Responsive Farming for Soil Type at Wharminda

RESEARCH

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Searching for answers

Location: Wharminda
Ed Hunt

Rainfall
Av. Annual: 322 mm
Av. GSR: 222 mm
2009 Total: 283 mm
2009 GSR: 245 mm

Yield
Potential: 2.7 t/ha (W)
Actual: 1.4 t/ha (W)

Paddock History
2008: Pasture
2007: Pasture

Diseases
Rhizoctonia

Yield Limiting Factors
Late sowing

Key messages

- **Sowing in early June 2009 resulted in wheat yields on 3 soil types being similar but only achieving 50% of potential water use efficiency.**

Why do the trial?

It is important that our low rainfall farming systems are low risk, flexible and responsive, paddock inputs need to balance the best agronomic and economic advice with the need to ensure reliable outcomes at low cost. At Wharminda the focus is on managing risk through variable rate technology using different inputs over variable soil types and testing the use of Yield Prophet to match plant available water and nutrition with modelling of climatic conditions, knowing that we can have unpredictable finishes to seasons.

The Wharminda soil was chosen as a focus site for the Eyre Peninsula Farming Systems 3 Project (EPFS III) as the non-wetting sands represent approximately 455,000 ha on the EP. These sands present farmers with unique challenges; non-wetting sands that "wet up" slowly and unevenly at the beginning of the growing season which can result in uneven germination, increasing the likelihood of wind erosion. There are also a range of EP common factors preventing crops from reaching their yield potential include insufficient nutrition, disease, weed competition, delayed sowing dates and restricted access to soil water due to chemical constraints.

Changing inputs according to the production capability of different paddock zones or soil types provides an opportunity to improve profitability for the whole paddock.

How was it done?

A paddock on Ed Hunt's property at Wharminda was selected and zoned according to soil type - deep sand over clay, shallow sand over clay and loam. Four representative sampling points were then selected and soil samples taken for chemical analysis and potential water holding capacity. This paddock was then sown with Wyalkatchem wheat @ 60 kg/ha and N @ 11 kg/ha and P @ 5 kg/ha on 6 June 2009. The paddock received standard weed management across all zones.

Measurements taken during the growing season were wheat establishment, dry matter at early tillering, anthesis and maturity, soil water at sowing and harvest, and grain yield and quality.

What happened?

The Wharminda district had a late break to the season; however the growing season rainfall was above average.

Soil fertility and chemical restraints were sampled just after seeding (Table 1). Total mineral N was high in the deep sand and loam zones and moderate in the shallow sand indicating a history of good medic based pastures and low crop productivity in recent years. The shallow sand and loam zones had a Colwell P level that indicates these zones might be P responsive. The electrical conductivity levels in the shallow sand and loam zones are at levels that may restrict root growth at >0.2 m and certainly below 0.4 m in the soil profile. No zones had toxic levels of boron or chloride in the 0-0.6 m soil profile, however soil samples were not collected below 0.2 m in the loam soil zone due to rock.

All zones had similar plant establishment numbers, however dry matter production was lower in the deep sand zone at early tillering and anthesis compared to the loam soil type (Table 2). The percentage of grain compared to crop biomass (harvest index) was similar irrespective of the paddock zone.

Grain yields and quality were similar across the zones. Screenings and test weights were excellent but grain protein levels were low (Table 3).

Table 1 Soil chemical analysis for Wharminda 2009, immediatey after seeding

	Deep Sand	Shallow Sand	Loam
Colwell P (mg/kg) 0 - 0.1 m	34	22	24
Total Mineral N (kg/ha) 0 - 0.6 m	125	82	149

Table 2 Plant establishment, biomass at tillering, anthesis, maturity and harvest index from the 3 paddock zones

Zones	Plants/m²	Dry Matter (t/ha)			Grain/Biomass (%)
	Establishment 20 July	Tillering 20 July	Anthesis 29 September	Maturity 9 November	Harvest Index
Deep sand	108	0.07	2.0	2.8	46
Shallow sand	127	0.16	2.8	3.1	44
Loam	138	0.19	3.0	2.8	43
LSD (P=0.05)	*ns*	*0.09*	*0.8*	*ns*	*ns*

Table 3 Grain yield and grain quality from the 3 paddock zones

Zones	Grain yield (t/ha)	Grain protein (%)	Screenings (%)	Test Weight (g/hL)
Deep sand	1.3	10.0	0.8	79.1
Shallow sand	1.4	9.2	0.3	81.3
Loam	1.4	10.1	0.3	79.6
LSD (P=0.05)	*ns*	*ns*	*ns*	*ns*

What does this mean?

The late break to the season delayed sowing, resulting in slower crop growth and a lower grain yield. Only half of the potential yield was achieved in 2009 despite the above average total growing season rainfall. Dry matter production was greater at tillering and anthesis in the shallow sand and loam zones than the deep sands, but this did not equate to higher yields in 2009.

The soil analysis results suggest a variation in the productive capacity of the three soil zones within the paddock. A plant available soil profile of <0.4 m would restrict production in many years due to water deficiency. The high available soil N measured in the shallow loam soil may also impact on production; however this was not the case in 2009 with low screenings percentages measured. The non-wetting deep sand zone did not produce a yield loss compared to the heavier soil types, this may have been as a result of the above average consistent rainfall conditions.

All measurements taken in 2009 will be used to baseline production prior to management of this paddock under a VRT strategy as one of the three focus paddocks for the EPFS III project. Direction on how to maximise production in each zone in 2010 will be discussed with farmers involved in the Focus Site Discussion Group.

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