

Basic Study for Improving Saline Soil Area into Agricultural Land.

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Summary

Saline soil extends widely in arid and semi-arid area in the world, where agricultural land use is difficult. Therefore, it is required to develop the way to improve saline soil land into agricultural field. In typical saline soil fields, the upward moving soil water from groundwater or deeper unsaturated layer to the surface transports dissolved salts with it and leave them in the root zone. In order for planting, the accumulated salt should be washed out by applying excess water and the salt containing water should be removed by arranging drain. The two dimensional flow of water and salt toward drain was examined in this study.

A model soil layer with a drain in it was made for experiments, of which bottom was impermeable. Saturated steady water flows were established by applying salty water on the surface uniformly at constant rates. The soil was initially saturated by solution of concentration  $C_0$ , and the concentration of applying water was suddenly switched into a different concentration of  $C_1$ . Salt concentrations in the soil layer and effluent concentration were measured afterwards. On the other hand, computer programs for calculating water flow and salt movement with it were made. The observed and the calculated water pressures showed excellent agreement. The calculation could predict well the time at which the concentrations change, while the numerical dispersion was fairly larger than the actual physical dispersion. The calculated effluent concentration also indicates good agreement with observed one.

As results, the reaching proceeds in the way that the old water and the fresh water form a clear boundary, which is almost horizontal except for near the drain where it dips toward the drain, moving downward. When the boundary reaches at about half depth of the drain where water flux becomes horizontal, drainage of fresh water occurs, and downward velocity of the boundary and reaching efficiency fall down. Therefore, it is desired that the depth of the drain should be arranged enough for the bottom of the required reaching layer to have vertical water flux component. This depth of the drain is about twice of the thickness of the reaching layer in case soil is saturated over all.