



Examining lime application for improving soil acidity, crop yield and CCS

A field trial in collaboration with a subgroup of growers from the Central Queensland Soil Health Society will examine the impact of fine lime application upon yield, CCS and soil amelioration.

BY BEENA ANIL-BISWAS, ADOPTION OFFICER, MACKAY, AND NICK HILL, RESEARCHER, MACKAY.

Within Australian agriculture, soil acidification is a serious land degradation issue, with over 50 million hectares of agricultural land affected nationally. Often called a “silent hunger” it is a process by which the pH of a soil decreases slowly overtime, acidifying the soil and causing a gradual reduction in yield which can go unnoticed and be attributed to other factors.

Soil acidification is a natural process that is accelerated via crop removal and the use of nitrogen fertilisers which cause an increase in the level of hydrogen ions within the soil, measured and expressed via the pH scale. Ideally the pH of a soil should be maintained at above 5.5 in the topsoil. Once the pH falls below these values the increase in acidification will affect crop yield.

The acidification of a soil causes a change in chemical processes, such as increasing the solubility and availability of aluminium and manganese to toxic levels which can then impact upon root growth, nutrient uptake and plant development.

The combined impact is poor root development and plant growth, resulting in lower yields. Acidification can also negatively impact microbial activity in the soil, lessening the rates of nutrient cycling via mineralisation and reducing legume nodulation and the associated inputs of nitrogen into the system.

Also, soil acidity negatively impacts upon the structure of a soil, reducing the infiltration of water and increasing rates of erosion and associated transportation of soil. As pH of the upper section of the soil profile falls below 5.5, acidification moves down through the soil profile, negatively impacting the lower sections of the profile. While surface acidity can be relatively simple to address and have considerable benefits to plant health, subsurface acidity is more difficult and expensive to treat.

The use of agricultural lime is considered the most effective method of addressing soil acidification. A major consideration when applying lime is its Effective Neutralising Value which is directly influenced by particle size and Calcium Carbonate (CaCo₃) content. Fine lime, with its reduced particle size and associated increase in surface area, is known to have a greater rate of impact upon the pH of a soil when compared to coarse lime with a comparable CaCo₃ content.

To quantify the benefits of fine lime for Central region growers, SRA Research and Adoption Officer Nick Hill is involved in conducting a cooperative trial with Central region growers Allan McLean and Richard Prior, who are members of the

Central Queensland Soil Health Systems (CQSHS) group. The CQSHS is a grower-driven group undertaking research and trial work addressing soil health issues in Central Queensland.

The trial site is located in Kuttabul, north of Mackay, and was established post-harvest 2017 in second ratoon Q242(b) and will conclude prior to plough-out (fourth ratoon). The trial is a paddock scale randomised strip trial comprised of four treatments: three rates of lime surface applied to the trash blanket and a zero control, with all treatments replicated three times.

As per standard on-farm practices, an annual application of 0.33 t/ha will be applied and compared with 1t/ha and 2t/ha applied once in 2017. Over the life of the trial the impact of the treatments will be assessed annually via:

- identifying changes to the soil pH at the surface; 0-20cm, and subsurface; 20-40cm, 40-60cm and 60-80cm;
- yield;
- CCS; and,
- A cost benefit analysis for each of the different treatments (*see Table*)

FINE LIME APPLICATION RATES	FREQUENCY OF APPLICATION	ANNUAL ASSESSMENT – ALL TREATMENTS
0.333t/ha	Annually	Soil analysis: pH at surface (0-20cm) and subsurface (20-40cm, 40-60cm and 60-80cm) Harvest: Yield, CCS Cost benefit analysis
1t/ha	Once	
2t/ha	Once	

Trial outcomes will be communicated through building on the existing CQSHS group network, working closely with extension officers from Mackay Agricultural Productivity Service (MAPS) and associated MAPS regional farming groups. ■

*(Over Page) lime being applied as part of the trial.
(Below) Growers Allan Mclean and Richard Prior are eager to learn more about an assessment of different approaches for fine lime application.*



For more information, contact:
Nick Hill
E nhill@sugarresearch.com.au
T (07) 4963 6807