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Online decision support based on modeling with the aim of increased irrigation efficiency

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The significant changes in the structure of ownership and control of irrigation infrastructure in the past decades resultted in the decrease of total irrigable and irrigated area (Szilárd, 1999). In this paper, the development of a model-based online service is described whose aim is to aid reasonable irrigation practice and increase water use efficiency. In order to establish a scientific background for irrigation, an agrometeorological station network has been built up by the Agrometeorological and Agroecological Monitoring Centre. A website has been launched in order to provide direct access for local agricultural producers to both the measured weather parameters and results of model based calculations. The public site provides information for general use, registered partners get a handy model based toolkit for decision support at the plot level concerning irrigation, plant protection or frost forecast.
The agrometeorological reference station network was established in the recent years by the Agrometeorological and Agroecological Monitoring Centre and is distributed to cover most of the irrigated cropland areas of Hungary. From the spatial aspect, the stations have been deployed mainly in Eastern Hungary with concentrated irrigation infrastructure. The meteorological stations' locations have been carefully chosen to represent their environment in terms of soil, climatic and topographic factors, thereby assuring relevant and up-to-date input data for the models. The measured parameters range from classic meteorological data (air temperature, relative humidity, solar irradiation, wind speed etc.) to specific data which are not available from other services in the region, such as soil temperature, soil water content in multiple depths and leaf wetness.
In addition to the basic grid of reference stations, specific stations under irrigated conditions have been deployed to calibrate and validate the models. A specific modeling framework (MetAgro) has been developed to allow the integration of several public available models and algorithms adapted to local climate (Rácz et al., 2013). The service, the server side framework, scripts and the front-end, providing access to the measured and modeled data, are based on own developments or free available and/or open source softwares and services like Apache, PHP, MySQL and Google Maps API.
MetAgro intends to accomplish functionalities of three different areas of usage: research, education and practice. The members differ in educational background, knowledge of models and possibilities to access relevant input data. The system and interfaces must reflect these differences that is accomplished by the degradation of modeling: choosing the place of the farm and the crop already gives some general results, but with every additional parameter given the results are more reliable.
The system 'MetAgro' provides a basis for improved decision-making with regard to irrigation on cropland. Based on experiences and feedback, the online application was proved to be useful in the design and practice of reasonable irrigation. In addition to its use in irrigation practice, MetAgro is also a valuable tool for research and education.