

Optimal irrigation water resources management for water saving and salinity control

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Abstract Based on the dynamic response function of a crop to water and salt, the relationship between crop growth and the movement of water and salt was analysed. A dynamic programming model was formulated to suggest the optimal irrigation water resources management of water saving and salinity control for giving the maximum relative yield per unit area under freshwater and brackish water irrigation conditions. The study was done in Sheyang County, Jiangsu Province, China, which is located on the coastal plain of the Yellow Sea, where freshwater resources are insufficient, but salt and brackish water resources are abundant due to the tide and regeneration water of irrigation. A case of winter wheat irrigated with freshwater and brackish water alternately, was analysed for three types of typical water year. The optimal irrigation frequency for brackish water was three times in a normal year and a low flow year, and five times in a very low flow year, with an availability of brackish water of 27%, 29% and 35% of the total watering respectively. The soil salt content of winter wheat in the growth period of the normal year decreased as a whole. The soil salt content of unit soil mass at the end of growth duration was 98.2% of that at the beginning of the growth period. The amount of freshwater saving was 2100 m³ hm⁻² and the mean annual yield of winter wheat was 6.06 t hm⁻². This case study indicates that through optimal irrigation water resources management, the soil salt content was controlled overall, there was a great freshwater saving and winter wheat yield was increased.

Key words irrigation; optimal water resources management; salinity control; water saving
