Improving sub soil pH

Background

With over 70% of the island farm land affected by soil acidity, its one of the key land degradation issues that producers need to address to maintain soil health and productivity. Most soil monitoring measures the top soils, but it's what goes on at depth that can also impact upon plant growth.

Many island soils have acidic sub soils, this limits root growth and development, preventing plants from accessing nutrients and water. Whilst top soil acidity can more easily be rectified by the appliaction of lime (either broadcast or incorporated), it is extremely difficult and costly to get lime to depth.

What was done

A trial was set up on Robert Hams property (Corner Timber Creek and South Coast Roads) to look at the effectiveness of placing lime at depth. Many of the plateau soils have acidic subsoils and surface applied lime is simply unable to penetrate to sufficient depth to counteract the subsoil acidity.

Limesand was applied at 3t/ha both on the surface and at depth. The deep placement of lime was undertaken using a sub soiler machine which rips to a depth of approximately 40-45 cm with product placed at about 35 cm. Each treatment was replicated three times.

The site was monitored for changes in soil pH both on the surface and at depth.

Results

The area was measured for pH prior to the trial being established. The site was re-monitored in May 2013 (TABLE 1).

TABLE 1: **pH changes over time**

Treatment	Initial $pH_{(CaCl_2)}$ 0 – 10 cm	Initial $pH_{(CaCl_2)}$ 35 – 45 cm	Final $pH_{(CaCl_2)}$ 0 – 10 cm	Final $pH_{(CaCl_2)}$ 35 – 45 cm
control	4.8	5.6	4.9	5.9
Rip only	4.8	5.8	5.3	5.9
Surface applied 3t lime sand/ha	4.9	5.3	5.8	5.7
Deep Ripped 3t lime sand/ha	4.8	5.5	5.1	5.8

All plots started off with an average surface pH(CaCl2) of approximatley 4.8 and an average sub soil of result of 5.5. The control surface pH did not significantly change (as to be expected as no lime was added) however the subsoil pH did increase by 0.3 unit – possibly due to natural soil variability. The surface applied lime at 3t/ha increased the surface pH by 0.9 of a unit and by 0.4 unit a depth.

Previous trial work conducted on KI has shown that surface applied lime only moves down the profile at about 2-3 cm/yr so its not expected that the surface applied lime would have had an impact on sub soil pH. Again this change is possibly more likely to be the result of natural soil variability as occured within the control plots. The lime applied at depth had a slight impact on the surface pH (0.2 unit) which could be due to natural variability or the ripping process pulling up some less acidic sub soil to the surface. Interestingly, the lime applied at depth had limited impact on soil pH at depth, only increasing it by 0.3 unit which was no greater impact than the other treatments (which were not meant to impact on sub soil pH anyway!). The ripping changed the surface pH. Possibly an impact of the ripping process pulling up less acidic soil from at depth.

One treatment of lime at 6t/ha was applied at both surface and depth. The 6 t/ha increased surface pH by 1.3 units and the deep ripped lime at 6t/ha increased subsoil pH by 0.5 unit.

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- Robert Hams for providing the trial site.

For further information contact

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Take home messages

- Surface applied lime increased soil pH in the top 10 cm by 0.9 unit.
- Deep application of lime had a limited impact on soil pH at depth, possibly due to sampling errors and natural soil variability.