# Responsive Farming for Soil Type at Mudamuckla

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RESEARCH


**Location:** Mudamuckla Muddy/Nunji/Wirrulla Ag Bureau

**Rainfall**
Av. Annual: 293 mm
Av. GSR: 219 mm
2009 Total: 292 mm
2009 GSR: 229 mm

**Yield**
Potential: 3.0 t/ha (W)
Actual: 1.3 t/ha (W)

**Paddock History**
2008: Wheat
2007: Self sown barley
2006: Barley

**Soil test**
Outlined in article

**Diseases**
Rhizoctonia

**Resource Efficiency**
Energy/fuel use: Standard
Greenhouse gas emissions ($CO_2$, $NO_2$, methane): Standard

**Social/Practice**
Time (hrs): Standard
Clash with other farming operations: Standard
Labour requirements: Standard

**Economic**
Infrastructure/operating inputs: VRT technology
Cost of adoption risk: Low if improving returns

**Key messages**

- **In a good growing season, wheat performed equally well in zones identified as good, medium or poor however they achieved only 50% of their yield 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 Mudamuckla, the focus is 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.

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

## How was it done?

Paddock 8 at Mudamuckla was segregated into zones of good, medium and poor production zones in 2009 using 5 years of yield maps. Four sites were selected in each of those production zones and soil cores taken to conduct a soil chemical analysis (see Whitbread et al article 'Farming to Soil Potential on the Upper Eyre Peninsula: How Accurate was In-season Yield Prediction in 2009?'). The paddock was sown with Gladius wheat and phosphoric acid on 6 May using variable rate technology (VRT). The paddock received standard weed management across all zones.

All crop measurements were taken in strips where the sowing rate of Gladius was 50 kg/ha and the phosphoric acid rate was 4 kg P/ha. A detailed analysis of the different input rates will be completed during 2010. Measurements included dry matter at early tillering, anthesis and maturity, soil water measurements (sowing and harvest), grain yield and quality.

## What happened?

Total mineral N was very high in all zones, especially the poor zone, due to a history of good medic based pastures and fertiliser applications exceeding crop requirements. The poor zone had toxic levels of boron at 40 cm and chloride at a depth of 20 cm. These constraints will restrict productivity, except in wet years when frequent rainfall events may leach some of the hostile elements deeper into the soil profile, enabling the crop to perform well on the moist upper layers.

Plant establishment was lower in the poor zone than the medium and good zones (Table 2). Dry matter was less at tillering in the poor zone than both the medium and good but only less than the good zone at anthesis and maturity. Harvest indices were similar irrespective of zone.

Although the emergence was lower in the poor zone, grain yields were similar in all zones and grain quality was excellent in all 3 zones.

## What does this mean?

The 2009 growing season was an average year for rainfall, and all zones performed well. However monitoring on this property by Jon Hancock has indicated that tailoring inputs to the production zone has the potential to improve profitability (EPFS 2007 p 106). The first year of monitoring at this focus site has established the relative performance and constraints associated with each zone. Phase 2 will be to impose variable rates on those points to measure whole of system benefits from targeting inputs to expected economic outcomes.


## Acknowledgements

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***Table 1 Soil chemical analysis for paddock 8, Mudamuckla 2009***

| | Good | Medium | Poor |
|---|---|---|---|
| Colwell P (mg/kg) 0 - 10 cm | 38.5 | 42.7 | 43.2 |
| Total Mineral N (kg/ha) 0 - 60 cm | 142 | 158 | 231 |
| *Depth to B > 15 mg/kg (cm) | n/a | n/a | 60 |
| *Depth to Cl > 1000 mg/kg (cm) | n/a | n/a | 40 |

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

| Zones | Plants/m² | Dry Matter (t/ha) | | | Grain/Biomass (%) |
|---|---|---|---|---|---|
| | Establishment 17 July | Tillering 17 July | Anthesis 26 Sept | Maturity 05 Nov | Harvest Index |
| Good | 150 | 0.56 | 3.3 | 3.50 | 47 |
| Medium | 146 | 0.27 | 2.1 | 2.40 | 50 |
| Poor | 99 | 0.13 | 1.7 | 2.10 | 49 |
| *LSD (P=0.05)* | *19* | *0.13* | *1.21* | *0.98* | *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) |
|---|---|---|---|---|
| Good | 1.4 | 12.5 | 0.8 | 80.3 |
| Medium | 1.3 | 12.8 | 0.6 | 85.0 |
| Poor | 1.4 | 12.8 | 1.4 | 79.9 |
| *LSD (P=0.05)* | *ns* | *ns* | *ns* | *ns* |


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