

Evaluation of Late Nitrogen Applications to Achieve Yield Potential and increased protein content in wheat

Start Date: 15 August 2013

Finish Date: 30 April 2014

1. PRIMARY LOCATION(S) OF PROJECT ACTIVITIES:

Trial sites will be established by the key farming systems groups across the HRZ, specifically MFMG (2 trial sites), SFS Victoria (3 trial sites) and Tasmania (2 trial sites) and Farmlink in NSW (2 trial sites).

2. PROJECT SUMMARY:

This project aims to contribute to the knowledge gaps identified by the HRZ RCSN in the program logic for the very high priority issue of nitrogen management. The research question is – Can we achieve optimum yield (measured at 10.5 -11% protein) and still increase the grain protein (to 12%) of wheat produced in the HRZ? Specific to the project is – What impact will delaying the timing of nitrogen applications after GS32 have on wheat yield and protein and is there an advantage of using solid or liquid fertiliser?

Trial sites will be established in wheat crops to evaluate the impact of late (post GS32) nitrogen application rates, products and timings on yields and grain quality. The treatments are outlined under “Detailed Methodology”. Grain yield and protein quality data will be collected.

Project objectives, updates and trial results will be extended through farming systems and GRDC networks via a range of mediums and activities, including field days and trial results presentations.

3. RATIONALE:

Growers and agronomists have to make a number of key tactical decisions, each season, in respect of their overall nitrogen management. These decisions include such things as:

- Application rates, based on seasonal conditions and their effect on yield potential
- The price of nitrogen fertiliser and how this will impact on the potential \$ return/ha
- The timing of applications and the ability to get nitrogen into the crop with sufficient rainfall or moisture, especially when applied later in the season.

In the current season with good soil moisture in both medium and high rainfall areas and a positive outlook for the spring from the majority of climate models, these issues have been identified as a high priority issue by the GRDC HRZ RCSN.

The low protein levels of wheat from last season would suggest that the optimum nitrogen requirements were not being met and therefore limited yield potential. The above average yields of this past season combined with low protein grain leads us to assume that the soil nitrogen supply will also be low. This has been confirmed by the results of deep soil nitrogen availability from tests both prior to sowing and those taken

over recent months. Given the dry summer and little mineralisation of nitrogen and now a wet winter it is likely that protein levels of wheat could again be low. Another factor contributing to lower available nitrogen inputs into the system is the lack of nitrogen fixing break crops. The consequence of eroded nitrogen levels in the soil is that nitrogen fertiliser input requirements will be significantly higher than most growers have been used to applying, to achieve yield potential and grain quality (protein and screening). The timing of nitrogen applications is also important to ensure that the supply of nitrogen matches that of the crop demand.

The need for additional nitrogen fertiliser inputs this season to achieve yield potential at accepted receival standards for protein content is not clearly understood and/or underestimated by the majority of agronomists and growers. The type of nitrogen fertiliser applied, whether as a liquid or in the solid form, has not been researched when applied after GS32, as in many seasons the conditions are not suitable for further yield gains and grain protein enhancement.

These trials will provide objective data to assist farmers make decisions on late nitrogen applications from GS32 (second node detectable) through to GS70 (grain watery ripe) comparing solid urea with two forms of liquid nitrogen. This will demonstrate strategies growers can utilise in the future to achieve increased grain yields, whilst maintaining acceptable grain protein, in seasons where crops have adequate soil water.

4. DETAILS OF ANY RELATED RD&E ACTIVITIES:

DAV00083 – “Assisting growers achieve yield in the HRZ of South-Eastern Australia” – Penny Riffkin.

DAV00061 – “Genotype and management combinations for highly productive cropping systems in the HRZ of Southern Australia”

CSP00132 – “Dual purpose crops in the HRZ” – Dr John Kirkegaard

SFS00017 – Canopy management – Dr. Nick Poole

UT00016 – Tasmanian Institute of Agriculture – Tina Acuna

5. PROJECT OUTPUTS:

Trial protocols for collaborating farming systems group developed by Project Co-ordinator (Jon Midwood) with technical expertise provided by Dr. Rob Norton.

Trial site selection based upon criteria defined in protocols:

- Nitrogen treatments applied by trial co-operators as stipulated in the trial protocols.
- GreenSeeker crop sensor, digital photographs and biomass and nitrogen content measurements undertaken at GS32, GS39 and GS65.
- Nitrogen treatments applied at GS32, GS39, GS55 and GS70.
- Scoring of plots to quantify leaf scorch and lodging.
- Fungicide(s) applied across all treatments to eliminate foliar diseases impacting yield.

- Small plot harvester used to measure grain yield.
- Grain sampling and analysis undertaken to quantify grain protein, moisture, screenings, specific weight and thousand seed weight.
- Deep soil nitrogen sampling and analysis to determine soil N levels at the end of the season.
- Trial results will be statistically analysed and a cost-benefit analysis of the treatments calculated.

Project objectives, updates and trial results will be extended through farming systems and GRDC networks via a range of mediums and activities, including field days and trial results presentations and publications.

6. DETAILED METHODOLOGY:

Nine trial sites will be established and will use a common set of protocols to evaluate the effect of nitrogen rates, products and application times on wheat yield and grain quality under a wide range of environmental conditions.

The protocols will be developed by the Project Co-ordinator with technical expertise and review provided by (Regional Director, Australia and New Zealand with the International Plant Nutrition Institute). These standard protocols will ensure consistency and limit the variables between the sites to improve the statistical validity of the trials across multiple site locations.

The following background data and information will be required for each trial sites –

- soil description (organic C %, texture and nutrient status);
- paddock/trial site history (crop rotation for previous 3 years);
- moisture conditions throughout the season (commentary);
- location and distance to nearest BOM weather station;
- fertiliser applications (application date, product and rate);
- deep N analysis (if available);

Trial site locations and co-operating organisations –

- 2 sites – MFMG, South East of SA;
- 3 sites – SFS, 3 Western Districts of Victoria;
- 2 sites – SFS, Midlands of Tasmania;
- 2 sites – Farmlink, Southern NSW and Riverine Plains

The treatments are as follows -

- two nitrogen rates – 25 and 50 kg of N/ha;
- three nitrogen products –UAN versus granular Urea versus liquid urea;
 - UAN and Liquid Urea applied through streaming nozzles at GS 32 and GS39 and through Flat fan nozzles at GS55 and GS70

- application times - (GS32, GS39, GS55 and GS70)
- control – “district practice”
- Total number of plots per trial = 100

Data collection will include the following –

- grain yield (t/ha);
- grain protein (%);
- moisture (%);
- screenings (%);
- specific weight (kg/hL);
- TGW (g/1000 seeds);
- leaf scorch score (% burn on top leaves Flag, L2 and L3);
- lodging;
- dry matter and N content at GS32, GS39, GS 65)
- N in straw;
- deep N soil analysis
- Greenseeker readings at each timing to quantify relative differences
- digital photographs of 1 replicate at assessment times;

Dr. Rob Norton (IPNI) will provide statistical analysis of yield and quality data.

The trial objectives, updates, results and the application of this information for nitrogen budgeting and decision-making will be extended through the farming systems and GRDC networks. The extension activities will include newsletters, field days, trial results publications, “Groundcover” and HRZ RCSN members’ networks.

7. COMMUNICATION AND EXTENSION PLAN:

The trials will be conducted by several farming systems groups and results will be extended at field days, harvest meetings and in harvest results books. Results will be discussed in terms of changed yield and protein in relation to climatic conditions at each site. The extension of the trial results will be applying this information to assist in nitrogen budgeting and management.