WATER-RUN GYPSUM FOR CRUSTING, SODIC SOILS

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Crop and pasture establishment on sodic clay soils is often poor due to surface crusting, particularly after landforming. Irrigation with low salinity water results in a low concentration of electrolyte at the soil surface causing the clay to disperse. As the soil dries out a hard, thin crust forms restricting the emergence of plants. The problem is particularly severe when sodic clay subsoils are exposed after landforming.

Dispersion can be prevented by the presence of a dissolved salt such as gympsum in the irrigation water. Gypsum is usually applied by broad- casting as a dry powder at 2.5 to 5.0 t/ha but because of its slow rate of dissolution, only a small fraction, consisting of the smallest particles sizes, dissolves in the initial irrigation. The electrolytic effect that prevents dispersion can also be achieved by predissolving gypsum in the irrigation water, concentrations of 5 to 10 milli-equivalents of calcium per litre (0.33 to 0.67 kg $(Ca\ SO_4)/m^3$) being sufficient to reduce crusting and significantly improve emergence of plants. These concentrations, equivalent to 0.31 to 0.63 t (100% gypsum)/ha in 75 mm of water, represent a considerable cost saving compared to broadcast gypsum if the aim is just to improve establishment. The greater quantities of broadcast gypsum will, of course, give a greater long term benefit by supplying more calcium to ameliorate a greater depth of soil.

Gypsum is not easy to dissolve efficiently and requires special equipment. A demonstration gypsum dissolver has been built in which high shear forces in a 150 mm pump speed up the dissolution of gypsum particles. Undissolved particles are separated out by centrifugal force in a hydrocyclone and are recycled until they dissolve completely.

A trial to demonstrate the dissolver and the benefits of water-run gypsum was held near Hay in March, 1985. An 8-metre-wide strip was treated with 9 meq/L of $CaSO_4$ in a newly laser-planed, border check layout being sown to pasture. Other bays were given treatments of nil, 2.5 t/ha and 5.0 t/ha of natural

reduced the exchangeable sodium percentage and maintained an adequate electrolyte content at the soil surface. The treated soil was much less dispersive than the soil not treated with gypsum. The 37% establishment achieved was equivalent to the 5 t/ha broadcast treatment (35%) and exceeded the other treatments (12% and 23% respectively).

In addition to (a) aiding crop and pasture establishment with a reduced quantity of gypsum, water-run gypsum can be used for: (b) subsoil amelio- ration, (c) enabling the use of saline-sodic groundwater for irrigation, (d) reclamation of saline-sodic soils and (e) clearing muddy water in rice bays.

The demonstration gypsum dissolver is suitable for some of these applications but a scaled-up version would be needed for large, flood-irrigation systems. It would be also possible to use the pump of mobile irrigation equipment to dissolve and distribute gypsum.