

Spader and liming trials: did they mix?

Background

The spader machine is often used for the deep incorporation of materials into the soil profile. The advantage of the spader is the even mixing of the material right through the soil profile down to a depth of approximately 35-40 cm.

Soil acidity is a major limiting factor to productivity on Kangaroo Island. Whilst the application of lime is an effective means of addressing acidification, the problem has always been in getting it to depth quickly. Surface applied lime only moves slowly through the profile and rarely gets below 10-15 cm. A trial was set up to investigate the effectiveness of using the spader to get lime quickly and effectively mixed through the top 30-40 cm of soil.

What was done

Lime was applied at 100 t, 25 t, 10 t and 2.5 t/ha. The spader was used to incorporate the lime. In addition, one treatment of 2.5 t/ha was left on the surface and one area was spaded with no lime applied. Lupins, faba beans, lentils and chickpeas were sown in strips across all treatments.

Results

Due to the overall poor growth of the crops, yields were not recorded. The beans grew very well, but lupins grew poorly due to the wet winter. Figure 1 shows the resultant changes in pH through the soil profile of the various treatments.

The control showed that the natural trend is for the topsoil to be acidic, with the pH gradually increasing at

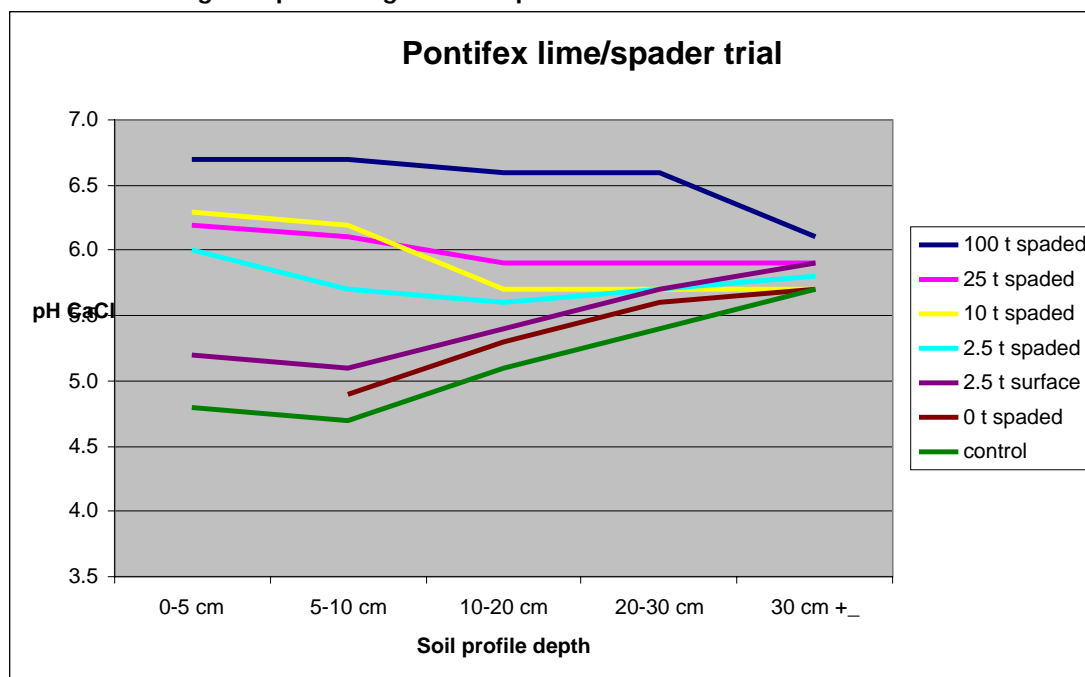
depth. The spading slightly raised the pH (0 t spaded versus control). It is possible that spading may have increased the pH by breaking up and oxidising organic matter, which tends to be a source of acidity. Spading may have also incorporated the less acidic sub soil into the top soil.

The 2.5 t surface treatment increased the pH around 0.6 units in the top 10 cm. The 2.5 t spaded treatment was quite effective, particularly in the top 10 cm. There was less increase in pH at depth. The effect of spading (2.5 t surface versus 2.5 t spaded) was to change the shape of the pH line from the natural one of increasing pH to a flat one of higher pH across the full spaded depth, by incorporating the lime and allowing it to work better. So spading lime (or incorporating it) is a good thing. This is why we always say it's more effective to incorporate lime than just broadcasting it, but broadcasting is better than not doing anything at all!

The 10 t spaded and 25 t spaded treatments are just a further development of the 2.5 t spaded treatment. The effects of both treatments lessen with depth, as per the 2.5 t spaded treatment.

The 100 t spaded treatment shows a significant increase in soil pH. Such a major increase could impact upon nutrient availability such as iron (which is a good thing) and zinc and manganese (which may cause nutrient deficiencies). The lime moved below 30 cm depth and raised the pH significantly through the whole depth.

FIGURE 1 Changes in pH through the soil profile



In another trial on the property, a large area was spaded that included both sloping and flat country. The whole site was seeded to canola. The canola grew well on sloping areas that were spaded, but spading was not recommended on the flats as the soils became very "soupy". This made the soil very difficult to get on to for spraying and other operations. This may only apply to wet years like 2009 and spading may be suitable in drier years.

Funding/Sponsors

- Ben Pontifex
- Jenny Stanton (Keilem)
- Caring for our Country through the KI Natural Resources Management Board

For further information contact

Lyn Dohle, Rural Solutions SA,
Kingscote on 8553 4999 or email
lyn.dohle@sa.gov.au

Take home messages

- As to be expected, the highest rate of lime application (100 t/ha) had the greatest increase on pH, increasing pH by 1.5 units in the topsoil and 0.4 of a unit in the sub soil
- The spaded only treatments (no lime applied) also increased the pH by bringing up less acidic clay into the surface soil horizons
- The higher lime rate applications showed that the soil pH had been evenly increased through the profile, demonstrating the ability of the spader to uniformly mix the lime to depth.