applied. These responses will have been possible due to the good season and the relatively low starting soil N (50-100 kgN/ha) due to the previous year being a cereal. Follow up modeling analysis will attempt to confirm this.

- Yield response to in-season N on deep yellow sand was 0.2-0.4 t/ha for an extra 12.5 kgN/ha (N response of 20-30 kg grain per kg N applied). Similar responses were also recorded for the gravel over clay (0.9 t/ha increase) and sand over gravel (0.2-0.6 t/ha), but not for the shallow gravel where the response to late N was negative. This was probably due to water limiting the response to late N. Follow up modeling analysis will attempt to confirm this.
- Yield responses to late N were in line with average expectations as indicated by Yield Prophet in late August. Responses were greater on the better soils, although the soil type differences were not as large as indicated by Yield Prophet due to the season ending better than average.
- Protein tended to respond only to late N. The rate of N at sowing had no effect. The exception to this was the topdressed treatments on the gravel over clay soil type, which had a 1% higher protein for the 34 vs 9 kg/ha at sowing. Response in protein to late N on the gravel over clay was 1.5-2.6% increase and on the shallow gravel was a 0.7% increase. Screenings did not vary significantly with treatment.
- Protein responses to late N were similar to those that Yield Prophet indicated at the end of August.
- Overall with the better responses to applied N being achieved on the better soils (eg deep yellow sand vs gravel) this experiment has given encouragement to the idea of managing soil types (or management zones) differentially for N. As the response will differ with each season, tools such as Yield Prophet allow one to "play the season" in terms of N application strategies.

ACKNOWLEDGEMENTS

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IN-SEASON NITROGEN ON WHEAT ON PADDOCK MANAGEMENT ZONES – WEST MAYA

Michael Robertson and Kathy Wittwer, CSIRO Precision Agriculture Project

AIM

To evaluate the response of wheat (yield and protein) in different paddock management zones to in-season application of nitrogen fertiliser, using the Yield Prophet system as a guide.

BACKGROUND

Management zones within paddocks differ in yield potential due to soil type characteristics, and hence will respond differently to inputs like fertiliser. At the start of the season the response to inputs like nitrogen fertiliser is uncertain. In-season methods for estimating yield potential and hence demand for N could aid in managing sub-paddock zones by matching fertiliser application to need.

This experiment focused on a well-characterised paddock on Brian McAlpine's farm where management zones and their soil type basis has been well established. We used the Yield Prophet crop modeling system to follow zones through the season and compared different rates of fertiliser N applied in each zone.

TRIAL DETAILS

Property	Brian McAlpine, paddocks Chris and Dayswell
Plot size & replication	At each sampling position wheat yield, biomass, protein, screenings was measured from four 0.5 m^2 quadrats
Soil type	Plots were set up on lines as indicated in Figure 1.
Sowing date	18th May 2005. Yield Prophet runs were set up for good sand, gravel, red clay using starting soil water and N measured before sowing.
Seeding rate	80 kg/ha, Calingiri wheat
Fertiliser (kg/ha)	Basal fertiliser: 100 kg/ha of K-Till extra (10 kgN/ha) applied to entire paddock at seeding.

	At each sampling position **3 fertiliser treatments** were applied See Table 1 for a list of the rates and dates of fertiliser N applications. Application treatments were the same for 4 out of the 5 soil types. However, simulations with Yield Prophet in July indicated that the red clay soil, with its high starting soil N, would not respond to further topdressings of N, so there was no application of 21 kgN/ha on 26th July to this soil type.
Paddock rotation	2002 = brown manure wheat, 2003 = wheat, 2004 = canola
Growing Season Rainfall	April to October = 298.5 mm

Results

Table 1: Yield, quality and gross income of wheat sown at West Maya on 5 soil types within one paddock.

			N fertiliser applied							
Soil type	**Treat**	**Starting N (kgN/ha)**	**18-May**	**20-Jun**	**26-Jul**	**Total**	**Yield (t/ha)**	**Protein (%)**	**Screenings (%)**	**Gross margin ($/ha)**
Good sand	B	150	10		0	10	2.3	7.0	5.2	303
	C		10		21	31	2.9	7.2	4.0	387
	A		10	21	17	48	3.0	7.5	4.9	396
Gravel	B	150	10		0	10	2.7	8.4	3.0	377
	C		10		21	31	2.8	8.7	3.0	367
	A		10	21	17	48	2.7	9.9	3.2	328
Medium sand	B	140	10		0	10	2.5	7.7	4.0	340
	C		10		21	31	2.8	7.9	2.1	375
	A		10	21	17	48	2.9	8.5	3.3	367
Poor sand	B	not sampled	10		0	10	2.8	9.1	5.8	398
	C		10		21	31	2.7	9.6	2.1	365
	A		10	21	17	48	2.1	11.1	5.5	229
Red clay	B	250	10		0	10	3.6	9.7	4.0	554
	C		10		0	10	2.9	7.9	1.4	413
	A		10	21	17	48	3.4	9.5	4.2	474

Based on EPR for 6/1/05 APW Base Price $188/tonne, $110/ha variable costs (excluding N fertiliser) and $1.3/kgN applied.

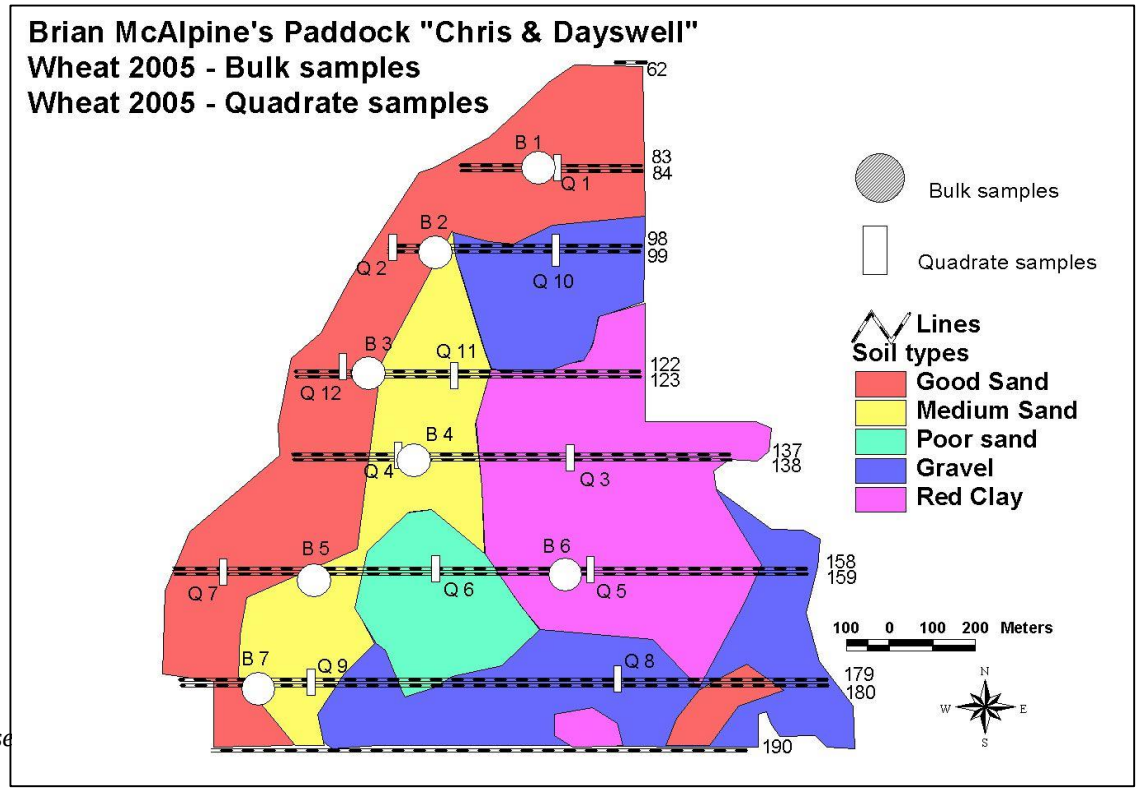

Figure 1: Layout of the sampling locations on paddock Chris and Dayswell at Brian McAlpine's farm. Also shown is a soil map used for management zones.

COMMENTS

- Yield differences between soil types were less than seen in previous seasons on this paddock, although they did yield in expected order. At high N the red clay yielded about 3.5 t/ha, while the "good" and "medium" sands yielded 3 t/ha, the gravel yielded 2.7 t/ha, while the "poor" sand yielded 2.1 t/ha. Lack of difference was probably due to the season ending better than average.
- Starting soil nitrogen levels were quite high (> 100 kgN/ha) due to previous crop history.
- Yield responded best to an extra 21 kg/ha N at sowing on the good (+0.6 t/ha) and medium (+0.4 t/ha) sands. These responses are equivalent to 20-30 kg grain per kg N applied. Responses were non-existent on the gravel and poor sand due to high starting soil N relative to a limited plant available water capacity for these two soils.. Follow up modeling analysis will attempt to confirm this.
- The decision to not apply extra N to the red clay soil as indicated by Yield Prophet was warranted as this soil type did not respond to extra N due to its high starting soil N (250 kgN/ha).
- Protein levels were low. Protein only responded (about 1% increase) to more N on the two poorer soils, the gravel and poor sand.
- Overall with the better responses to applied N being achieved on the better soils or where there was plenty of starting soil nitrogen, this experiment has given encouragement to the idea of managing soil types (or management zones) differentially for N. As the response will differ with each season, tools such as Yield Prophet allow one to "play the season" in terms of N application strategies.

ACKNOWLEDGEMENTS

Brian McAlpine, Brianna Peake with assistance with Yield Prophet simulations, CBH for grain analysis, GRDC for funding through the SIP09 Precision Agriculture Initiative.

WHEAT YIELD AND QUALITY IN WESTERN AUSTRALIAN SANDPLAIN FARMING SYSTEMS

Steve Milroy and Kelley Whisson, CSIRO

CSIRO PLANT INDUSTRY

AIM

The aim of the research is to explore the yield potential for wheat in the northern sandplain region and to identify the main constraints to achieving this potential.

BACKGROUND

Our aim is to examine the potential crop yields in the northern sandplain region and to identify means of overcoming the biophysical constraints to production and quality. The focus is primarily on wheat but there is also interest in examining the performance of lupins and canola given their importance in the farming system. There is some concern regarding the potential rates of deep drainage and nutrient leaching on the sandy soils of the area. This will be assessed in parallel with yield and quality.

TRIAL DETAILS

Property	Stuart McAlpine, Liebe Long Term Research Site Buntine-Marchargee Rd, Buntine
Plot size & replication	Mainplots (for crop species) 40m x 10m Sub-plots (for nitrogen rates) 40m x 2.5m