

Gypsum for the Lower Murray

Why use gypsum?

Soils of the Lower Murray reclaimed areas are very high in clay content—50 to 70% clay. Some clay soils disperse or fall apart on wetting causing several problems:

- poor aeration resulting in poor pasture growth—pastures need air in the soil around their roots to grow well.
- structural collapse resulting in poor drainage and water-logging. Other associated problems include pugging damage from livestock.
- surface crusting and/or sealing resulting in poor seedling emergence and lowered water penetration. The soil surface appears “smeared” and sticky and sets very hard when dry.

This is mainly due to dominance of sodium ions (see text box) on the exchange sites on the clay particles (where nutrients are stored) from salinity in the irrigation water and from salt in the underground water. The “salt”^{*} in the clay forces the clay particles apart breaking down soil structure, causing the problems described.

* Salt is made up of sodium and chloride or NaCl

How does gypsum work?

Gypsum (CaSO_4) works in two ways:

1. Replacing exchangeable sodium (Na) with calcium (Ca).

Calcium is much more stable under soil wetting than sodium. Soils that are high in calcium seldom disperse, hence gypsum is applied to raise the calcium level. To achieve a rapid exchange of calcium for sodium, maximum soil contact is desirable, therefore gypsum should ideally be worked into the soil. This can be accomplished at seeding or laser-levelling.

WARNING: Gypsum should only be applied where drainage is good. Once the calcium has replaced the sodium, the sodium has to be leached away by rain or irrigation, or salinity will increase. Gypsum is itself a salt. Make sure your side drains are clean and in good condition

2. Electrolyte[†] effect.

Addition of gypsum increases the level of electrolyte (see text box) in the soil solution. This in turn leads to higher flocculation—sticking together—of the clay particles preventing structural collapse.

[†] “Electrolyte” means “salt solution”. The electrolyte effect is based on the fact that as the salinity of the soil solution increases the effects on soil structure decrease. Gypsum is a salt and therefore has an electrolyte effect.

How do I know if I need to apply gypsum?

No one should be applying gypsum without first having had a soil test done. Ask your fertiliser rep or farm adviser to have an ESP test done—this assesses the level of exchangeable sodium in the soil—if it is over 5% you will most likely get a response to gypsum.

Alternatively, there are two simple on-farm tests that you can do:

- **Place some soil lumps in a jar and slowly add some rainwater.** Let stand 2 hours—if the water around the soil is very milky or cloudy (so you can hardly see through it) then the soil may respond to gypsum. Repeat the test with water with a little gypsum shaken in it—if the cloudiness does not form, this confirms there may be a gypsum response.
- **Punch holes in the bottom of 2 tins.** Fill both with soil—tap the tins to settle the soil. Leave soil level about 1 ½ inches from the top of the tin. Pour 250 to 500ml of water through one tin, the same amount of water but with gypsum dissolved in it, through the other. Time how long it takes for the water to flow through, if it is at least 3 times quicker in the one with gypsum, then the soil may be responsive to gypsum. It is a good idea to repeat both these tests at least twice.

These tests are a guide only—get a soil test done before committing to the expense of gypsum—see your adviser or fertiliser representative.

How much gypsum do I need?

On most soils 2.5 to 5 tonnes per hectare is adequate. However, the soils of the reclaimed areas are very different—up to 10 to 20 tonnes per hectare of gypsum needs to be applied to get a similar response. For this reason, gypsum is only economic on small areas which are severely affected by salt and which can have their drainage improved to enable leaching away of the sodium that causes the problem. Smaller amounts applied annually may also be beneficial in the long term on salt affected soils.

When should I apply gypsum?

Apply gypsum when working up the soil and prior to seeding. This can be done prior to laser levelling.

Is there an alternative?

For hard setting soil areas such as at the drain end of some irrigation paddocks, composted manure/s can be effective in improving soil. These are relatively cheap compared to gypsum but work in a different way by increasing soil organic matter and feeding micro-organisms in the soil. This in turn improves aeration, friability and drainage and so addresses the three issues of poor aeration, structural collapse and surface crusting and/or sealing.

When in doubt—contact your local fertiliser representative.

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