Potassium & Sulphur Nutrition Trial

Following on from the discussion held within the group on our Farmer Day in 2009, the NSS performed a nutrition trial assessing the response of Barley to Potassium & Sulphur.

It is planned to do a similar trial in 2011 on Lentils.

Soil testing was performed in early April on the area adjoining the current NSS Alternative Break Crops trial site at Lynton & Avan Ireland's.
It proved to be perfect for a trial site assessing the response to the nutrients Potassium (K) and Sulphur (S). These two nutrients are becoming more marginal on NYP and Northern Areas.

Potassium is responsible for a lot of processes within a plant and is abundant in the straw/ stubble. With higher yielding crops of late, cereal straw baling and Oaten Hay, large amounts of this element have been removed from paddocks in the district—particularly important after 2010's Harvest. WA farmers have been applying Potassium to their paddocks for a long time and seeing massive responses, particularly in their acidic soil types.

Sulphur has become an issue over the last 25 years since the advent of high analysis fertilisers. Single superphosphate applications prior to this were adding a lot of Sulphur to our soils, but when the low Sulphur analysis fertilisers in MAP & DAP replaced it, Sulphur was no longer getting applied to our paddocks in large amounts. Some areas on NYP have high Sulphur sub-soils, but it is unknown whether the short term deficiency early in the crop's life before it reaches these subsoils causes any yield loss or not.

Soil Test Results from April 2010 at the NSS Trial Site

	SULPHUR	POTASSIUM
	mg/kg	mg/kg
0-10 cm	3.1	200
10-30 cm	1.7	260
30-50 cm	2.5	170
50-70cm	2.3	140
Benchmark	**5.0**	**200**

2010 Trial Treatments

Treatment	2010 Crop	Variety	Seeding Rate	Pre-Fertiliser	Sowing Fertiliser	GS 21 Fertiliser	GS 31 Fertiliser
UTC	BARLEY	Scope	60 kg	nil	nil	nil	nil
Seeding Only	BARLEY	Scope	60 kg	nil	100 24:16	nil	nil
District Practice	BARLEY	Scope	60 kg	nil	100 24:16	50 UAN	nil
Sulphate Ammonia	BARLEY	Scope	60 kg	nil	100 24:16	50 SOA	25 UAN
Gypsum	BARLEY	Scope	60 kg	2.5 T Gyp	100 24:16	50 UAN	nil
Muriate Potash	BARLEY	Scope	60 kg	40 MOP	100 24:16	50 UAN	nil
Sulphate Potash	BARLEY	Scope	60 kg	50 SOP	100 24:16	50 UAN	nil
Potassium Nitrate	BARLEY	Scope	60 kg	50 KNO3	100 24:16	35 UAN	nil
Fainal K	BARLEY	Scope	60 kg	nil	100 24:16	50 UAN	2L FK

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Results:

Table 1. Summary of NDVI and yield assessments.

Trt. No.	Seeding Treatment Rate/ha	Z21 Foliar Fert/ha	Z31 Foliar Fert/ha	NDVI Z39	Yield T/ha	Yield % of T3
1	UTC			0.775 b	4.69 b	94
2	Seed Fert.			0.822 a	4.99 ab	100
3	Seed Fert.	UAN @ 50L		0.823 a	4.98 ab	100
4	Seed Fert.	SOA @ 50kg	UAN @ 25L	0.826 a	4.89 ab	98
5	Seed Fert. + Gypsum @ 2.5T	UAN @ 50L		0.847 a	5.24 ab	105
6	Seed Fert. + MOP @ 40kg	UAN @ 50L		0.851 a	5.20 ab	104
7	Seed Fert. + SOP @ 50kg	UAN @ 50L		0.830 a	5.32 a	107
8	Seed Fert. + KNO3 @ 50kg	UAN @ 35L		0.837 a	5.36 a	108
9	Seed Fert.	UAN @ 50L	Fainal K @ 2L	0.842 a	5.20 ab	104
			Coefficient of Variation	**2.4%**	**6.3%**	
			LSD (p=0.05)	**0.035**	**0.56**	

Note: Means followed by the same letter do not differ significantly.

This trial was sown relatively early into drying soils. Rainfall through winter was average with above average rainfall in spring and cool ripening conditions resulting in excellent yields. Foliar nitrogen nutrition was applied early on in the growing season (Z21, early tillering) at rates to equal out nitrogen amongst all plots besides treatment 1 and 2.

Due to the excellent growing season it was decided that a second application of foliar nitrogen should be applied to all plots at a rate of 42kg of N/ha. The untreated control, which had no seeding fertiliser, but like all other plots an application of UAN @ 100L on 29th July, had the lowest yield as would be expected. However, its yield was not significantly different to all but 2 treatments. This would suggest that the site was not particularly phosphorous responsive. It is interesting to note that when comparing treatment 2 (seeding fertiliser + UAN @ 100L on 29th July) to treatment 3 (seeding fertiliser + UAN @ 50L + 1st July + UAN @ 100L on 29th July) the yields are equivalent. Both of these results would suggest that there was a reasonable level of soil nitrogen during the early stages of crop growth and it was only the later application of a high rate of nitrogen (UAN @ 100L/ha on 29th July) that was the driver behind the respectable yields.

The trial was assessed for NDVI with a GreenSeeker at first node (Z39) and this reading of both greenness and biomass showed that there was a significant difference in the NDVI of the UTC compared to all other treatments. One may have expected a bigger gap in the yield difference between the UTC and other treatments based on the in-season NDVI, but as indicated above, the yield reduction of applying no starter fertiliser was not significant to most treatments that had starter fertiliser applied.

Aside from treatment 4 which had sulphate of ammonia (SOA) applied at Z21 (early tillering) all other potassium and sulphur treatments (treatment 5 to treatment 9) had a positive yield response compared to the district standard, treatment 3. No responses were significantly above the district standard, but the fact that all of these potassium and sulphur treatments resulted in a yield advantage gives support to the application of such nutrients in this soil type and environment.

This trial does not indicate any standout treatments of either potassium or sulphur, but it should be noted that the gypsum treatments did visually look the best through the early part of the season. Further work will need to be conducted to establish whether these results can be replicated.