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Severely salt-affected country underlain by a shallow saline water-table

## GYPSUM FOR SALT LAND ?

By T. C. STONEMAN, B.Sc. (Agric.), Agricultural Adviser, Soils Division

**G**YPSUM is used in many parts of the world as a soil dressing for the reclamation of "salty" country. Farmers have asked whether such applications would improve salt-affected soils in Western Australia. The answer to such questions is that tests made over a period of 20 years, using gypsum on salt-affected soils in various parts of the wheatbelt, have failed to reveal any benefits accruing from even very heavy applications.

In order to understand why a soil treatment, which gives good results in other countries, is a failure in Western Australia, it is necessary to consider firstly, the characteristics of various types of salt-affected soils, and secondly, the manner in which gypsum reacts with the soil constituents to provide a beneficial effect.

### CHARACTERISTICS OF SALT-AFFECTED SOILS

There are two quite distinct, but nevertheless sometimes overlapping, types of problem soils under this main heading.

Firstly, there are those soils in which soluble salts have accumulated in the root zone to such an extent that plant growth is adversely affected. This is the type of problem which occurs most commonly in

Western Australia. In these soils, the salts remain as such in the soil solution, the only effect being to produce a concentrated salt solution from which the plant roots have to extract moisture and nutrients. The result is that as the concentration of this solution increases, it becomes more and more difficult for the plant to extract its requirements of water from the soil. The final stage is that plants, when in a sufficiently salty soil, eventually die of drought even though the soil may appear quite moist. One important characteristic of this type of soil is that the presence of these salts does not influence, to any great extent, the structural properties of the soil.

The second type of salt-affected soil is one in which the sodium part of the salt



(sodium chloride) becomes attached to the clay particles of the soil. The presence of a large quantity of sodium on the soil clay has the effect of producing a poor soil structure and, in particular, a very much reduced permeability to water.

### HOW GYPSUM AFFECTS SOIL AND SALT

A clay with much sodium attached to it has a poor structure. On the other hand, a clay with predominantly calcium attached to it has a good physical condition. The object of applying gypsum which is a calcium salt (calcium sulphate) is to replace the sodium on the clay with the more desirable calcium. The sodium thus displaced can then be washed or leached from the soil leaving a soil with good physical characteristics.

It is clear, then, that gypsum is only used on salt-affected soils to correct the sodium effects, and indirectly where salt and sodium effects exist together, to enable a leaching out of the excess amount of salts by producing a more per-

meable soil. Also as gypsum is not freely soluble in water, it is necessary to have large amounts of water, either as rainfall or as irrigation water. Again, in order for the replacement to continue, the "by-products" of this replacement must be continually removed by downward-moving water.

In all these cases, large quantities of relatively fresh water are required. Nowhere in the wheatbelt of W.A., where salinity is a problem, can these conditions be met. As mentioned earlier, the main salinity problem in W.A. is in the first category where only the presence of soluble salts in the soil is the problem, and for this class there is no reason to expect the application of gypsum to be of use.

It is also possible to get the two sets of conditions occurring together, in which there are excessive amounts of soluble sodium absorbed on the clay particles. These conditions do exist but only to a very small extent in this State, in association with the main type of salinity problem indicated above.

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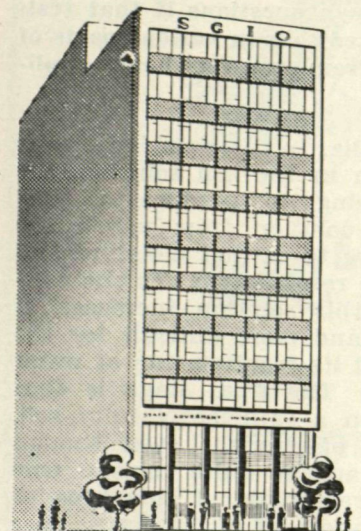
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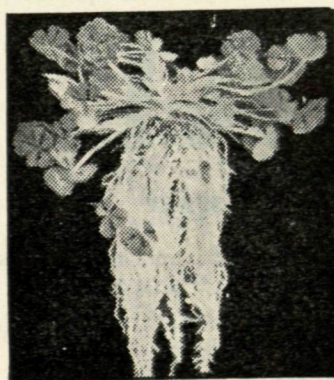
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