Water Stress & Biomass Monitoring and SWAP Modeling of Irrigated Crops in Saratov Region of Russia

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Development of modern irrigation technologies are balanced between the need to maximize production and the need to minimize water use which provides harmonious interaction of irrigated systems with closely-spaced environment. Thus requires an understanding of complex interrelationships between landscape and underground of irrigated and adjacent areas in present and future conditions aiming to minimize development of negative scenarios. In this way in each irrigated areas a combination of specific factors and drivers must be recognized and evaluated.

Much can be obtained by improving the efficiency use of water applied for irrigation. Modern RS monitoring technologies offers the opportunity to develop and implement an effective irrigation control program permitting today to increase efficiency of irrigation water use. These technologies provide parameters with both high temporal and adequate spatial needed to monitor agrohydrological parameters of irrigated agricultural crops. Combination of these parameters with meteorological and biophysical parameters can be used to estimate crop water stress defined as ratio between actual (ETa) and potential (ETc) evapotranspiration. Aggregation of actual values of crop water stress with biomass (yield) data predicted by agrohydrological model based on weather forecasting and scenarios of irrigation water application may be used for indication of both rational timing and amount of irrigation water allocation. This type of analysis facilitating an efficient water management can be easily extended to irrigated areas by developing maps of water efficiency application serving as an irrigation advice system for farmers at his fields and as a decision support tool for the authorities on the large perimeter irrigation management.

This contribution aims to communicate an illustrative explanation about the practical application of a data combination of agrohydrological modeling and ground & space based monitoring. For this aim some results of analyzing water stress during growing season of 2012 and yielded biomass of crops three types of crops alfalfa, corn and soya irrigated by sprinkling machines at left bank of Volga River at Saratov Region of Russia are presented and analyzed. For that a combination of data received from satellite, local meteorological station and farmers as well as SWAP model was used. Analyze of data sets of monitored water deficit of each crop averaged for irrigation period was done by linear regression with yielded biomass values. Following analyze of effectiveness of irrigation water application was done by SWAP agrohydrological model.