SUSTAINABLE AGRICULTURE THROUGH SODIC SOIL REMEDIATION

By way of background, sodicity is an environmental issue that adversely affects soils by causing clay particles to swell and disperse. Swelling and dispersion of the clay minerals in turn clogs soil pores and prevents nutrient, air and water transport. The resultant waterlogging, lack of aeration, and poor nutrient access, leads to poor plant growth in affected soils. In addition, the dispersible clays set hard on drying to make root penetration difficult, and slake on wetting to exacerbate soil erosion.

Between 25 and 30% of Australian soils are sodic. As an example of the scale of this problem, a related problem is salinity, which has been tracked over the past few decades and is also on the increase. According to the Queensland EPA's "State of the Environment" Reports, salinity affected areas increased from 14000 Ha in 1990 to 48000 Ha in 2000, and the latter figure may actually be closer to 107000 Ha in the 2007 study.

The soils of southeast Queensland historically supported open eucalypt woodlands, with deep-drawing root systems which kept the potentially sodic-saline water tables low, and kept land sodicfication at bay. As the State developed, with growing urban expansion this land was cleared for multiple uses, ranging from cropping to pasture to redevelopment. However, the experience in other parts of the country subjected to these unsuitable clearing practices has shown that the consequent rising of sodic-saline water tables led to loss of land value through soil sodification.

The lesson from these experiences is that if the land is to remain healthy, a change of land use or environment must be accompanied by a corresponding change in the remaining environment, i.e. the soil type, structure, or drainage.

With the ever-increasing demands society is placing on acquiring nutritious foods, fertile land is becoming harder to acquire and maintain. To meet this demand, poorer soils have to be targeted and rejuvenated, and historically degraded land remediated.

Similarly, society is placing huge demands on tying up land (and in some cases useable agricultural land) for generations with the placement of its wastes in landfills. These same wastes may provide the basic ingredients for remediating damaged soil.

It is of course highly sought to reduce or remove sodicity where it exists in farmland because of the associated loss of productivity. While gypsum is the most common ameliorant in use, its effects are not permanent as the calcium is eventually displaced and leached away by successive saline inundations.

It is against this background that AGR has sought to combat the spread of soil degradation through development of alternative technology for the effective (and cost-effective) long-term treatment of sodic soils.

Furthermore, we at AGR have sought to multiply the environmental benefit of the technology by developing these sodic soil treatment products from waste streams. The *Environmental Protection (Waste Management) Policy 2000* under Division 2 – Hierarchy and principles, section 10 – Waste Management Hierarchy highlights the waste

management practices listed in the preferred option of adoption. We therefore believe that the beneficial reuse of certain wastes applied to agricultural land represents a practice that is higher on the waste hierarchy than disposal at a landfill.

Over the past seven years, AGR have developed and proved a technology for remediating affected land, and immunizing land at risk of sodification. AGR subsequently acquired 2300 Ha of degraded pasture land in a notorious sodicity "hot spot" at Leyburn in the Darling Downs and have put this technology into practice, to not only halt the onset of sodification, but to turn the fate of the property around from being unproductive and uneconomic to being fertile and productive cropping/grazing land, as is evident in the "before and after" photographs below.

Soil and pasture quality before AGR's treatment

The same paddock growing barley after treatment.

AGR's research program has demonstrated that the primary result of its sodic soil amendment agent (SSAA) treatment is the aggregation and cementation of dispersive clays which would otherwise give rise to adverse sodicity effects in the land. By achieving this fundamental change in the clay chemistry, the treated land is effectively immunized against sodicity.

Consequently, changes in the soil structure and micronutrient availability resultant from this SSAA treatment have allowed improved extraction and utilization of the micronutrients by the pasture grasses. This improved micronutrient utilization is reflected in a nearly two-fold increase in protein and trace element levels of the grasses compared to those grown in untreated soils. It should be stressed that these improvements are seen without the use of conventional fertilizers or irrigation. The pasture improvements in turn yield significantly higher livestock carrying capacities on the available land, and soften the grazing pressure on the neighbouring regional ecosystem.

Finally, that these treatment agents are sourced from beneficially reused materials otherwise destined for landfill demonstrates AGR's commitment to sustainable agriculture and to the Environment as a whole.