the Hungarian test area.

The study area was conducted on a 85 ha maize field on sandy soil, located in a nitrate-sensitive area (based on European guidelines) and owned by the private company. The case study site situated at the alluvial cone plain is covered mainly with quicksand which is not optimal for maize production from a water management point of view. Irrigation is implemented by a GPS controlled, VRI technology controlled, reversible linear irrigation system with zone and nozzle irrigation control. However there is limited available water resources at the site, therefore alternative water sources utilization system was set up for irrigation to adapt to climate change and reduce fertilizers. The basis of the alternative water resources are excess water, treated wastewater, biogas fermentation sludge which is collected in a water reservoir with 114000 m^3 capacity.

In this research the role of these alternative water resources were evaluated in the hydrological system and in the water cycle. A wide variety of remote sensing platforms were used in this research, as satellites, drones, and laboratory instruments. These remote sensing (pigment and plant phenology) data formed the basis of time series studies. The results can contribute to a spatially and temporally optimal stress monitoring of plants and their water supply at the same time. Beside better irrigation management due to the used irrigation techniques as up to 30-50% of the required water can be replaced by using alternative water resources.

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