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Water and solute balances as a basis for sustainable irrigation agriculture

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The growing development of irrigated agriculture is necessary for the sustainable production of the food required by the increasing World′s population. Such development is limited by the increasing scarcity and low quality of the available water resources and by the competitive use of the water for other purposes. There are also increasing problems of contamination of surface and ground waters to be used for other purposes by the drainage effluents of irrigated lands. Irrigation and drainage may cause drastic changes in the regime and balance of water and solutes (salts, sodium, contaminants) in the soil profile, resulting in problems of water supply to crops and problems of salinization, sodification and contamination of soils and ground waters. This is affected by climate, crops, soils, ground water depth, irrigation and groundwater composition, and by irrigation and drainage management. In order to predict and prevent such problems for a sustainable irrigated agriculture and increased efficiency in water use, under each particular set of conditions, there have to be considered both the hydrological, physical and chemical processes determining such water and solute balances in the soil profile. In this contribution there are proposed the new versions of two modeling approaches (SOMORE and SALSODIMAR) to predict those balances and to guide irrigation water use and management, integrating the different factors involved in such processes. Examples of their application under Mediterranean and tropical climate conditions are also presented.