STUDIES ON IRRIGATION METHODS AND SALINIZATION CONTROL IN ZONES WITH SALT ACCUMULATION SOILS

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Summary

Prevention of soil salinization in the arid and semi-arid zones is an indispensable measure for successive farm production. Basically, suitable irrigation methods and salinization control techniques in zones with salt accumulation soils were assessed through the following three ways: a) using computer simulation for understanding of salt concentration changes in soil; b) conducting a feasibility study on the utilization of irrigation system with solar battery-powered pumps through appraising its applicable area; c) estimation of efficiency and applicability of ceramic irrigation as a method for control of soil salinity through prevention or removal of salt accumulation in soil layers.

In order to assess salt concentration changes in soil, salt transport simulation system, HYDRUS, developed inU.S. Salinity Laboratory was employed to investigate the improvement of farm production conditions in zones with soil salinization. Simulation of soil moisture and solute variation was used to successfully conduct experiments in support of simulation results that illustrated the effect of soil layers with disturbed capillarity, especially the effect of layers with and without drainage faculty, on soil leaching. One factor analysis on the simulation results, which in order to emphasize on the effect of soil layers on salinity of soil used loam with the assumption of sand presence in its layers, was conducted. Further, validation of soil layers' simulation results was conducted. It illustrated that salt content in soil changed depending of availability or absence of drainage faculty of soil layers as moisture moved downwards after irrigation or rainfalls and upwards with evaporation. Albeit, the simulation results of subsoil irrigation showed that this type of irrigation could be effectively employed for salt content control in the plant root zone, yet field experiments are necessary for validation of the results.

It was confirmed through experiments with the irrigation system with solar battery powered pumps that water content can be preserved depending on the structure of the system. Due to stable sun light with small variation during the dry season the solar battery powered pump operated without difficulty. During the rainy season, however, depending on the situation of clouds the batteries' output varied widely, suggesting that for maintaining a high reliability of the system it is necessary to install storage batteries between the solar batteries and pumps. For field application of the system where high elevation of water is required—the insufficiency of pumping capacity is taken into consideration—a step-by-step system would be a solution to the problem. Further, it often comes to pump water from ponds where the water is easily getting muddy mixed with sand and clay—a burden for pumping requiring proper selection of solar batteries panel area assuring enough reserve capacity.