# Filling the Nutrient Gap

*a project being carried out by the MacKillop Farm Management Group through GRDC*

*funding provided through NSW DPI*

Mark Conyers, Jonathon Holland, NSW DPI

**Keith Trial details**

| | |
|---|---|
| **Location name:** | Sherwood (property), Keith (town) |
| **Farmer name:** | Trevor & Trish Menz |
| **Crop management:** | SARDI NVA Struan |
| **Nutrient of interest:** | Phosphorus (P) |
| **Experimental design:** | Randomised complete block design with 3 replicates |
| **Treatment levels:** | 4 (P0 = control, P1 = 10 kg P/ ha, P2 = 20 kg P/ ha, P3 = 30 kg P/ ha |
| **Fertiliser applied:** | Triple Superphosphate |
| **CLCrop types:** | wheat Scout; barley GrangeR; canola Hyola 575CL |
| **Rainfall:** | growing season – April-October 400mm |
| **Date crop sown:** | 29/05/2013 |
| **Date crop harvested:** | 09/12/2013 (canola); 12/12/2013 (wheat & barley) |

This trial is part of a collaborative project being managed by the MFMG for NSW DPI. Funding is provided by GRDC and site management is being provided by SARDI.

**Background:**
3 different crop species were planted to measure the responses to P; this will assist in crop data gaps being able to be filled allowing for better fertiliser decisions to be made.

Table 1.Basic soil chemical properties at Keith trial site

| Horizon | Depth (cm) | pH ($CaCl_2$) | EC (µS/ cm) | OC (%) | Exchangeable cations Ca | Mg | K | Na | Colwell P (mg/ kg) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | (cmol(+)/kg ) | | | | |
| A | 0-10 | 6.07 | 239 | 1.64 | 5.53 | 2.21 | 1.30 | 0.45 | 16 |
| A | 10-20 | 6.37 | 119 | 0.37 | 6.69 | 4.66 | 0.73 | 1.36 | 4 |
| B1 | 35-50 | 7.63 | 324 | 0.17 | 9.82 | 8.28 | 1.09 | 3.55 | 1 |
| B2 | 50-100 | 7.93 | 607 | 0.10 | 7.92 | 9.31 | 1.22 | 5.48 | 1 |

**Table 2. Soils data (at the trial plot scale)**
Soil samples were taken from each plot prior to sowing to provide an assessment of the initial soil phosphorus status.

| | |
|---|---|
| **Soil sampling depth(s):** | 0-5, 5-10, 10-20 (cm) |
| **Soil tests measured** | Colwell P |

**Soil test results**

There was no significant difference found in the Colwell P for any of the depths measured. The mean value for 0-5 cm was 16 (mg/ kg), for 5-10 cm was 8 (mg/ kg) and for 10-20 cm was 6 (mg/ kg).

## Crop results

### Crop establishment

Plant counts were taken on 09/07/2013 and were as follows: 206/ $m^2$ (wheat), 119/ $m^2$ (barley) and 29/ $m^2$ (canola). There was no significant difference in plant population between the plots because of the applied P fertilizer treatment.

### Anthesis dry matter

At mid flowering dry matter samples were taken from the wheat, barley and canola crops. There was a distinct difference between the crops in their maturity and so the samples were taken on different dates: canola (24 September), wheat (27 September) and barley (1 October). A significant P treatment rate effect on the dry matter was detected (P = 0.048).

**Table 3: Anthesis dry matter values (t/ ha) for the Keith trial site[A]**

| P treatment rate | Wheat (t/ ha) | Barley (t/ ha) | Canola (t/ ha) |
|---|---|---|---|
| P0 | 3.98 | 4.21 | 4.82 |
| P1 | 4.61 | 6.56 | 4.92 |
| P2 | 5.67 | 7.19 | 6.38 |
| P3 | 5.71 | 5.89 | 5.38 |

[A]5% LSD is 1.42.

## Harvest results

### Grain yield

The effect of the P fertilizer treatment on grain yield was significant difference (P<0.001).

**Table 4: Grain values (t/ ha) for the Keith trial site[A]**

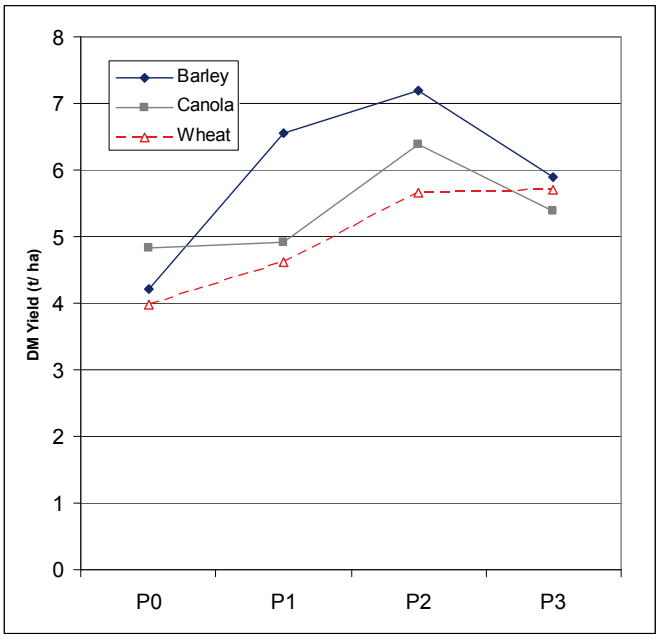
| P treatment rate | Wheat (t/ ha) | Barley (t/ ha) | Canola (t/ ha) |
|---|---|---|---|
| P0 | 2.53 | 3.19 | 1.00 |
| P1 | 3.15 | 3.96 | 1.17 |
| P2 | 3.41 | 4.34 | 0.99 |
| P3 | 4.02 | 4.54 | 1.02 |

[A]5% LSD is 0.28.

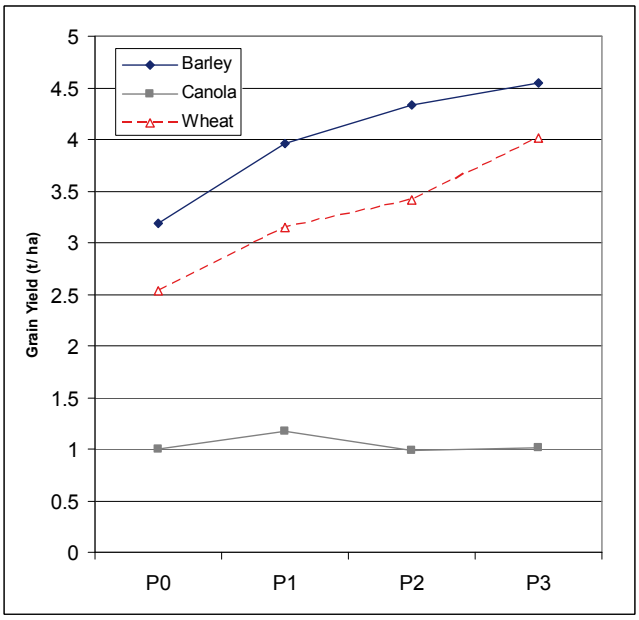
### Grain quality variables

There was no significant P rate effect on the thousand grain weight. The mean weight for 1000 grains for wheat was 40.6 g, for barley 45.0 g was and for canola was 2.8 g.

**Graph 1: Biomass (Harvest Index) responses to increasing phosphorous levels**




**Graph 2: Grain yield responses to increasing phosphorous levels**




**Conclusion:**

Knowing phosphorous levels in the soil is critical. At low levels of nutrition, an economic response to phosphorous application will be achieved.

This work is critical in determining where the nutrient response curve flattens out – allowing for improved management decisions to be made.

Acknowledgements:

- SARDI NVA Team, Struan
- MacKillop Farm Management Group