

Analysis and Control of Salt and Water Behavior in Soil
for Greening of Desert and Prevention of Salt Accumulation,
and Energy Evaluation of Pure Water Production with Solar Energy

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Distribution of water and salt was studied in an one-dimensional apparatus filled with glass beads with and without SAP (super absorbent polymer), to predict the behavior of water and salt in soil in arid lands. The permeability of the water or salt solution of 0.5% was separately examined. It was found that the layer with SAP always contained more water than that without SAP because of the expansion of SAP in glass beads void. It was also found that the rate of permeation was reduced with SAP because the blockage of the water pass was caused by the expansion of SAP with swelling. The above effects of SAP on the water content and the water permeability were also found for the case of salt solution, while they were not so remarkable as for the case of fresh water.

The layer with SAP restrained salt accumulation on its surface under the condition with promoted evaporation by infrared lamps. In conclusion, SAP prevents water and salt in it from moving in the layer, leading to restraint of evaporation and salt accumulation.

Problems of salt removal and disposal from irrigated farm-land or discarded land in arid and semi-arid regions of the world are pointed out. However there has not been proposed efficient method for the resolution of these problems yet. Therefore we tried a new salt removal method based on the concept which dispose of the salt at soil surface by utilizing evaporation force and using salt capture sheet.

It was confirmed experimentally that salt accumulated in the surface layer was removed by the DRY-UP method more efficiently than the leaching method. Furthermore it was recognized that the DRY-UP method has advantages which can basically use less quantity and bad quality of water.

Lastly, the energy balance of afforestation by using water made by solar still showed that it requires half of the afforestation area in desert.