

18. High Inputs, High Yields

Amanda Pearce, SARDI, amanda.pearce@sa.gov.au,
Felicity Turner, MFMG fturner@mackillopgroup.com.au

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KEY MESSAGES

- Regional survey on the nutrient status of nitrogen (N), Phosphorous (P), Potassium (K), Sulphur (S) and the micro-nutrients Zinc (Zn) and Copper (Cu) of soils in the HRZ of south-eastern Australia undertaken and status report prepared.
- Two omission trials sown in 2015 to test crop yield response and the interactions between nutrients where N, P, K and S and micro-nutrients Zn and Cu are omitted.
- Seasonal conditions resulted in the only responses being received from nitrogen applications; the omission trials to be repeated in 2016 under different seasonal conditions.

The MFMG is a collaborator in the national GRDC funded 'Optimising the yield and economic potential of high input cropping systems in the high rainfall zone' project (DAV00141). The project is led by DEDJTR in Victoria and field trials in South Australia are managed by the SARDI team based at Struan.

A component of this project is 'Managing High Input Systems'. MFMG and SARDI have been extensively involved in this component via regional soil, tissue and grain sampling and field omission trials.

Managing High Input Systems Project Background

Canola and wheat grown in the HRZ of South Australia and Victoria can potentially produce grain yields over 4 and 8 t/ha, respectively. However, the average in this region tends to be less than half these values. Such high yielding crops require a substantial application of inputs, the most costly being fertiliser. Decisions about nitrogen fertiliser rates are generally based on the difference between the nutrients required for a targeted yield and the estimated amount of nutrients supplied to the soil. However, limited research has been conducted in the HRZ relating the nutrient response of crops to soil nutrient status, and soil critical soil test values are either not known or are estimated from other regions and soil types. An improved

understanding of this relationship will reduce the risk of either under or over applying fertilisers, hence maximizing returns to growers.

The project aims (i) to collect field data that can be pooled with existing data from the Better Fertiliser Decisions for Crops database (BFDC) to assess the applicability of recommended soil critical values for the HRZ of southern Australia, (ii) quantify the effects of nutrient deficiencies on grain yield, and (iii) identify the main nutrients limiting grain yield for the purpose of conducting rate experiments in subsequent years.

2014 Region Surveys

An on-ground survey was conducted in the region to assess the status of the major and trace elements in soils and crops. Selected paddocks across the region were soil sampled, followed with tissue sample of the sown crop and then subsequent grain quality. Results from soil and plant (tissue and grain) analyses were compared to established critical values to determine if there were common deficiencies.

This data will be added into the current technical document 'Managing crop inputs in a high yield potential environment – HRZ of southern Australia' (access online <http://research.ipni.net/page/RANZ-2433>) which provides a situation analysis of the soil nutrient status across the HRZ of Southern Australia.

2015 Omission Trials

Leading on from the regional surveys four 'omission' trials were established in 2015, two trials in Victoria and two trials in the South-East, one at Frances (canola) and one at Bool Lagoon (wheat). The 'omission' experiments were designed to test crop yield response and the interactions between nutrients where N, P, K and S plus the micro-nutrients (Micro) Zn and Cu are omitted.

Figure 1 represents the trial design, including nutrient application and omission and

nitrogen rates applied. There were a total of 14 treatments evaluated over 4 replicates. The control treatments were all nutrients (ALL) with the three different N amounts applied (100 % yield potential, 75 % yield potential and 0 %) and no nutrients (NIL) with the three different N amounts applied. Each of the other treatments omitted one nutrient at a time with two different N amounts applied; either 100 % yield potential or 75 % yield potential. Nutrient and nitrogen amounts were calibrated to each site based on pre-seeding soil analysis results.

Figure 1. Concept and design of the omission trials.

Figure 1a. Control Treatments

PKSMicro	- PKSMicro	Nitrogen 100 % yield potential
ALL	NIL	Nitrogen 75 % yield potential
		Nitrogen 0 %

Figure 1b. Experimental Treatments

PKS	KSMicro	SMicroP	MicroPK	Nitrogen 100 % yield potential
- Micro	- P	- K	- S	Nitrogen 75 % yield potential

Figure 1c. Nitrogen Rates Applied (includes both seeding and in-crop applications):

Yield Potential	Kg N/ha	
	Frances Canola	Bool Lagoon Wheat
100 % yield potential	167	140
75 % yield potential	95	64

The omission trial sites were selected following strict criteria, which included selecting sites that have at least one low macro nutrient (P,K,S) or micro nutrients (Zn, Cu). The Frances site was selected as a micro-nutrient responsive site and the Bool Lagoon site as a P responsive site. The sites had extensive soil testing pre-seeding and post-harvest and Predicta B testing was completed.

Frances canola (cultivar Archer) was sown (with the mentioned treatments) on the 27 May with an aim of 60 plants/m². Bool Lagoon wheat (cultivar Beaufort) was sown (with the mentioned treatments) on the 28 May with an aim of 180 plants/m².

Tissue samples were collected at the 5-7 leaf stage for both crops and sent for nutrient testing. At growth stage 65 for wheat and first flower for canola a biomass sample was collected from all plots to measure dry matter production and plant tissue was sent for analysis. At maturity total biomass above ground was taken and dry matter and grain yield and quality (still to be completed) determined. In addition a machine harvest was conducted.

The only results available to date are the grain yields from both sites and Frances yields are shown in Figure 2 and Bool Lagoon Figure 3.

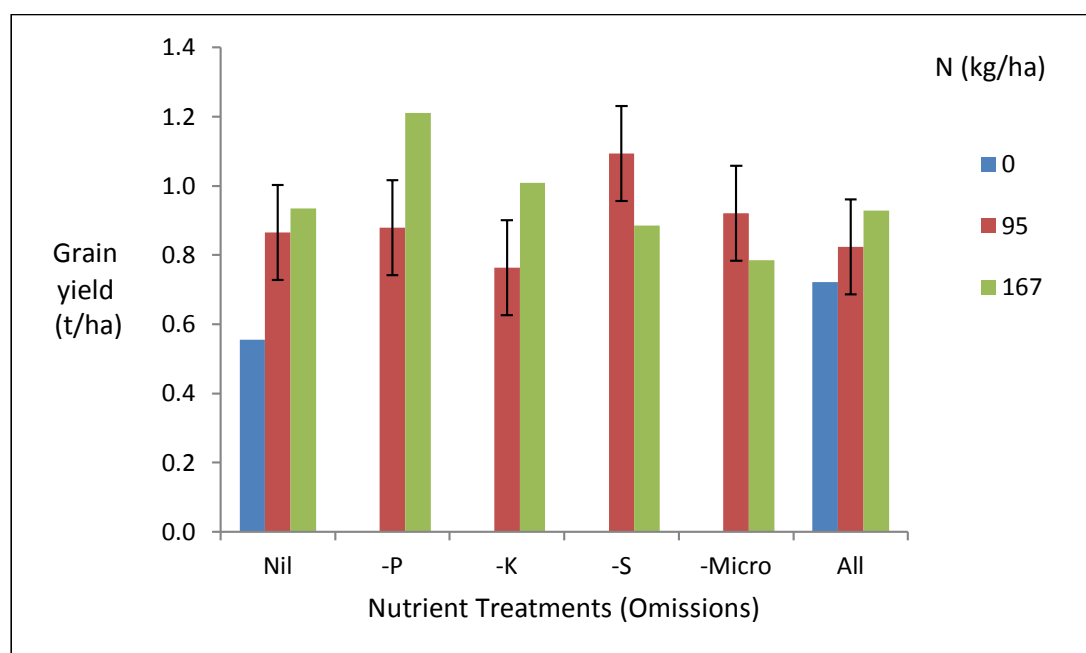


Figure 2. Frances canola grain yield.

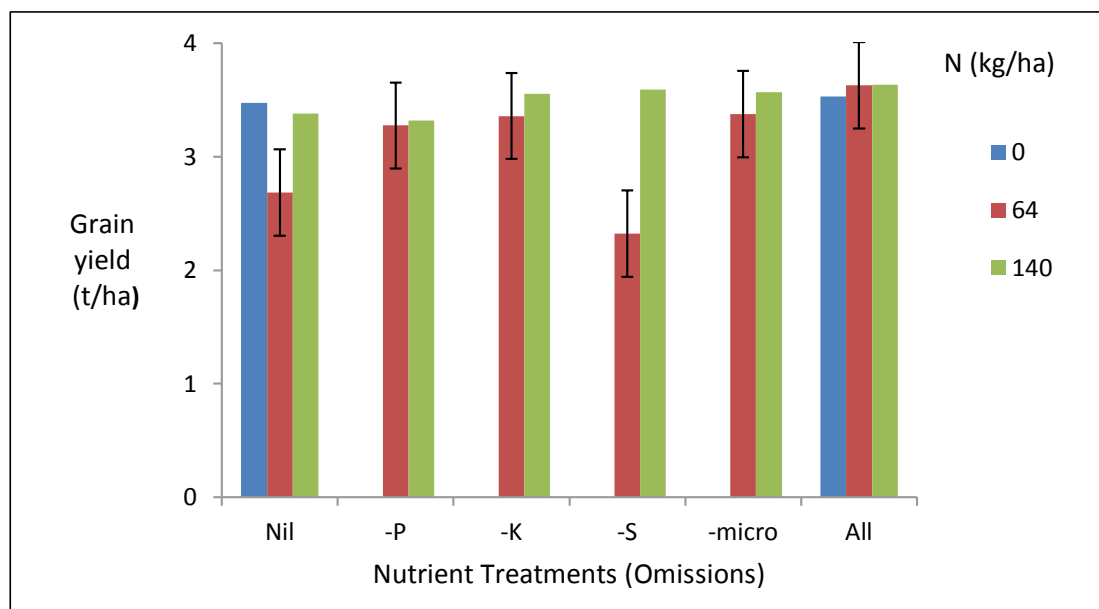


Figure 3. Bool Lagoon wheat grain yield.

At both sites the only significant response observed was between the N application rates. Due to the exceptionally dry conditions yields were well below regional long-term averages and the results suggest that yields can be obtained on low nutrients in dry seasons.

2016 Experiments

In 2016 in the South-East two new omission trials will be established and the trial will be repeated in a similar manner.

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- SARDI's South East New Variety Agronomy Team, based at Struan, who manage the South East Omission Trials.

