

MEASURING THE LONG TERM EFFECTS OF LIMING IN WHEAT

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Grains
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AIM

To evaluate the long term effect various rates of lime applications has on yield and protein in wheat.

BACKGROUND

This trial is an on-farm demonstration for the Liebe Group's GRDC funded adoption project '**Growers critically analysing new technologies for improved farming systems**'.

Soil acidity has been identified as a key constraint over large areas of the northern agricultural region, particularly on the sand plain soils.

In December 2004, it was decided to re-sample a liming trial that was established by Dr Lorelle Lightfoot in 1986 with the aim of comparing the soil profile pH with the measurements made in 1993.

The results showed that there had been a drop in surface pH for all of the lime treatments. After 18 years, the 5 t/ha treatments showed a pH level of 5.5 throughout the top 35cm of the profile, however the topsoil had become more acidic due to the removal of crop and inefficiencies of nitrogen use. The 1.25 and 2.5 t/ha treatments were still showing a liming effect in the topsoil (0-10cm) with the pH ranging between 5 and 5.5. The 0 t/ha treatments recorded a slightly acidic topsoil pH level of 4.5. The effectiveness of lime applications are influenced by farming practices, in this case incorporation has achieved distribution of lime and correction of acidity in the 10-20 cm soil layer.

In 2008 it was decided to harvest the trial again with the main focus being to evaluate if there is a residual effect from the lime treatments on wheat grain yield and protein results.

TRIAL DETAILS

Property	Ian and Brenda Bowman, east Carnamah
Plot size & replication	150m x 22m x 3 replicates
Soil type	Yellow sand
Sowing date	4/5/08
Seeding rate	75 kg/ha
Variety	Calingiri
Fertiliser	40 kg/ha Agflow
Paddock rotation	2006 = Wheat, 2007 = Pasture
Herbicides	800 mL/ha Roundup, 35 g/ha Logran, 1.2 L/ha Treflan
Growing Season Rainfall	247mm (Carnamah)

The initial trial was set up with four different lime treatments, 0 t/ha, 1.25 t/ha, 2.5 t/ha and 5 t/ha. The applications were spread on the surface of the plots before being worked in using a full cut scarifier. In 2002 all plots received an additional 1.25 t/ha of lime which was spread on the surface.

RESULTS

Table 1: Yield and quality of wheat for various replicates of a liming trial at east Carnamah.

1986 Lime Treatment	2002 Lime Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Weight (kg/hectolitre)
0 t/ha	1.25 t/ha	2.4	10.5	2.8	82.1
1.25 t/ha	1.25 t/ha	2.3	10.7	2.9	82.1
2.5 t/ha	1.25 t/ha	2.2	11.2	2.4	81.4
5 t/ha	1.25 t/ha	2.3	10.5	2.2	82.4
LSD (5%)		ns	ns	ns	ns

The results showed no significant difference between any of the four 1986 lime treatments in either yield or protein, suggesting the residual effect from the lime treatments has decreased dramatically with the lime having been completely neutralised since being applied 22 years ago for the original lime applications or six years ago for the blanket lime application in 2002. Although there were no significant differences in the protein results, plots treated with the initial treatment of 2.5 t/ha did show a trend towards slightly higher levels while there was a trend towards lower screenings at the higher rates of lime applied in 1986.

COMMENTS

- Due to the dry start to the season, germination across the trial paddock was very uneven which may have influenced the yield results of the trial. Given the long-term nature of this trial it is not surprising that the impact of the lower lime rates applied in 1986, 22 years ago, is negligible given the ongoing acidification that has occurred. What is a little surprising is that there is no residual effect of the 5t/ha lime treatment applied in 1986 with a subsequent blanket application of 1.25 t/ha of lime in 2002.
- It is anticipated that further soil sampling and analysis work will be carried out on this trial in 2009 to look at the residual effect of lime on soil pH and aluminium toxicity. Visual observations of clover growth during pasture phases in the trial paddock showed the clover plants grown on the trial area performed better and had healthier plants compared to the rest of the paddock, suggesting that species more sensitive to soil acidity are responding to the historical lime treatments.

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