Zone responses to four years of repeated low, medium and high input treatments at Minnipa

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RESEARCH

Location:
Minnipa Ag Centre paddock North 1
Rainfall
Av. Annual: 325 mm
Av. GSR: 241 mm
2012 Total: 253 mm
2012 GSR: 185 mm
Paddock History
2012: Medic
2011: Barley
2010: Wheat
2009: Wheat
2008: Wheat
2007: Wheat
Soil Type
Sandy loam to sandy clay loam
Diseases
Rhizoctonia
Plot Size
Paddock trial, sowing widths 9 m
Yield Limiting Factors
Rhizoctonia
Dry spell in spring
Environmental Impacts
Soil Health
Soil nutrients: Needs to be monitored
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

- **There are identifiable production zones in Paddock N1.**
- **Production zones are useful for designing sowing input strategies for 'typical' yields.**
- **In wet years, zones still indicate the risk and size of a return to in-season inputs but there will be increased input demand (e.g. N) and the response probably won't follow the exact pattern of response for an average year.**

Why do the trial?

Variable rate technology (VRT) allows farmers to easily adjust sowing and fertiliser rates during the seeding process, providing the opportunity to change inputs according to the production capability of different paddock zones or soil types. While this system has been steadily adopted in other regions it is not yet apparent whether the VRT approach will markedly shift yields and profitability from the levels achieved using blanket inputs across the whole paddock in the Minnipa region.

How was it done?

In 2008 a variable rate experiment commenced in N1 paddock at Minnipa Agriculture Centre with the paddock cropped to continuous cereals until 2012 when it was sown to medic (EPFS Summary 2012). Three treatment levels were set; the middle treatment was "district practice" as if it were a blanket application for the whole paddock and then low and high treatments were selected either side of district practice (treatment details given in the 2008-2011 EPFS summaries). The treatments were applied across the paddock in single 9 m seeder widths, sown with 2 cm GPS-guided auto steer. Treatments alternated in a repeated pattern across the paddock (low, medium and high) and the same treatments were applied in the same seeder run each year. Crops were harvested with a harvester of the same width as the seeder and using the same 2 cm guidance system. Yield data was recorded with a Microtrak yield monitor and logging system, using GPS with 2 cm correction.

In 2012 this data was analysed using spatial techniques to address the following questions:

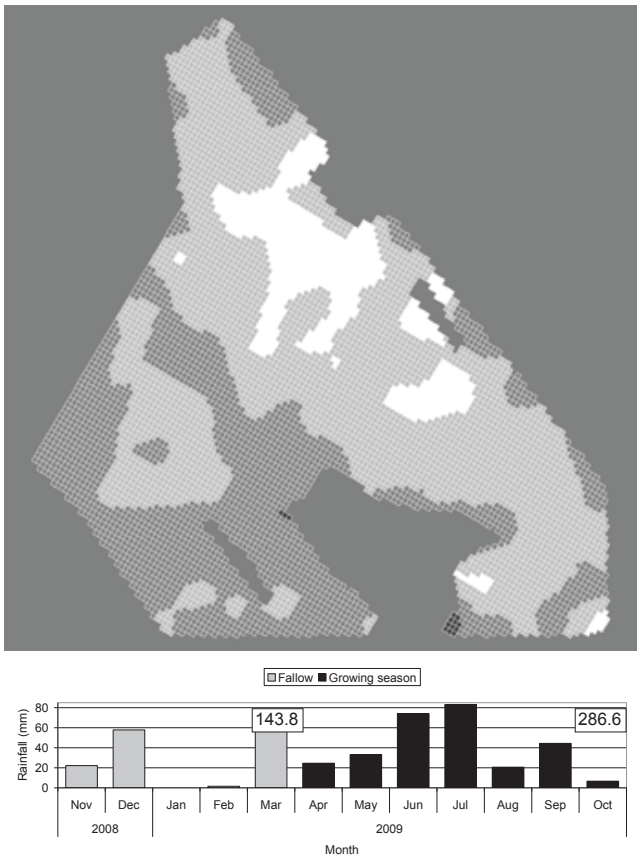
1. In which parts of the paddock was there a difference in crop response to input level?
2. Are the zones of crop response to input level stable or do they change with season type?

What happened?

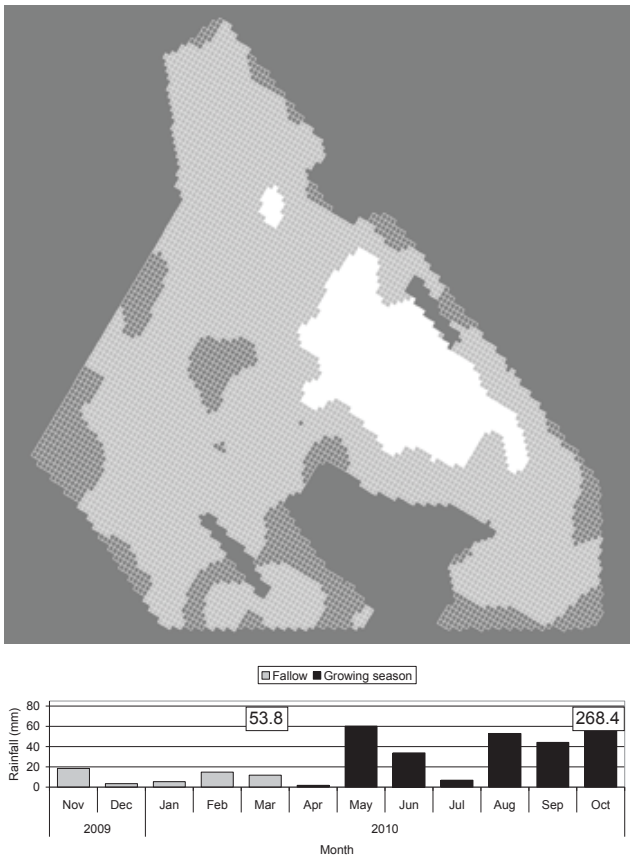
2008 was a dry season and we see this in the lack of response to varying input levels from low to medium (Figure 1a) except a small response in the Northern part of the paddock. In 2009, GSR was above average and the better production areas in the North East of the paddock showed responses to the medium input treatment (Figure 1b) with some differences between the medium and high input treatments in the North East (not shown). The GSR in 2010 was even better than 2009 and most of the paddock showed responses to medium inputs (Figure 1c) with further responses between medium and high levels of inputs in the North and South East (not shown).

a. 2008

b. 2009



c. 2010



d. 2011

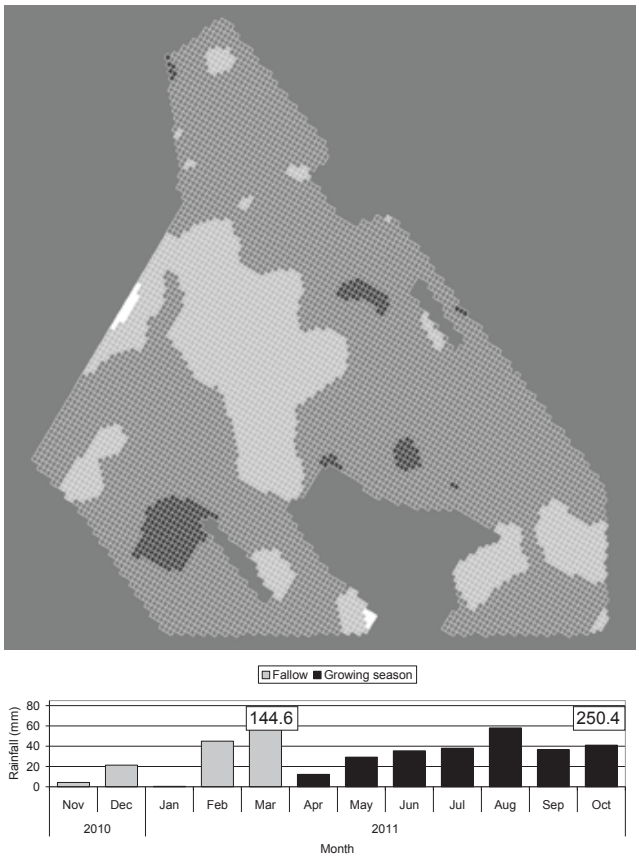
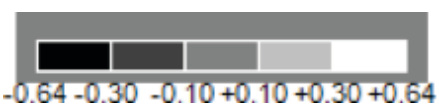


Figure 1. Visual representation of response to medium inputs compared to low inputs in a) 2008, b) 2009, c) 2010 and d) 2011.

Differences between treatments (t/ha):



2011 was an average GSR and the better producing areas did not show responses to increasing inputs above the low input treatment (Figure 1d), however we did observe a response to inputs in the poor producing central parts of the paddock. These treatments will show cumulative effects because the same input level was applied to the same seeder run in each season. The response in the poor producing central part of the paddock is driven by a demand for P input following two high yielding seasons with low P inputs. This is supported by the observation of P responses in 2011 in the P replacement trial located in the same part of the paddock (EPFS Summary 2011, pp 119-122).

What does this mean?

There were responses to differing levels of inputs in different parts of the paddock. The paddock area that responded to inputs depended on both season type and treatment history (eg. poor part of paddock responded to inputs only after 2 above average GSR seasons). The pattern of response to inputs in the landscape may be correlated with soil type after a period of dry years, but will be affected by nutrient removal and paddock history after wetter years.

Zone-based upfront input strategies should focus on ensuring nutrition is adequate for the minimum likely yield. In wetter years, input requirements may not follow zone boundaries, but yield potential will. The status of the crop should be used as a guide to where to place in-season inputs, but zones will indicate the likely risk and size of the response.

Acknowledgements

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