# Trial 32

## Nitrogen Trial - Production of Quality Wheat

**GRDC, CropFacts, Pivot, Bunge**

**Aim:** this trial site was part of a larger trial (14 sites across the State, over three years) where the nitrogen requirements of wheat are investigated. Quality characteristics (dough quality) were also determined by Bunge.

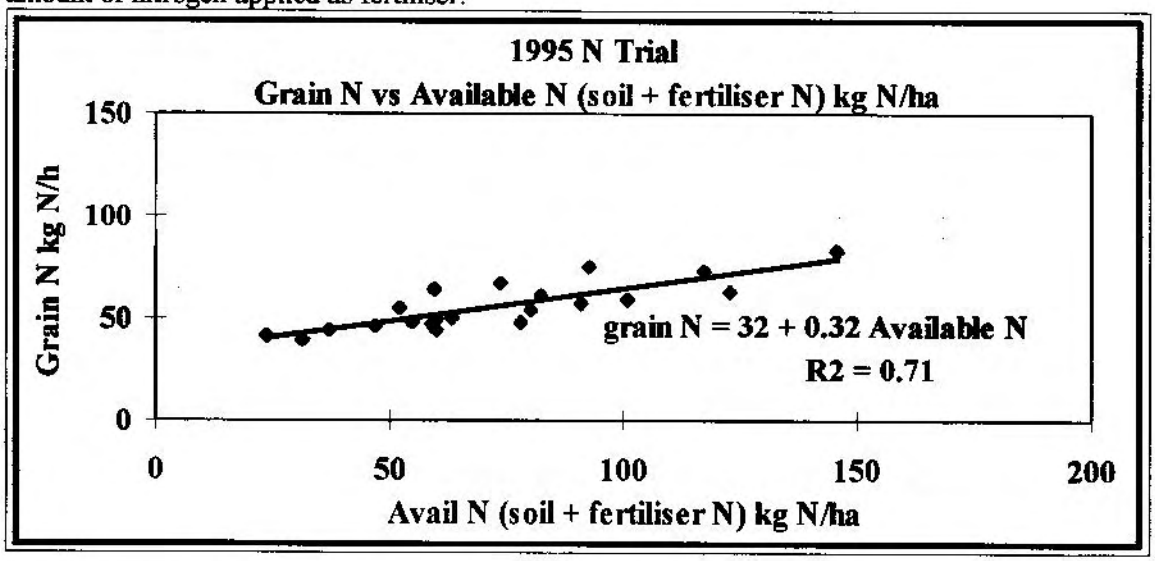
**Method:** the trial site was established in the paddock sown by Keith Barber, immediately adjacent to the BCDS main field day site. The treatments were:

- control - no nitrogen fertiliser applied
- predrilled urea at 35 kg of N/ha as urea
- predrilled urea + topdressed 28 kg of N/ha as urea at the end of tillering (Z30)
- predrilled urea + topdressed 37 kg of N/ha as urea at the second node stage (stem elongation - Z32)
- predrilled urea + topdressed 37 kg of N/ha as ammonium sulphate at the second node stage (as above). This treatment was used in an attempt to increase the sulphur content of the grain, which may have a beneficial effect on grain quality.

**Results:** the site at the BCDS looked the most promising of all fourteen sites, unfortunately the frosts in late September and early October reaped havoc on grain yield, and the resulting yields were less than half of expected.

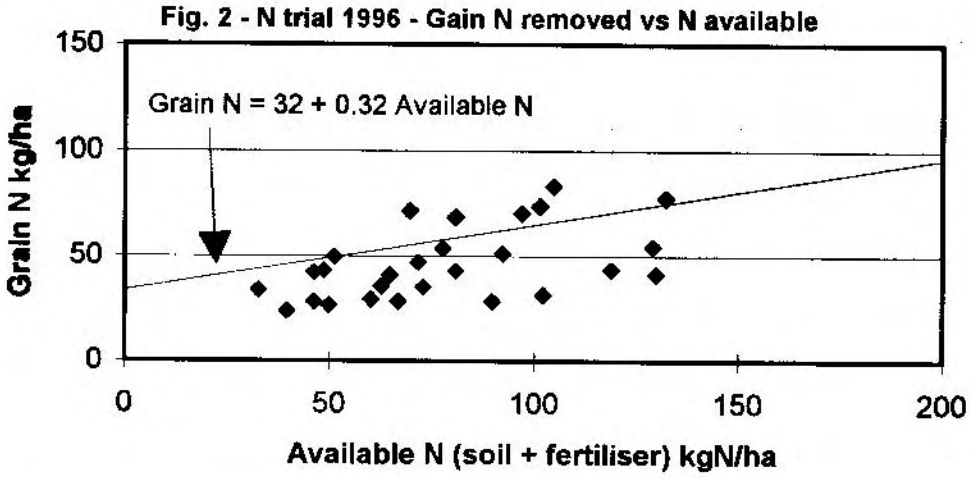
| | Control - 0N | predrilled 35 kg N/ha as urea | topdress at Z30 28kg N/ha as urea | topdress at Z32 37 kg N/ha as urea | topdress Z32 37 kg of N/ha as ammonium sulphate |
|---|---|---|---|---|---|
| yield t/ha | 1.5 | 2.0 | 1.8 | 2.0 | 1.9 |
| protein % | 11.7 | 11.7 | 11.2 | 11.7 | 12.7 |

In 1995 we found an excellent relationship between the amount of nitrogen removed in the grain (yield by protein) and the amount of nitrogen available in the soil at sowing (measured as deep soil nitrate) plus the amount of nitrogen applied as fertiliser.




The above graph clearly shows the relationship between yield (reported as nitrogen removal per hectare) and the amount of nitrogen available for crop growth. It illustrates that after allowing for mineralisation to occur during the season that the efficiency of nitrogen uptake is only about 32% of the total amount of nitrogen available in the soil and what was applied as fertiliser.

In 1996 the relationship was not as clear.




Two sites had a higher grain nitrogen removal rate (yield by protein) than expected (the two sites well above the efficiency line). The reason for this are not clear but could be due to:

- the crops accessed nitrogen deeper in the soil profile than was measured by us (we measured to 60 cm depth)
- the deep soil nitrate test was wrong (either the sampling was wrong or there was a laboratory error)
- release of mineralised nitrogen during the season was much higher than expected (and measured previously)

Many sites had a much less efficient uptake of nitrogen than was reported in 1995 (those sites falling well below the efficiency line). All of these sites were affected by frost, the crops looked good but they did not yield.

The information collected over the last three years can be used to provide for a reasonably accurate estimate of fertiliser requirements at sowing.

Use the formula Grain N removed = 32 + 0.32 (soil available N + fertiliser N)

For a target yield of 3t/ha at 11.0% protein, and a measured 50 kg of available N in the soil (measured from a deep soil nitrate test) the expected fertiliser N requirement would be:

(Remember - grain N is the amount of N removed by a crop and is calculated as yield x protein / 5.7)

3t/ha at 11% protein = 3 x (11/5.7) x 10 = 58 kg of N/ha

using the formula 58 kg N/ha = 32 + 0.32 (50 kg N + fertiliser N) 50 kg N was the amount of N measured in the soil

then 26 kg N/ha = 0.32 (50 kg N + fertiliser N)

then 81 kg N/ha = (50 kg N + fertiliser N) therefore fertiliser N = 31 kg N/ha

**Other results:**

The results of the quality work has not been completed yet at the time of publishing the manual. The results, when available, will be reported in the BCDS newsletter.