

## **Stepping up grain production in the High Rainfall Zone of south-eastern Australia**

### **Project Report**

#### **Background**

Cropping and livestock systems in the high rainfall mixed-farming zone around Holbrook have traditionally attracted less research than other areas. However, Holbrook Landcare members have an interest in gaining a greater understanding of these complex farming systems, with their specific issues. To this end, a project was developed in conjunction with GRDC and VIC DEPI to investigate ways of increasing grain production. It followed on from a similar GRDC-funded project in Tasmania, southern Victoria and South Australia.

The project involved four partner organisations providing five case study sites and two experimental sites, which fed information into the project. Two of these case study sites were provided by Holbrook Landcare Network, who co-ordinated local input and response.

#### **Aim**

The aim of this project was to assist growers in the high rainfall zone (HRZ) of northern Victoria and southern New South Wales to realise crop potential in their region. The project set out to provide better understanding and awareness by growers and advisors of the impact of different management decisions on the yields of wheat crops, through the development of a modelling tool.

HLN cropping group members identified important strategies and management practices to investigate at these sites. Data from these case study sites was used to generate model parameters, validate models and provide growers with confidence in the model outputs.

#### **Planning the project**

Producer engagement is an integral part of Holbrook Landcare's project management philosophy. Every project has a nominated project team including producers, researchers and extension specialists. In a series of six meetings of the project team, there was much discussion about the trial design to enable it to generate useful local information.

Members were keen to find out:

- what factors were limiting crop production in the Holbrook area, and
- the cost of maximising the potential versus the risk of not achieving that potential.

Finally control of fungal disease, nitrogen rates and timing, and trace elements were identified as the issues that local farmers were keen to investigate.

#### **Methodology**

##### Trial sites

Two trial sites were established for this project, one to the north of Holbrook, and one to the south, both on alluvial soils. Holbrook Landcare Network project officers worked in collaboration with the landowners hosting the trials to plan, set up and manage these trial sites for one cropping season. A grid of 10m x 12m plots was set up at each site, and the final designs are shown below:

- Dunraven site (Lachie Snow)
  - Grazing, Nitrogen and Boron were the variables (previous soil testing had indicated this site was low in boron)

PLOT F Normal N Ungrazed	PLOT E Normal N Ungrazed Boron	PLOT D Normal N 1 Grazing Boron
PLOT A High N Ungrazed	PLOT B High N Ungrazed Boron	PLOT C High N Grazing Boron



- Billa Billa site (Tony Geddes)
  - Fungicide, Nitrogen (both rate and timing) were the variables

PLOT 12 Standard N Fungicide	PLOT 11 High N Fungicide	PLOT 10 Late N Fungicide
PLOT 9 Standard N No fungicide	PLOT 8 High N No fungicide	PLOT 7 Late N No fungicide
PLOT 6 Standard N No fungicide	PLOT 5 High N No fungicide	PLOT 4 Late N No fungicide
PLOT 3 Standard N Fungicide	PLOT 2 High N Fungicide	PLOT 1 Late N Fungicide



## Modelling

Computerised modelling was used to substitute for the absence of long term cropping records in these areas. Final model outputs showing the impact of management on wheat grain yield was presented as a series of fact sheets.

Parameters required by the model were provided from the sites. This included data on

- climate,
- soil,
- current crop growth,
- management for the last three years,
- current management and
- crop observations.

Management data was gathered from the site growers, climate data loggers were installed and the data periodically downloaded, soil samples were collected for analysis, and the crop was monitored regularly by HLN project officers to gain this information. Rainout shelters, shown below in the two trials, were used to determine the crop lower limit of water extraction. When the field trials were complete VIC DEPI modelled the resulting data, generating some preliminary strategies for local growers.



Preliminary strategies for the Holbrook area were presented to HLN for grower feedback from mid-June 2013, specifically at a meeting between VIC DPI crop modellers and HLN growers and advisors on 19<sup>th</sup> June. The limitations of the model were discussed, for example it doesn't take into account disease, nitrogen deficiency, and water stress. As a result it tends to overestimate yield, but in the Holbrook area it underestimates, perhaps due to a longer, cooler finish. This feedback was incorporated into fact sheets which were presented for further feedback at a HLN field day on 2<sup>nd</sup> September 2013. Final fact sheets were produced and distributed to HLN members in October.

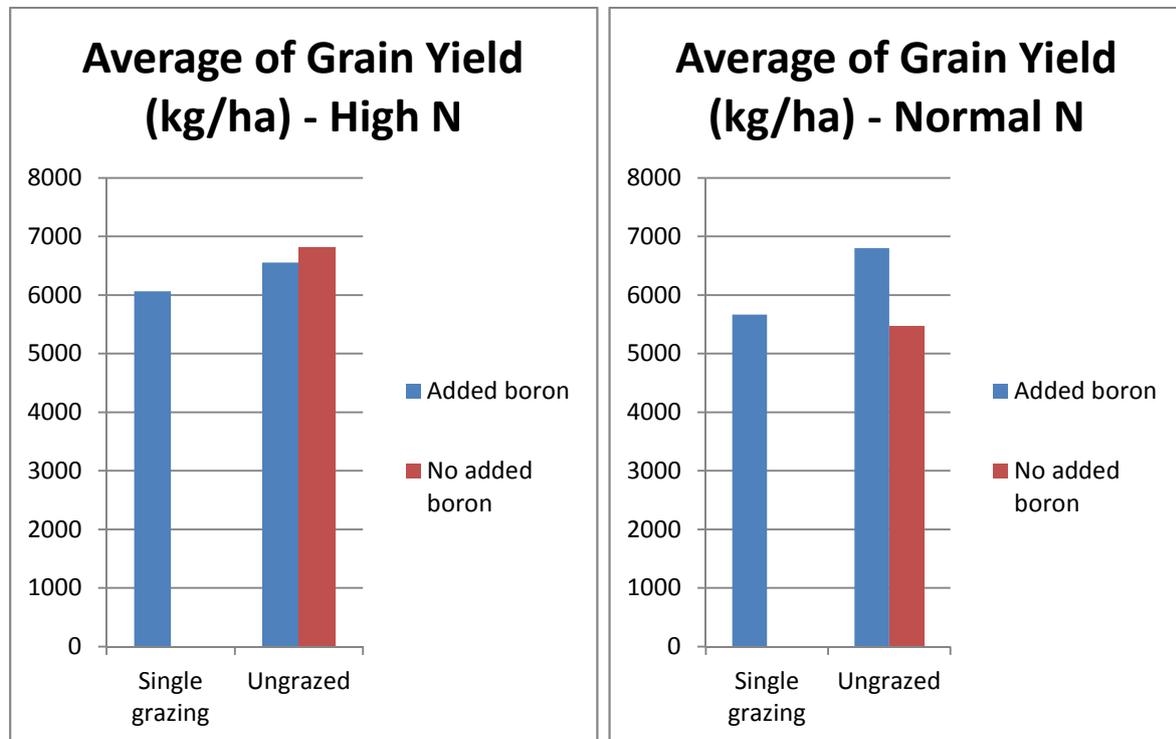
## **Results**

VIC DEPI produced local factsheets for Woomargama and Holbrook based on the results and data collected at the Dunraven and Billa Billa trial sites respectively. These addressed time of sowing for wheat, nitrogen management for wheat, canola stubble retention (specifically the effect of stubble management on soil nitrogen), and strategies for changing soil organic carbon. These are available at <http://www.holbrooklandcare.org.au>

Based on this work, VIC DEPI state that the Yield Prophet model can be used in the Holbrook/Woomargama area but users must have very good quality soil data for their paddock of interest. It is important not to underestimate rooting depth when getting soils analysed. However, the model is not appropriate for a grazed crop, but should be confined to ungrazed cereals. Also, the model may actually underestimate potential grain yields a little --

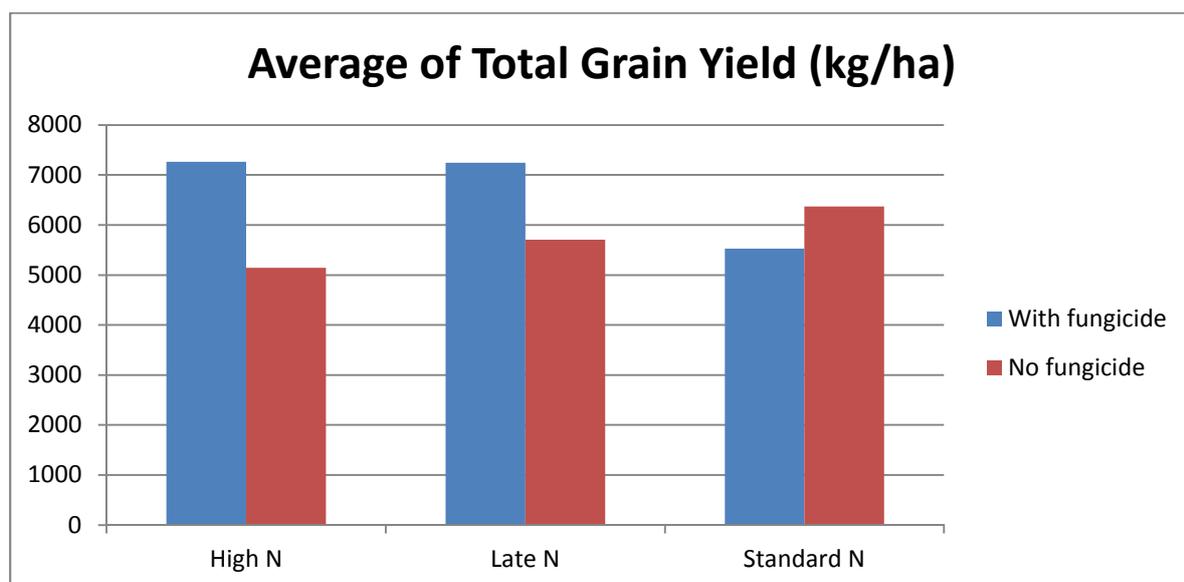
actual grain yields may be more than the predicted grain yields in good years. Getting individual modelling done may be too expensive for some land holders, but they can use the fact sheets to create their own rules of thumb for their crops and work within their own cost and timing limitations.

At the Dunraven site, the boron treatment had no significant effect on the grain yield in the high N plots. It may have made a difference to the ungrazed yield of the normal N plots; however, adding more N appears to be just as effective in this trial. The boron was actually added after GS65 so growth stage responses are not available.



Graphed results of Dunraven treatments

At the Billa Billa site, the application of fungicide did result in significantly higher final grain yields in both the high and late N treatments, but not in the standard N plots.



Graphed results of Billa Billa treatments

### Practice change review

This project included a telephone survey of grower and agronomist attitudes and understanding of how crop management impacts on grain yields and agronomic risks locally. The survey was undertaken once before the results of the project were known. A subset of the same growers and agronomists were surveyed again after the strategies and results had been publicised and after the factsheets were distributed, to gauge the level of impact that the project has had on farmers' and agronomists' knowledge.

Three respondents made general comments that the fact sheets provided good useful background information that they might refer to in the future, but would not be drawn on more specific feedback. One wanted to see more replicated work done before commenting further.

Most respondents agreed with the time of sowing information given in the fact sheets. Many thought this work had already been done, but recognised that the results, particularly the importance of cultivar choice and timing of frost risk, gave the model credibility. One respondent mentioned that there is more movement in the predicted potential grain yields because the model excludes some factors (e.g. disease risk).

The nitrogen management for wheat fact sheet prompted comments on the efficiency and flexibility of split applications. Comment was also made that longer season varieties have access to deeper nitrogen, and that the results show that you can overdo it with nitrogen applications. One respondent made the observation that there is a lot of difference between the two sites and they are not very far apart.

Most respondents agreed that the fact sheets on stubble management for nitrogen and soil carbon confirmed what they already knew. Two respondents were interested in learning more about the tie-up of nitrogen, and trade-off with soil carbon resulting from stubble retention. It was noted that in this district it has been the solution to burn rather than retain stubbles as in the short term carbon is not regarded as an issue, and yields are highest after burning, which results in short term increases in nitrogen mineralization. Another comment was that soils are not good enough for continual cropping so a pasture phase is included, and this respondent was not sure that soil carbon could be increased with continual cropping, even with stubble retention.

### Field Days

More than 50 people attended a field day for the project held on 8<sup>th</sup> August 2012. The topics were:

- Grazing varieties: new wheat, triticale, barley and oats (Peter Matthews, NSW DPI)
- APSIM plots and N management (Mark Fraser, HLN)
- Fungicides and yellow leaf spot management (Andrew Milgate, NSW DPI)



Another field day on 2<sup>nd</sup> September 2013 attracted 15 people. Speakers and topics were:

- Peter Matthews (NSW DPI) discussing the local variety trials at 'Roachdale'
- Angela Clough (VIC DEPI) reviewing the GRDC HRZ project with reference to nitrogen in a high rainfall zone with full stubble retention
- Dr Michael Nash (Melbourne University) talking on slug monitoring and identification: the key to control.

### **Partnerships and Funding**

Holbrook Landcare received funding from GRDC and support from VIC DEPI to deliver a local portion of the larger project. This included soil analysis and use of such equipment as the climate data loggers and rainout shelters.

### **Publicity**

The project has been promoted through various local media including the Holbrook Landcare newsletter (reach of 2000) and local papers. It is also featured on the Holbrook Landcare Network website.

### **Equipment purchase**

Chemical masks, measuring devices, a backpack sprayer and other sundry tools for fieldwork were purchased to manage the trials. These will be available for use in subsequent field trials HLN undertakes.



The ungrazed treatment at Dunraven



Fungal disease affecting the crop at Billa Billa