Karoonda and Waikerie Information Booklet

“Dynamic, profitable and sustainable farming”
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<td>MSF – Peter Loller and Dean Wormald</td>
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<td>Canola Hybrids- New Hybrid varieties and canola management in the Mallee</td>
<td>Paul Jenke Pioneer Seeds</td>
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<td>Rick Llewellyn CSIRO</td>
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<td>Bill Davoren CSIRO</td>
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<td>Gupta CSIRO</td>
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<td>Therese McBeath, CSIRO</td>
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<td>Break/Changeover + Static Displays:</td>
<td></td>
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<td>- Perennial grasses and pasture cropping (Katrien Descheemaeker)</td>
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<tr>
<td></td>
<td>- Soil Moisture monitoring Jeremy Nelson SAMDBNRM (Static display)</td>
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<td>- MSF</td>
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<td>3.30</td>
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<td>Sean Mason University of Adelaide</td>
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<td>3.45</td>
<td>New strand medicos for the Mallee</td>
<td>Jake Howie SARDI</td>
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<td>4.00</td>
<td>Time of Sowing Wheat,</td>
<td>Richard Saunders, Rural Solutions</td>
</tr>
<tr>
<td>4.15</td>
<td><strong>New barley varieties</strong> and their agronomy -improving early vigour and growth in the Mallee</td>
<td>Kenton Porker SARDI</td>
</tr>
<tr>
<td>4.30</td>
<td>Soil Amelioration strategies, claying 2nd year and surfactants for non wetting sands</td>
<td>Rebecca Tonkin Rural Solutions</td>
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<td>4.45</td>
<td>Wrap Up, Closing comments, BBQ and drinks</td>
<td>Dean Wormald / Hannah Loller</td>
</tr>
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</table>
Cereal strategies: reaching and maintaining yield potential on variable Mallee soils
Therese McBeath, Rick Llewellyn, Bill Davoren, CSIRO

TAKE HOME MESSAGES

- Shifting fertiliser N investment from constrained flats to sand has been profitable in a dry-finishing season and a high-yielding wet season.
- Return on investment in P fertiliser at this site is limited.
- Volunteer medic-based pasture breaks offered up to 1 t/ha yield gains in subsequent wheat, as also observed in the break crops trial.
- The flats achieved 4-5 t/ha yields at near-maximum yield potential in the wet 2010 season despite the presence of subsoil constraints that impact on yield in dry-finishing years such as 2009.
- Sandy hill soils have consistently performed below yield potential but are responsive to N and break crop management.
- Crop biomass in 2011 is indicating the sensitivity of the sands to zero inputs showing significant penalties compared to 2 years of higher N inputs or a year of medic-based pasture.

AIMS

1. Identify the most profitable strategies for N and P management in response to season type and soil conditions.
2. Identify in-season management strategies to manage profit and risk in cereal-intensive cropping
3. Develop paddock zoning and best-bet management for each zone using a combination of nutrient, crop type and other management strategies.

METHODS

*Main Strategies Trial:* We have the cereal strategies trial which uses 150 m long plots along a range of soil types and production potentials. This trial is in its second year of full treatments.
Table 1. Cereal strategies trials treatments for 2011.

<table>
<thead>
<tr>
<th>No.</th>
<th>Treatment</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pasture (09)-wheat (10-12)</td>
<td>District practice fertiliser (50 kg DAP)</td>
</tr>
<tr>
<td>2</td>
<td>Wheat (09)-pasture (10)-wheat (11-12)</td>
<td>District practice fertiliser (50 kg DAP)</td>
</tr>
<tr>
<td>3</td>
<td>Continuous cereal district practice</td>
<td>District practice fertiliser (50 kg DAP)</td>
</tr>
<tr>
<td>4</td>
<td>Continuous cereal no fertiliser</td>
<td>No fertiliser</td>
</tr>
<tr>
<td>5</td>
<td>Continuous cereal high N</td>
<td>High N fertiliser at sowing (50 kg DAP+ 67 kg Urea)</td>
</tr>
<tr>
<td>6</td>
<td>Continuous cereal reactive to good spring</td>
<td>Extra N topdressed if good spring (50 kg DAP+ 67 kg Urea) - added 15th August 2011.</td>
</tr>
<tr>
<td>7</td>
<td>Continuous cereal reactive to poor spring</td>
<td>Hay in spring (50 kg DAP)</td>
</tr>
<tr>
<td>8</td>
<td>Continuous cereal reactive to starting conditions</td>
<td>Canola (Snapper) in response to good break (50 kg DAP+ 67 kg Urea)</td>
</tr>
</tbody>
</table>

*The whole trial site was topdressed with 100 kg/ha Gypsum prior to sowing to prevent a S deficiency in the emerging crop.

Variable rate N x P Trial: To support identification of best nutrient management for the different zones we have a fertiliser trial testing every combination of 5 rates of N (0, 10, 20, 40 and 80 kg N/ha) and 4 rates of phosphorus (P) (0, 5, 10, 20 kg P/ha) on 3 soils (hill, mid-slope and flat).

2010- How did it go?

Strategies Trial

- A low input strategy on the heaviest soils in the flats did not reduce yield in the decile 10 season, where yields exceeded 4t/ha with no fertiliser and did not respond significantly to additional fertilizer (Figure 1).
- Transitions in yield and responsiveness to DAP and additional N across the landscape were rapid and substantial highlighting potential benefits from accurate zoning (Figure 1).
Wheat following volunteer pasture was the best yielding treatment in 2010, with yield benefits of over 1 t/ha on mid-slope soils (Figure 1).

Substantial wheat yield responses to additional N occurred on the sandy topsoils (Figure 1).

**Figure 1.** Wheat yields across the landscape positions for the Nil fertiliser, District Practice (40 kg DAP) and the two High N (40kg DAP+54kg Urea) treatments in 2010.

**Variable rate N x P Trial:**

- Across the range of soil types there was no interaction between N and P additions i.e. a higher N rate did not require a higher P rate to increase wheat yield.
- The wheat response to P was significant on the flats (12 kg grain/ kg P) and hill sand (17 kg grain/ kg P). It is not expected that this response would continue at the same rate at applications of more than 10 kg P/ha (response was very flat between 10 and 20 kg P/ha). Using crude estimates, in 2010 P cost $2.98/kg and grain return was $0.23/kg ex-Karooonda. The break-even point for P application for 2010 was 13 kg grain/ kg P.
- The responses to N were significant at 12 kg grain/ kg N on the flats, 24 kg grain/ kg N on the mid-slope and 27 kg grain/ kg N on the hill sands (Figure 2). The response to N addition was much smaller on the flats than the sandy hill and mid-slope soil types. This was expected, as the flats had the highest initial soil profile N values. Significant gains...
could have been made from increasing N rates on the flats and applying this N to the sandy topsoils.

Figure 2. Grain yield response to additions of N and P (kg/ha) on the three soil types (no interaction between N and P so they are presented individually). The linear relationship developed between N rate and grain yield for all soil types was significant (P<0.001) while for P it was only significant on the flats and sand hill (P<0.05).

- The responses to N are substantially more economic than the responses to P (Table 2), due to the lower price per kg N than price per kg P and the higher rate of response to N (especially on the hill sand and mid-slope). Significant gains would have been made at this site in 2010 if investment in P was diverted into N applications.

Table 2. Estimated return ($/ha) on N fertiliser (cost used was $520/t urea, Jan 2010, and return was $229.85/t GP grain ex-Karoonda, average of prices 6th and 15th Dec, 2010) including only fertiliser cost and grain prices.

<table>
<thead>
<tr>
<th>N rate (kg/ha)</th>
<th>10</th>
<th>20</th>
<th>40</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return ($/ha)= $ for Grain above zero N Fertiliser-Fertiliser Cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swale</td>
<td>54</td>
<td>65</td>
<td>104</td>
<td>127</td>
</tr>
<tr>
<td>Mid-slope</td>
<td>70</td>
<td>88</td>
<td>195</td>
<td>354</td>
</tr>
<tr>
<td>Dune</td>
<td>74</td>
<td>132</td>
<td>286</td>
<td>404</td>
</tr>
</tbody>
</table>
2011 - How is it tracking?

Establishment densities were low across all parts of the site this year due to high stubble loads, high populations of mice and a lack of topsoil moisture in the first part of the growing season. Recent rains have made a big difference to crop health and exacerbated symptoms where nutrients are limited (a plus for the researchers!).

**Figure 3.** 2011 wheat biomass (t/ha) at GS 31 across soils for Treatment 3 (50 kg/ha 2011) also showing treatment effects at 3 positions.

- Crop biomass on the flat is approximately double that on the sandier soils.

- The sandier soils are showing substantially higher growth as a result of higher upfront N treatments or pasture in 2009 or 2010.

- Two consecutive years of Nil fertiliser has greatly reduced biomass on the sandier soils but not on the flat.

**Further information**

Therese McBeath, CSIRO, Phone 83038455

Rick Llewellyn CSIRO, Phone 83038502
Where to from here? Yield Potential and N in this year’s Mallee Crops
Therese McBeath, Rick Llewellyn, CSIRO
Michael Moodie, MSF

TAKE HOME MESSAGES

- Yield prophet predictions at this time in 2010 were reasonably matched with actual yields.
- Due to the slow start to the season this year yield potential is predicted to be lower than 2010, however good yields are still expected due to high levels of stored moisture pre seeding.
- Forecast benefits of additional N in sandy topsoils are high, and match results we are seeing in our plots.
- Combine Yield Prophet with zone maps and soil testing to provide accurate indications of yield potential across soil types and paddock history.

KAROONDA SITE

VARIABLE SOILS

The site at Karoonda is characterised by a dune-swale system consisting of widely ranging soils. On the dune part of the paddock, the highest elevation consists of very sandy soil with rapid water infiltration, relatively low fertility, higher disease loading and vulnerability to erosion. The mid-slopes still have sandy topsoil but are less erosion prone and have clay at 30-40 cm depth that results in a higher water holding capacity than the top of the sand hill. The swales are characterised by a higher clay content and water holding capacity with subsoil constraints from 25 cm and below. These soils can produce high yields in wet years but tend to be poor performing in drier seasons.
**YIELD PROPHET 2010- HOW DID IT GO?**

The reports generated at on 23rd August 2010, when the season was tracking at a decile 9, suggested that there were some very high yield potentials (at 50% probability) with additional N on the hill (3.5 t/ha) and mid-slopes (3.8 t/ha). The actual yields for 2010 with 10-40 kg added N were in the order of 1.9-3.0 t/ha on the hill, 3.1-3.9 t/ha on the mid-slope and 4.5-4.9 t/ha on the swale. The actual yields with 40 kg added N/ha were approaching the predicted yield with unlimited N but fell short of their yield potential on the hill in part due to a heavy infection of yellow leaf spot.

![Graphs showing yield predictions and actual yields for Hill, Mid-slope, and Swale.](image)

Figure 1. Yield Prophet output 23rd August, 2010 for Hill, Mid-slope and Swale at Karoonda MSF site.

**YIELD PROPHET 2011- WHERE ARE WE AT?**

As is known, 2011 has been a very interesting season climatically! We started with record summer rainfall, followed by decile 2 April-June and the growing season rainfall is now tracking at around decile 5.
The Yield Prophet reports generated on the 18th August 2011 suggest that there are some good yield potentials with additional N on the hill and mid-slopes (both 3 t/ha at 50% probability) while the yield potential may be lower on the swale (around 2 t/ha at 50% probability) but is not N limited (Figure 3). However, this prediction on the swale may improve if rains continue and we are further characterising these soils this year to improve the reliability of this prediction.

Figure 2. Growing season rainfall at Karoonda.
Figure 3. Yield Prophet output 18th August, 2011 for Hill, Mid-slope and Swale at Karoonda MSF site.

We also used Yield Prophet to generate N profit reports (Figure 4) using nitrogen input and application costs and commodity prices from the Loller farm ($1.40/kg N with $4/ha for spreading and $285/t APW wheat), and N application strategies that correspond to the treatments used in the cereal strategies trial. The line on the left represents 9 kg N/ha at sowing while the centre line in the Hill figure is 9 kg N/ha at sowing with 31 kg N/ha at GS31 and the line to the right is 40 kg N/ha at sowing. The reports demonstrate as per 2010, that there are potentially high returns on investment in N on the Hill and mid-slope, with very little difference coming from applying the fertiliser at GS31 vs. sowing. The returns per hectare do-not include non-nitrogen related input costs (seed, chemical, fungicide etc), and therefore do not represent the actual gross margin.

Figure 4. Calculating Nitrogen profit report 18th August, 2011 for Hill, Mid-slope and Swale at Karoonda MSF site. (Note: Non-nitrogen input costs are not included in the returns per hectare graphs).
WHAT ABOUT OTHER SITES IN THE MALLEE?

MSF is using Focus Paddocks located throughout the wider Mallee region to support the research being conducted through the water use efficiency trial sites. Six paddocks are located at Lameroo, Waikerie, Loxton, Mildura, Kyalite and Ouyen.

Each paddock has been zoned using Precision Agriculture (PA). A range of zoning methods such EM38, yield, elevation and NDVI (greenness index) maps have been used across the six paddocks to identify different soil types and production zones. Using these maps, we soil tested 2-3 zones per paddock prior to seeding (Figure 5). Soil testing included a topsoil test to determine soil fertility and a subsoil test in 30 cm increments to measure water and nitrogen levels and to identify sub-soil constraints.

![Figure 3. An example of how a zone map has been used to target soil sampling at the Lameroo Focus Paddock](image)

Across all paddocks the ‘Dune’ soil had an average of 60 kg/ha of nitrogen available to the plant while the swale soils had 102 kg/ha of nitrogen. This demonstrates the importance of soil testing to soil type. However, rotation is also an important determinant of N requirement. A comparison between two paddocks at Lameroo, Lupins in 2010 (LW) and Wheat in 2010 (WW), shows that nitrogen levels on the LW paddocks were 43-56 kg Nitrogen higher than
in the WW paddocks. Therefore without additional nitrogen, the potential yield in the WW paddocks is 0.8-1.8 t/ha less than that in the LW paddock.

Despite relatively low growing season rainfall, yield potential across the Mallee generally remains good due to high levels of stored sub-soil water. Table 1 provides a summary of the Yield Prophet predicted for yields for focus paddocks in the SA Mallee. As you can see, the N limited yields (i.e. no extra N applied after seeding) ranges from 1.5 – 3 t/ha on the dune soils and 1.1 – 3.9 t/ha on the swale soils. The application of N would increase potential yields on the dune at the Loxton paddock and the dune and swale soil types at both Lameroo paddocks. However, the Waikerie paddock has lower yield potential due to lower levels of stored soil water prior to seeding, and therefore additional N is not required.

In Table 1, we have selected the yield’s predicted at the 50% probability (average spring conditions), however if you were more risk averse you could choose to use a higher probability (i.e. what would happen if the spring remained dry) or lower probability (what would happen in a wet spring). Figure 6 shows how to use yield prophet outputs to predict the 50% probability yield potential.

Table 1. 50% Yield Prophet Predictions for SA Focus Paddocks on the 10th of August

<table>
<thead>
<tr>
<th>Focus Paddock</th>
<th>Soil Type</th>
<th>N Limited</th>
<th>N Unlimited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lameroo LW</td>
<td>Dune</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Lameroo LW</td>
<td>Swale</td>
<td>3.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Lameroo WW</td>
<td>Dune</td>
<td>2.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Lameroo WW</td>
<td>Swale</td>
<td>2.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Loxton</td>
<td>Dune</td>
<td>1.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Loxton</td>
<td>Midslope</td>
<td>2.9</td>
<td>3.1</td>
</tr>
<tr>
<td>Loxton</td>
<td>Swale</td>
<td>2.9</td>
<td>2.9</td>
</tr>
<tr>
<td>Waikerie</td>
<td>Dune</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Waikerie</td>
<td>Swale</td>
<td>1.1</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Figure 4: Calculating the yield potential at a given probability (Here we have used 50%). The higher the probability, the more likely it is that climatic conditions will occur to achieve that yield potential.

Finally we should touch on the Yield Prophet yield potential. The potential yields are what Yield Prophet predicts that particular crop (variety and sowing date) can produce on that soil type in that season with only N and soil water supply as limitations to yield. It does not factor in phosphorus and other nutrient limitations, weeds, disease or frost and heat stress. Therefore, think of these yields as an upper limit, what would happen if everything (apart from N) in the crop was perfect. Therefore, you might aim to achieve 70 – 80 % of this predicted yield depending on what other factors may be affecting your crop. In water use efficiency terms, this would equate to 15-18 kg grain per mm of water.

If haven’t already done so visit www.msfp.org.au to view the Yield Prophet Reports for focus paddocks in your region.

Further information

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Michael Moodie, MSF, Phone 0448612892

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Mallee break crops – what breaks where?
Bill Davoren, Therese McBeath, Rick Llewellyn, and Vadakattu Gupta
CSIRO Ecosystem Sciences, Waite Campus.

TAKE HOME MESSAGES
- Break crops and pasture led to wheat yield boosts of over 1 t/ha on some soils last season.
- Break crops performed well across all soil types in 2010.
- Large increases in 2011 pre-sow soil N resulted from 2010 lupin and volunteer pasture treatments.
- ‘Grazing’ cereal rye has reduced grain yield by 20-50% depending on soil type and season.
- Break effects on rhizoctonia risk and N-supply potential are substantial (reported in accompanying paper)
- Second-year effects will determine the overall economic value of break crop strategies on different soils.

Aims
- To evaluate the performance and benefits to subsequent cereal crops of a range of break options across Mallee soil types.
- To determine effects of breaks on disease risk and N-supply potential on different Mallee soils.
- To evaluate cereal rye as a grain-graze option.
- To develop soil zone-based strategies for best breaks for sustaining profitable cereal-based rotations.

Methods
The 2011 wheat crops are being grown on plots that were sown to a range of break options in 2009 or 2010 (Table 1). Seed and fertiliser rates were kept the same across all soil types (Table 2) with all treatments receiving 50 kg/ha of DAP at sowing. With the exception of the legume crop treatments, urea was also applied at sowing at a 35 kg/ha. One of the cereal rye treatments was cut prior to GS31 to simulate grazing or hay production (Treatment 4). The volunteer pasture treatment received no inputs except spraytopping in spring.
Table 1. Break crop treatments imposed in 2009-11 and proposed treatments in 2012

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Legume (peas)</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>2</td>
<td>Brassica (mustard)</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>3</td>
<td>Cereal Rye – grain</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>4</td>
<td>Cereal Rye– grazed</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>5</td>
<td>Volunteer pasture</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>6</td>
<td>Wheat (control)</td>
<td>Wheat</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>7</td>
<td>Wheat</td>
<td>Brassica (canola)</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>8</td>
<td>Wheat</td>
<td>Cereal Rye – grain</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
<tr>
<td>9</td>
<td>Wheat</td>
<td>Cereal Rye– grazed</td>
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<td>Wheat</td>
</tr>
<tr>
<td>10</td>
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<td>Volunteer pasture</td>
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<td>Wheat</td>
</tr>
<tr>
<td>11</td>
<td>Wheat</td>
<td>Legume (lupins)</td>
<td>Wheat</td>
<td>Wheat</td>
</tr>
</tbody>
</table>

Table 2: The following inputs were applied to the treatments established in 2009-11

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Crop/Variety</th>
<th>Seed kg/ha</th>
<th>Fertiliser kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legume</td>
<td>2009: Peas cv. Kaspa</td>
<td>100</td>
<td>50 DAP</td>
</tr>
<tr>
<td></td>
<td>2010: Lupins cv Mandelup</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Brassica</td>
<td>2009: Mustard cv. Sahara</td>
<td>5</td>
<td>50 DAP/ 35 Urea</td>
</tr>
<tr>
<td></td>
<td>2010: Canola cv. Hyola 50</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Cereal – grain</td>
<td>Cereal rye cv.Bevy</td>
<td>80</td>
<td>50 DAP/ 35 Urea</td>
</tr>
<tr>
<td>Cereal – hay/grazing</td>
<td>Cereal rye cv. Bevy</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td>2009/10 Wheat cv. Correll</td>
<td>70</td>
<td>50 DAP/ 35 Urea</td>
</tr>
<tr>
<td></td>
<td>2011 Wheat cv. Mace</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>
How well did break crops perform in 2009?

Total growing season rainfall (from sowing to October) was 192 mm which was between a decile 5 and 6.

The grain yield of peas was 0.5 t/ha over all landscape positions, while the un-cut rye grain yield on the hill and mid-slope were more than double that on the flats (Table 3).

The effect of cutting the rye resulted in the grain yield being about half of the un-cut treatments (Table 3).

Volunteer pasture was highly productive, particularly on the flats with the medic component in spring ranging from 41% on the flat to 85% on the sand.

Table 3: 2009 Grain yields of break crops, cereal and volunteer pasture biomass.

<table>
<thead>
<tr>
<th></th>
<th>Rye ‘grain’</th>
<th>Rye ‘cut’</th>
<th>Peas</th>
<th>Mustard</th>
<th>Wheat</th>
<th>Pasture biomass (July 28)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill (sand)</td>
<td>1.4</td>
<td>0.7</td>
<td>0.5</td>
<td>Failed</td>
<td>1.3</td>
<td>0.62</td>
</tr>
<tr>
<td>Mid-slopes</td>
<td>1.5</td>
<td>0.8</td>
<td>0.5</td>
<td>Failed</td>
<td>1.5</td>
<td>1.21</td>
</tr>
<tr>
<td>Flat</td>
<td>0.6</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
<td>1.1</td>
<td>2.28</td>
</tr>
</tbody>
</table>

How well did break crops perform in 2010?

Trials were sown in late May after approximately 20mm of rain. Rainfall until August was close to average and rainfall from August through spring was well above average reaching Decile 10 GSR. In 2010 the mid-slope sampling was split into two sections (mid-top and mid-bottom).
Pre-sowing 2010 soil N was 20-30 kg higher after pasture compared to after wheat. Peas had a lesser and inconsistent effect on starting N levels (1-17 kg N /ha) while rye (grain) led to lower starting N levels on the sandier soils relative to wheat (18-26 kg N /ha), but similar levels to wheat on the heavier soils.

Grain yield of all break crops in the wet 2010 season was relatively high with up to 2 t/ha of canola on the flat and hill, and up to 4 t/ha of lupin on the mid-slope.

Cereal rye performed well across all soil types yielding around 3 to 3.5 t/ha and Lupins yielded up to 1.5 t/ha more on the lighter sands than on the flats (Figure 1).

‘Grazing’ of cereal rye reduced its grain yield by 20% (hill) to 30% (flat) in 2010.

Pasture biomass of 3 t/ha was measured on the flats in July which was double the biomass of the hill, however by September and after grazing (mowing to simulate grazing) the pasture on the lighter soils had improved and the differences were reduced.

Figure 1: Grain yield (2010) of break crops on the different trial locations and pasture biomass at anthesis.
What were the break crop effects on 2010 wheat yield?

Non-cereal breaks grown in 2009 led to 2010 wheat yield gains of up to 1.1 t/ha with peas leading to an average 1 t/ha yield gain across all soils (Table 4).

Rye in 2009 led to significant 2010 wheat yield gains on the flat but not on sandier soils where it had led to less starting N.

Table 4: 2010 Correll wheat yield (t/ha) following 2009 break crops. Yield boost compared to wheat on wheat shown in brackets.

<table>
<thead>
<tr>
<th>2009 Break Crop</th>
<th>Flat</th>
<th>Mid-Bottom</th>
<th>Mid-Top</th>
<th>Hill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legume (peas)</td>
<td>6.1 (+1.0)</td>
<td>5.0 (+1.0)</td>
<td>3.1 (+0.9)</td>
<td>4.0 (+1.0)</td>
</tr>
<tr>
<td>Brassica (mustard)</td>
<td>6.3 (+1.1)</td>
<td>5.0 (+1.0)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cereal Rye Grain</td>
<td>5.9 (+0.7)</td>
<td>4.4 (+0.4)</td>
<td>2.4 (+0.1)</td>
<td>3.3 (+0.3)</td>
</tr>
<tr>
<td>Cereal Rye ‘Grazed’</td>
<td>6.1 (+0.9)</td>
<td>4.5 (+0.5)</td>
<td>2.9 (+0.7)</td>
<td>3.0 (+0.2)</td>
</tr>
<tr>
<td>Pasture</td>
<td>5.9 (+0.7)</td>
<td>4.7 (+0.6)</td>
<td>3.1 (+0.9)</td>
<td>4.1 (+1.1)</td>
</tr>
<tr>
<td>LSD within soil zone</td>
<td>(0.5)</td>
<td>(0.6)</td>
<td>(0.5)</td>
<td>(0.7)</td>
</tr>
</tbody>
</table>

Results 2011

All plots were sown to Mace wheat in late May after 30mm of rain; April had been very dry while over 100 mm in March had provided excellent sub soil moisture.

Pre-sowing soil nitrogen after 2010 lupins was up to 79 kg/ha higher and up to 64 kg/ha higher after pasture (Table 5).

Unlike other break options, 2010 lupins led to consistently increased 2011 pre-sowing N across all soil types.
Despite the large differences in soil N between treatments, crop biomass was yet to show consistent trends at GS 30/31.

**Table 5: Gains in 2011 pre-sowing N (0-100cm kg/ha) following 2010 break crops compared to 2010 wheat.**

<table>
<thead>
<tr>
<th></th>
<th>Rye</th>
<th>Rye 'cut'</th>
<th>Lupins</th>
<th>Canola</th>
<th>Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill (sand)</td>
<td>35</td>
<td>21</td>
<td>46</td>
<td>21</td>
<td>64</td>
</tr>
<tr>
<td>Mid-top</td>
<td>-13</td>
<td>-8</td>
<td>26</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>Mid-bottom</td>
<td>36</td>
<td>27</td>
<td>79</td>
<td>14</td>
<td>44</td>
</tr>
<tr>
<td>Flat</td>
<td>-17</td>
<td>-19</td>
<td>28</td>
<td>-17</td>
<td>9</td>
</tr>
</tbody>
</table>

**Further information**

Bill Davoren; Email: bill.davoren@csiro.au
Soil biology and Rhizoctonia disease management update – Break crop experiments at Karoonda

Gupta, V.V.S.R.¹, R. Llewellyn¹, T. McBeath¹, S. Kroker, B. Davoren¹, A. Mckay², K. Ophel-Keller² and A. Whitbread¹

¹ CSIRO, Adelaide and ² SARDI, Adelaide

TAKE HOME MESSAGES

- Crop rotation had a significant influence on the microbial activity, diversity, nitrogen supply potential and the level of Rhizoctonia pathogen inoculum in soil.
- Cereal crops promote the build-up of Rhizoctonia inoculum; mustard and canola can provide a practical rotation option to reduce inoculum levels in a multi-year cropping sequence.
- Crops such as cereal rye which do not show aboveground symptoms of Rhizoctonia but did not reduce inoculum levels in soil.
- Inoculum levels are generally reduced over summer following rainfall, however the extent of reduction is dependent on the amount of summer rainfall.
- Bumper crops in the 2010 crop season and exported a larger amount of nutrients resulting in lower levels of mineral N in the soil profile at sowing in the swale.
- An improved understanding of the factors influencing Rhizoctonia inoculum levels will assist growers and advisers to better utilise diagnostic information to select options and requirements for improved management of Rhizoctonia disease.

Introduction

Crop rotation provides options to better manage soil biological functions by modifying populations and activities of beneficial and plant pathogenic microorganisms. For example, grain and pasture legume crops provide benefits from N inputs through symbiotic N fixation whereas brassica crops (e.g. canola and mustard) modify the activity of different microbial groups and known to affect the populations of soil fungi. For the lower fertility Mallee soils improved understanding of how rotation crops influence microbial communities helps to maximize benefits from biological functions to the following cereal crop. Incorporation of flexible break options would help address some of the challenges associated with weed and disease management, fertilizer costs and soil organic matter management.
The incidence and severity of Rhizoctonia bare patch depends on the amount of Rhizoctonia inoculum, composition and activity of the soil biology community (inherent suppressive activity) and available soil N levels over summer and at seeding. The complex relationship makes this a difficult disease to predict and manage. Break crop experiments at Karoonda were monitored as part of a GRDC funded research on Rhizoctonia (CSE00048) to investigate the effect of rotation crops on pathogen inoculum and disease impacts on the following wheat crop.

The aim of our work is to evaluate the short-term benefits of alternate rotations through improved soil biological fertility and reduced risk of Rhizoctonia disease in the following wheat crop in different landscape positions (hill, mid-slope and swale (flat)).

**What we found?**

A brief summary of results observed in the break crop experiments conducted during 2009 and 2010 both within the crops and during non-crop period are given below:

**Microbial activity and nutrient availability**

1. During the summer (March 2011), microbial activity and catabolic diversity (ability of microorganisms to utilize various carbon substrates) in surface soils were higher after rotational crops such as canola, lupins and pastures compared to wheat and cereal rye (grain). Microbial activities were generally higher in soils from swale (flat) compared to Hill and mid-bottom slope experiments. These results confirm the beneficial effects of non-cereal crops on microbial activity found during summer 2010 compared to wheat and rye.

**Figure 1.** Soil microbial catabolic activity during March 2011 as influenced by previous season rotational crops.
2. Nutrient supply potential of a soil through biological activity is a product of microbial activity, microbial biomass turnover and crop residue and soil organic matter. Significant effects of rotational crops on microbial biomass carbon and nitrogen and nutrient mineralization potential, compared to continuous wheat treatment, were observed at sowing of the 2010 and 2011 wheat crop. In general, N mineralization potential was highest after legume crops, canola and rye and lowest in the continuous wheat treatment in all three experiments (Table 1). The amounts of microbial biomass carbon and nutrients and nutrient mineralization potentials were higher in swale soils compared to hill and mid-slope experiments.

3. Detailed analysis of composition of soil microorganisms, during March 2011, showed that wheat-canola had the highest between-crop differences followed by wheat-pasture and wheat-rye treatments.

4. Rotation crop based differences in microbial properties was reflected in the amount of mineral N in soil profile at sowing (Figure 2). Some of the effects include: (i) in the continuous wheat treatment, mineral N levels in the soil profile at sowing were highest in the swale experiment and no significant difference between the hill and mid-bottom experiments, (ii) mineral N levels were higher in the 1st year after rotational crops compared to 2nd year after break crops, (iii) mineral N levels were highest after pasture and lupins compared to after canola and rye, (iv) in the swale (flat) experiment, mineral N levels after canola and rye were lower than continuous wheat. Higher amounts of crop residues and microbial biomass carbon levels after cereal rye indicate the potential for immobilization (temporary tie-up) of nutrients.

Table 1. Nitrogen mineralization potential of surface 0-10cm soils (kg N / ha) at sowing in 2010 and 2011 as influenced by previous year’s rotational crops.

<table>
<thead>
<tr>
<th>Location</th>
<th>Crop</th>
<th>kg N / ha</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill</td>
<td>Canola</td>
<td>-</td>
<td>13.5</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td>Lupins</td>
<td>-</td>
<td>15.4</td>
<td>d</td>
</tr>
<tr>
<td></td>
<td>Pasture</td>
<td>-</td>
<td>15.3</td>
<td>d</td>
</tr>
<tr>
<td></td>
<td>Rye</td>
<td>-</td>
<td>11.5</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>5.1</td>
<td>9.1</td>
<td>a</td>
</tr>
<tr>
<td>Mid-bottom</td>
<td>Canola/Mustard</td>
<td>11.3</td>
<td>14.9</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>Lupins</td>
<td>-</td>
<td>13.5</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>Pasture</td>
<td>12.7</td>
<td>20.8</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td>Rye</td>
<td>11.9</td>
<td>14.1</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>10.4</td>
<td>9.1</td>
<td>a</td>
</tr>
<tr>
<td>Swale</td>
<td>Canola/Mustard</td>
<td>19.7</td>
<td>21.3</td>
<td>bc</td>
</tr>
<tr>
<td></td>
<td>Lupins</td>
<td>-</td>
<td>22.5</td>
<td>c</td>
</tr>
<tr>
<td></td>
<td>Pasture</td>
<td>13.7</td>
<td>27.8</td>
<td>d</td>
</tr>
<tr>
<td></td>
<td>Rye</td>
<td>26.4</td>
<td>19.0</td>
<td>b</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>8.5</td>
<td>13.3</td>
<td>a</td>
</tr>
</tbody>
</table>

Note: Determined using a laboratory incubation method; 2011 values for each location followed different letters are significantly different from each other at P<0.05.
Figure 2. Mineral N in the soil profile at the time of sowing in May 2011 as influenced by rotation crops in 2009 and 2010. Data represents mineral N levels in rotational crop treatments as compared to Continuous Wheat.

Rhizoctonia inoculum and disease incidence

5. There was a build-up of Rhizoctonia inoculum through 2010 crop season in all the crops and soils. Rhizoctonia inoculum levels were lowest in the canola crop and highest in the wheat crop in all the three soils (Figure 3). Levels in the cereal rye crop were higher than in the lupins and pasture crops. These results in general confirm observations from experiments at Waikerie and Streaky Bay. The variation in the effects of rotation crops between the three soils could be due to the differences in the amount of grasses present (e.g. grasses in the swale pasture (~10%) or weeds in other crops).
6. Regular rainfall during the summer 2011 resulted in a decline in the inoculum levels in all the treatments and at sowing inoculum levels were only in the medium disease risk category in the wheat and cereal rye rotation in the hill experiment. Inoculum levels in all the other treatments were in the lower disease risk category. This type of reduction in inoculum during this summer was also observed in other experiments in the Mallee and Eyre Peninsula. Summer weeds have the potential to influence inoculum changes during summer, which will be investigated during the next summer as part of the GRDC Rhizoctonia project.

7. In the 2010 wheat crop, disease incidence was lowest in wheat after mustard, in particular in the swale experiment. In the mid-slope (bottom) experiment, the mustard effect was only observed in the percentage of crown roots infected by Rhizoctonia. There was no significant difference in disease incidence after cereal rye, pasture and wheat both in swale and mid-slope (bottom) experiments.

8. Disease incidence differences in general were found to be associated with differences in inoculum levels and microbial properties e.g. soils with higher microbial activity and catabolic diversity showed lower disease incidence. Reduced inoculum levels following previous year’s mustard and pasture were correlated with the lower levels of Rhizoctonia disease and increased grain yield (R² ≥0.75).

9. Overall, yield benefits of rotational crops for wheat crops can be attributed to reduction in Rhizoctonia disease incidence coupled with improved soil biological activity in terms of catabolic N supply potential and N inputs from symbiotic N fixation by legumes.

10. Results from the GRDC Rhizoctonia project suggested that the impact of Rhizoctonia disease on wheat yield may be location and season dependant.

For further information:  
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Soil P test variations within a paddock – Karoonda main site

Sean Mason, University of Adelaide

- Variations in soil tests values from three distinct zones at Karoonda suggests P fixation potential is one of the main drivers for P availability
- Both Colwell P (with PBI) and DGT reveal adequate levels of P are present in all zones
- Zoning paddocks in terms of P tie up potential and P availability will assist in getting the most value out of P fertiliser applications

Status of soil P tests

The accuracy of the Colwell P soil test has been questioned on selected soil types. It is now highly recommended that the Phosphorus Buffering Index (PBI) measurement is included to calculate a specific critical Colwell P value for each paddock/zone.

Recently a new soil test for P called DGT has been evaluated on southern Australian soil types and provides greater confidence in predicting actual crop responses to P applications. The method is planned to be commercialised and available to farmers in some capacity for the 2012 season.

Currently the DGT soil P test has had a success rate of > 90% in predicting crop responses to P including wheat, canola, peas and barley. By comparison the Colwell P with PBI interpretation has had a success rate of 67% for the wheat trial dataset. The PBI inclusion to correct Colwell P has not been established for the other crop types.

Soil P levels at Karoonda

Soil samples (0-10cm) were taken at the establishment of the N x P trials at Karoonda in 2010 and prior to sowing in 2011. Three trials were placed at three locations (different soil types) in the paddock; flat, mid-slope and hill
sand. For more details on the trial set up please refer to the article by McBeath et al. As a summary (Table 1) all three soil types had surface Colwell P levels twice the critical Colwell P level for deficiency as determined by the PBI measurement. The DGT-P levels were also more than twice the critical level for deficiency with some variation between soil types. Both soil tests in this case correctly predicted that all soil types had adequate P to sustain wheat growth to maturity (> 90% maximum yield) as observed overall in the flat yield responses with P application for 2010.

**Paddock zoning by soil P**

In addition to the results generated by the N x P trials, samples were also taken from the break crop trial established this year across 4 zones (swale, small rise, mid-slope and dune). This trial is in a new part of the paddock which was previously under management of the farmer. Across paddock zones there is a trend of available P, as assessed by DGT with the fixation potential of the soil (PBI) (Figure 1). The zone with greater fertiliser tie up potential (flats) has less available P compared to the low fixing soil (hill sand, mid-slope). It appears that the ability of the soil to fix P applied is a controlling factor for the differences in P availability in this paddock assuming a blanket rate of P has been applied. Another factor that should be considered is the differences in P removal from the zones caused by different yield potentials.

**Replacement P strategy**

The Karoonda site is an excellent example of where the PBI measurement along with accurate assessment of the soil P status is valuable in determining application rates for the following year. Based on 2010 yields, assuming adequate N was applied the mid-slope and flats both yielded around 5t/ha. Therefore on a replacement strategy, it would be recommended that both zones would have the same amount of P applied in 2011. Using the PBI measurement and DGT values the recommendation might be a little different as the flats should be targeted for the higher P application rate to compensate for the higher PBI on this soil which will reduce the availability of added fertiliser. In comparison by using Colwell P results only, which would give a single soil test critical value, the hill sand and mid-slope zones would be the target for P application to achieve equivalent Colwell P levels across all soils. This would be an unnecessary input cost and in addition P supply capacity could be reduced in the flats.
Table 1. Soil P test summary for the N by P trials. Mean values of 3 replicate samples taken pre sowing (2010) across the trial

<table>
<thead>
<tr>
<th>Site</th>
<th>Colwell P mg/kg</th>
<th>PBI mg/kg</th>
<th>CCP* (mg/kg)</th>
<th>Colwell P - CCP (mg/kg)</th>
<th>DGT P mg/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flats</td>
<td>46</td>
<td>61</td>
<td>23</td>
<td>23</td>
<td>194</td>
</tr>
<tr>
<td>Mid-Slope</td>
<td>30</td>
<td>14</td>
<td>13</td>
<td>17</td>
<td>344</td>
</tr>
<tr>
<td>Hill Sand</td>
<td>26</td>
<td>10</td>
<td>11</td>
<td>15</td>
<td>227</td>
</tr>
</tbody>
</table>

Adequate P levels

>20-25# Colwell P > CCP 53

#Ag bureau of S.A inc.

*Critical Colwell P using PBI values

Figure 1. Relationship between PBI and available P (DGT) for 4 distinct zones associated with the 2011 break crop trial. Mean values of 12 replicates taken as a transect across the trial.

Further information

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Multi-Trait Medics for the Mallee
Jake Howie, Ross Ballard, David Peck & Jeff Hill, SARDI Pastures Group

TAKE HOME MESSAGES

- SARDI is evaluating a range of new strand medics bred for low rainfall, neutral/alkaline, sandy/loam soils.

- New powdery mildew resistant medics performed well in 2010 and are being tested at additional sites in 2011 (Lameroo, Netherton & Karoonda).

- Medic dominant pastures provide a disease break, high quality stock feed and biologically fixed organic nitrogen.

- In 2 CSIRO experiments* at Karoonda, naturally regenerating medic based pasture in 2009 increased 2010 wheat yields by an average of 0.84 and 1.1 t/ha.

What happened in 2010 – a summary

The key finding for us from 2010 was the excellent dry matter and seed yield at all sites (Karoonda, Minnipa and Arthurton) of a small set of powdery mildew (PM) resistant lines which also have sulfonylurea herbicide tolerance, aphid resistance and large seeds. They had excellent early vigour and outperformed Herald and Angel by 20% for winter and spring dry matter growth (see Fig. 1) even though powdery mildew wasn’t an issue last year. Their seed yield was also excellent (> 1000 kg/ha), an important indicator of longer term success, persistence and productivity. These have been short-listed and sown at additional sites in the Mallee this year (Lameroo, Netherton and Karoonda) to further test their field performance. We will also monitor the regeneration of the Karoonda 2010 site to gain 2\textsuperscript{nd} year agronomic performance data.

We were concerned to observe generally low nodulation of medics at the Karoonda site (although their dry matter and seed yields were excellent). This was reinforced by a number of anecdotal reports of poor nodulation of medics growing on some Mallee soil types (eg non-wetting sandy rises, low organic
matter). To check this further we have included some rhizobial inoculant treatments (new strains and high inoculation rates) in the 2011 trials.

**What’s happening so far in 2011?**

The patchy start to the season in the Mallee has meant our 2011 trials were sown later than ideal (late May – mid June) and early growth has been hampered by low growing temperatures (especially July). Establishment at our 2011 Lameroo and Netherton sites has been good but establishment on the Karoonda site has again been patchy with staggered germinations due to non-wetting soils. In a repeat of 2010 we have observed seedlings still trying to emerge at the end of July, 6 weeks after sowing, which puts them at a great disadvantage with respect to immediate survival, ability to compete with weeds and final productivity.

*Having to sow small seeded pastures shallow into non-wetting sand has presented us with real plant establishment issues at this site and in both years has been exacerbated by the soil surface apparently failing to wet up sufficiently in the many small rainfall events. In July 2011 there were 23 rain days for only 24.2mm rainfall; evapotranspiration was > 40mm; there were 26 hours of frost and less than 20 growing day degrees - a tough month! We will be watching Rebecca Tonkin’s soil surfactant work at this site with great interest.*

**Regeneration of 2010 trial**

Encouragingly the regeneration of the 2010 site was looking impressive at the time of writing, with dry matter yields already above 3 t/ha by the end of July. This is despite severe mice damage which turned parts of the site into a virtual quarry (despite Bill Davoren’s baiting efforts). *NB Be aware that mice are very efficient harvesters of medic pod and are able to open these to extract the seed.* Plant numbers in the regenerating pasture trial however have been generally sufficient to compensate for this and to take advantage of the big rains in March and warmer growing conditions in April and May to produce high dry matter over autumn/winter.

*Naturally regenerating medic pastures typically germinate on autumn rains and the key to early production is an early break to the season and/or high plant densities. To achieve this, seed yields should be maximised wherever*
possible in order to maintain high reserves of seed in the soil bank. It is possible that medic seed reserves in the Mallee have been significantly reduced by mice and that it will be particularly important to maximise medic seed yields this year, even if it means spelling some paddocks in spring to let the medic flower and set maximum seed.

Powdery mildew in 2011

There have been many reports of extensive powdery mildew infection in annual medic pastures this year, especially on the EP but also from the Mid North, Murray Mallee and Lower Murray. We have seen some on the regenerating trial here at Karoonda which is much earlier than usual (more normally spring). We suspect the March rains and subsequent early medic germination has given it a chance to get a foothold while the temperatures were still mild. There may have also been more carryover than usual with the late season and summer rains last year. This site may be our first opportunity to observe the performance of our PM resistant hybrids under real powdery mildew pressure in field conditions.

Acknowledgements

Many thanks to Hannah & Peter Loller and CSIRO for having us on their site, Lester Cattle (Netherton), Trevor Pocock (Lameroo) and South Australian Grains Industry Trust for funding this work.

*Davoren et al, MSF results compendium 2010, p. 60-64; 107-113.

Further information

Jake Howie, Waite Campus Phone (08 8303 9407) Email jake.howie@sa.gov.au
Figure 1: Winter-spring dry matter production (average of % maximum site yield over three assessments) at Karoonda of cultivar controls and selected powdery mildew resistant lines (PM).
Time of seeding in the Mallee – do the trials reflect what we instinctively know?
Richard Saunders, Rural Solutions SA

**TAKE HOME MESSAGES (same as 2010)**

- Effect of variety to time of sowing is well known. Varieties respond to different times of sowing according to their maturities.
- Time of seeding is one of the keys to optimising water use efficiency
- Average yield losses from delayed sowing are about 200kg/ha/week
- A suite of crop varieties with different maturities will reduce risk from events such as frost and disease as well as giving more management options for weed control.

**Current Knowledge**

The effect of variety to time of sowing is well known. Sowing time can have a major impact on water use efficiency and ultimate productivity of the crop. In the Mallee we observe each year the effects of delayed sowing by as little as a week to 10 days - there appears to be a small window of optimum sowing opportunity after which yields from later sown crops significant drop off in yield and yield potential.

At the 2009 GRDC update Glenn McDonald et al in his paper ‘Time of Sowing’ reviewed the current knowledge in the literature. McDonald et al summarized their findings with the following points:

- Average yield losses from delayed sowing are about 200kg/ha/week.
- The flowering window determines the optimum sowing time for a variety.
- Differences in crop development and grain yield among varieties increases with earlier sowing.
- Later flowering varieties can provide flexibility when sowing can occur in early May.
- Further yield benefits from very early sowing (April) may be slight but may provide other management options.
- Predicted changes in temperature and rainfall may increase the importance of early sowing. (McDonald et al, 2009)
In the 2010 Mallee trials the grain yield table showed significant differences between sowing treatments and a significant time of sowing by variety interaction at the Karoonda site. The results from 2010 are very similar to 2009, although the 2009 trials had high variation. At Waikerie the best yielding variety was Yitpi at 105% of mean yield and TOS2 was the best time of sowing at 111% of mean. Water use efficiency figures for the treatments were high, ranging from 15.8 to 18.9 kg/mm. Yields were apparently not restricted by rainfall received, with good rains and mild temperatures through Spring. The yield pattern for the time of sowing shows a classic pattern of rising then falling away. From the second time of sowing the average yield loss at Waikerie was 92 kg/ha/week, which is lower than the McDonald figure of about 200 kg/ha/week.

Karoonda, whilst recording a higher growing season rainfall yielded less than the Waikerie site. Consequently water use efficiency figures were nearly half of those from Waikerie. Yields, however, were nearly double those recorded in 2009. There was no difference between any of the varieties but there was a significant time of sowing effect and time of sowing-variety interaction. As with the Waikerie site there was a marked drop in yield after the second time of sowing, 288 kg/ha/week.

Yitpi appears to be the best adapted variety of the three included in the trial. It seems least affected by sowing time. Both Gladius and Axe show a bigger response. The spread of yields between the varieties is greater at the first time of sowing and becomes less with later sowing times. In most cases the second time of sowing was the most productive. Only Yitpi at Karoonda did not show this typical response pattern and at MSF site Axe’s yield seemed to plateau from the second time of sowing.

The MSF 2011 Research Compendium carries the full write up of these trials.

Given favourable seeding conditions – soil moisture and weed control, most northern Mallee growers all aim to sow at the optimum time in order to give the crop the best chance to develop and maximise crop potential. They know that delays beyond mid May are costly in terms of yield and sometimes quality. We have all seen examples of what seeding delays of just a few days to a week as a result of dry conditions, machinery breakdown, weather, or for whatever reason, have done to crop yields.
Recent Developments

Technological developments and increases in seeder and tractor capacities have seen a dramatic increase in the capacity of growers to sow large areas when conditions are optimum. As a result we have seen strong and consistent improvements in water use efficiency through better targeting time of seeding as a water use efficiency issue.

Controlling Weeds

Weed control is all about saving water for the crop and along with time of sowing is critical in optimising water use efficiency. Time of sowing can be used as a weed control strategy - to upset and reduce weed populations.

If you do the same thing every year, for example, spray then sow, you are still selecting for weeds, they may be different or harder to kill weeds. By mixing up time of seeding strategies (for example in one paddock – sow early one year, late the next) you can effectively disrupt the normal weed cycle. A simple strategy of employing different seeding times can be a useful tool in combating weeds and thereby improving water use efficiency.

Further information

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Barley agronomy research update
Kenton Porker & Rob Wheeler, SARDI

TAKE HOME MESSAGES
- Deep sowing to avoid herbicide damage can benefit varieties with long coleoptiles
- Herbicide damage can have less impact than deeper sowing in short coleoptile varieties
- Seed dressings can significantly reduce (Triademinols), or increase (Carboxin based products) coleoptile length, and hence change varietal establishment
- Varieties differ in susceptibility to pre harvest weather damage, and should be harvested according to risk

Introduction:
The Southern Australian Barley Agronomy Project is a tri state initiative funded by GRDC aimed to develop improved agronomic practices for new barley varieties. The project in SA is conducted in association with farming system groups and continues to gather data on varietal responses to agronomic practices such as time of sowing, nitrogen management, and fungicide application. A key focus of the work being undertaken at the Karoonda MSFP site in 2010/2011 concerns maximising establishment, growth, and reducing patchiness within the new barley varieties grown in the Mallee.

Lessons from 2010 research: Herbicides and Sowing Depth
There have been incidents of crop damage from soil active pre-emergent herbicides in recent years leading to paddock variability in barley establishment and growth. Trials at Karoonda (Mallee) and Turretfield (Mid North) in 2010 showed herbicide damage (establishment, vigour) to be more pronounced at shallow sowing and when rain immediately followed application. Increasing seeding depth below the herbicide band could have advantages by reducing the risk of damage from pre emergent herbicides washing onto the seed. If opting to sow deeper growers must consider that barley varieties differ in their ability to emerge from depth, due to their coleoptile length. Hindmarsh, Flagship, and Buloke are shorter coleoptiles varieties, so care should be taken with seeding depth. Commander and Maritime have medium coleoptiles lengths, while Fleet has the longest. Findings from 2010 (Figure 1) showed sowing deeper to avoid herbicide damage appears to benefit varieties that can cope with the stress of deeper sowing such as Fleet. However, it was better to sow the short coleoptile
variety, Hindmarsh, shallow as herbicide induced damage had less impact than the consequences of deeper sowing (figure 1).

![Figure 5 Establishment of Fleet and Hindmarsh sown deep (80mm) and shallow (30mm) with herbicide treatments averaged across Turretfield (Heavy Clay), and Karoonda (Sandy Loam), 2010](image)

**Seed quality and dressings**

Seed dressings are another factor influencing coleoptile length and plant establishment. Coleoptile length was shortened by a Triadminol seed dressing by up to 20mm, and it is advised to avoid using them on shorter coleoptile varieties such as Hindmarsh if sowing deep. However, a seed dressing containing the active ingredient Carboxin increased coleoptile length by up to 10mm, improving establishment from deeper sowing. The risk of reduced establishment in short coleoptile varieties is also exacerbated by using seed with poor vigour such as small or weather damaged seed. In 2010, emergence from deep sowing improved by up to 20 percent just by screening seed and sowing larger seed with more vigour. Trial work is continuing in 2011 to further understand the environmental factors that are contributing to growth responses to management practices such as herbicides, seed dressings, and sowing depth. The extent of damage, plant establishment, biomass reduction, and yield recover are all likely to be dependent on seasonal conditions.

**Pre harvest weather damage:**

Untimely rain during the 2010 harvest resulted in quality downgrades in a number of varieties. A trial at Turretfield (Mid North) last year investigated the effect of pre harvest weather damage on variety characteristics such as lodging, black point, sprouting, head loss, and test weight. The comparative performance of varieties harvested early and late after being subjected to significant weather damage was assessed. Varieties differed in test weight, and when harvested early, all achieved Malt1 or Feed1 standards and variety rankings were consistent with NVT trial results (figure 2). However, delaying
harvest, reduced test weight by an average 5.1kg/hL across all varieties. All malt varieties harvested late did not meet malt standards, but Buloke, Gairdner, and Sloop SA met F1 grade, while Commander and Flagship were below the required 62.5kg/hL for F1. Flagship is known to have superior test weights, but is the most susceptible variety to sprouting and hence recorded the largest reduction in test weight. Keel an early feed variety, dropped 10kg/hL with rain damage along with significant levels of black point, but Hindmarsh another early variety fell around 5.5kg/hL and still met F1 standards. Finniss a hulless (naked) variety had superior testweights at early harvest but was 12kg/hL lighter when harvested late. Varieties that are susceptible to sprouting and weather damage such as Flagship, and early variety Keel along with other varieties that typically have low testweights like Fleet and to a lesser extent Commander, should be harvested without delay once mature.

Figure 2. Mean test weights (kg/hL) for feed and malting* barley varieties from a delayed harvest trial at the Turretfield Research Centre 2010/2011 (LSD FPr <0.05 = 1.3kg/hL).

Further information

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Soil Modification Trials at Karoonda
Rebecca Tonkin, Rural Solutions SA, Murray Bridge

Background:
The sandy soils of the Mallee often have problems with water repellence and low nutrient holding capacity. Adding a small amount of clay to the topsoil can overcome the water repellence and increase the nutrients held in the topsoil. Getting this right is important as clay cannot be removed once it has been added to the sand.

Clay can be added to sand by a number of methods. The most commonly used are:

- Clay spreading, where suitable clay is taken from a shallow pit close to the area and spread across the surface, then incorporated by discing, cultivating or spading.
- Delving, where suitable clay is brought to the surface using a heavy tined implement to dig into the clay layer and bring clay up leaving it on the surface. This is then smudged across to cover the ground in between the delve lines, and incorporated as for clay spreading. It has the additional benefit of ripping any hard pans present, and leaving clay along the delve lines enabling plant roots to travel deeper into the subsoil. However, the clay must be at the right depth (30-60 cm) below the sand so that the machine can reach it.

Clay spreading has been used in the Mallee with variable results. Problems have occurred where high rates of clay have been put on, clays were incorporated poorly, or clays with high levels of lime, salts or boron were used. On the other hand, claying has enabled production of crops in areas that previously would erode every year, needed to be worked several times to overcome the non-wetting sand, and had weed problems due to staggered germination.

Delving is a recent practice in the Mallee and not as widely used, partly because it is still new and partly because the areas appropriate for delving are limited to those with suitable clay at the right depth. Trials in the Parilla area have shown that delving can increase cereal yields by about 20% if done properly. If too much clay is brought up however, water availability in late spring can be a problem as water becomes bound to the clay and is not available to plants.

The trials being conducted by the Karoonda & Districts Agricultural Bureau aim to test the usefulness of clay spreading and/or delving on farms around the district. As part of this they will also be trialling the spader, a machine capable of mixing and incorporating clay and organic matter down to 30-40 cm, which may be useful for mixing in over-clayed areas.
**Trial Design**  
3 farms have a delving trial, with treatments of  
- control (normal practice)  
- delved (900mm delve spacing, clay incorporated by farmer)  
- delved and spaded (clay incorporated with a spader machine)  
- spader (spader alone, no delve)  

2 farms also have a clay spreading trial. They have 3 different rates, using farmer methods for incorporation as well as the spader:  
- light rate (~70 t/ha)  
- medium rate (~140 t/ha)  
- heavy rate (~210 t/ha)  
- control (no clay)  
- all with & without spading  

**Results from 2010**  
The trials were harvested using the SARDI trial plot harvester in late December. Harvest was delayed due to heavy rain in early December, which also down-graded the crop quality.  

**Delving Results**  
The trial at Nick Wood’s property showed a strong effect of both delving and spading (see Figure 6). Both delving (2.23 t/ha) and spading (2.3 t/ha) were better than the control (1.65 t/ha), and the combination of delving and spading increased yield further (2.53 t/ha).  

![Yield results 2010, N Wood Delve Trial, Barley, t/ha](image-url)  
**Figure 6: Yield results of delving trial at Nick Wood’s property.**
The trial at Scott Huxtable’s (Figure 7) showed a similar result for the delving (1.76 t/ha) and spading (1.75 t/ha) treatments over the control (1.17 t/ha). Only 1 plot of the combination treatment was harvested, and this was lower yielding than expected (1.16 t/ha). The rain before harvest may have damaged the heavy crop in this area.

![Yield Results 2010 S Huxtable Delve Trial, Barley, t/ha](image)

**Figure 7: Yield results of delving trial on Scott Huxtable’s property.**

The delving trial at Pete Loller’s was divided into two areas, the dune and the flat. The dune area (Figure 8) had very little clay brought up except in one delved plot. This strongly affected the delving results, as the area with clay in it yielded very highly (3.38 t/ha). The delved area with no clay was similar to the rest of the trial (0.87 t/ha). No clay was brought up in the spaded (0.67 t/ha) or delve+spade (0.95 t/ha) plots, and the yields were similar to the control (0.88 t/ha).
The flat area had clay brought up wherever the soil was delved, and the effects of this showed in the yields (Figure 9). The delve+spade treatment had the highest yield (5.16 t/ha), followed by the delved treatment (4.02 t/ha), the spaded treatment (3.68 t/ha) and the control (2.28 t/ha).
When the results of all the delve trials are compared for yields as a percentage of the control plots (Figure 10), it can be seen that at all sites where clay was brought to the surface by either delving or spading, yields were increased between 40-60%. Where no clay was brought up, no yield increase is seen. Delve+Spade has increased yield over either delving or spading alone at 2 of the sites, no different to the control at 1 site (this site lacked replication of the D+S treatment) and had no effect on the deep sand dune.

![Karoonda Ag Bureau Delve Trial Yields (% of control) 2010](image)

**Figure 10:** Comparison of yields as a % of the control at all Delve Trial Sites.

Statistical analysis of the results shows that the delving and spading treatments have separate and additive effects on yield.

A trial of delving on Adrian Robert’s property showed improved yield where clay was brought to the surface, but the clay depth varied over the site making analysis of the results difficult.

**Clay Spread Trials**
The Clay Spread trial at Stuart Pope’s showed separate effects of both the clay spreading and the spading. There were 2 control plots in this trial, one at each end of a dune, with Control 1 at the lower end of the dune and Control 2 at the higher end on the crest. Control 2 was more prone to wind erosion and crop damage than Control 1. The treatments were laid out so that the Light rate was at the lower end of the dune next to Control 1, Med in the middle, and the Heavy rate at the upper end next to Control 2.

Clay spreading increased yields at all rates compared to Control 2, but decreased yields compared to Control 1 (except for the Spaded Light plot). The Light and Medium rates had better yields than the Heavy rate. The differences between Control 1 and Control 2 may be because of the difference in position, as Control 2 had more exposure to wind than Control 1.

Spading increased yield for all treatments except Control 1. However Control 2 showed a large increase in yield as a result of spading. Overall, spading increased yield by about 280 kg/ha. The spading may have reduced soil-borne disease such as rhizoctonia, buried some of the non-wetting sand and possibly enabled crops access to nutrients deeper in the soil.

![Figure 11: Yield results at Stuart Pope’s Clay Spreading and Spading Trial, 2010.](image)

When the yield results are compared to the bulked plant tissue tests taken in September, there are some indications that the lower yields on some clayed area may be due to lower levels of manganese and copper availability.
Plant manganese levels (Figure 12) declined overall as clay levels increased. Manganese availability in the soil is decreased as pH increases, and the alkaline clay spread on the trials has increased soil pH. Spading improved manganese levels over the un-spaded plots. This may be because spaded plots had better manganese availability as the alkaline clay was better incorporated, or because root growth was improved on the spaded plots and the plants could access more manganese.

![Leaf Tissue Analysis, Bulked Samples, Manganese, September 2010, S Pope, Clay Spread Trial](image)

Figure 12: Manganese levels in bulked plant tissue from Clay Spreading Trial, S Pope.

Plant copper levels (Figure 13) were increased on the spaded plots over the control, with no difference between the clay rates. However plant copper levels declined on the un-spaded plots as clay rates increased.
The clay spread trial at Pete Loller’s had only 1 control as it was on a flatter piece of land with not much variation across the site. It had 2 heavy treatment rates to provide a spare for extra treatments if necessary.

Yields again showed separate effects of clay rate and spading. All clayed treatments yielded higher than the control, with the Light and Medium rates slightly higher than the Heavy rates.

Spading increased yields for all treatments.
Conclusions – Take Home Message

- Delving or Spading can increase yields significantly in the first year (40-60%) as long as clay is within reach of the machinery and can be brought to the surface.
- Delving and Spading together can give an additional increase in yield, but has increased costs.
- Clay Spreading has increased yields slightly on average in these trials so far. Lighter (70-140 kg/ha) rates have shown higher yields than heavier ones (140-210 kg/ha).
- Spading increases the yield on clay spread sites, but also increases yield on controls, suggesting that there is an effect regardless of the clay application.
- These are only the first year’s results – stay tuned for more results next year!

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Perennial Grasses and Pasture Cropping
Katrien Descheemaeker, Bill Davoren, Rick Llewellyn
CSIRO Ecosystem Sciences, Waite Campus. Future Farm Industries CRC

TAKE HOME MESSAGES

- Average biomass production of four summer growing perennial grasses ranged from 1500 to 2800 kg/ha 6 months after planting.

- Establishment was problematic on some of the sandier soils, probably due to non-wetting characteristics.

- Perennial grasses hold the potential to fill the summer feed gap, provide groundcover on erosion-prone soils, and can be combined with winter crops in pasture cropping systems

Objectives

In Mallee mixed farming systems the summer feed gap is an important constraint. Summer growing perennial grasses hold the potential to fill this feed gap and because of their winter dormancy, can be combined with a cereal. This EverCrop (Future Farm Industries CRC) trial will help build up evidence of the performance of this system in the SA Mallee environment. It follows a related trial at Hopetoun in the Victorian Mallee, where biomass production ranged between 1 and 4 tonnes/ha since 2007, with a peak production of 20 tonnes/ha in the 2010/2011 summer.

Methods

The trial was established in October 2010. Four commercially available summer growing grasses were sown in 50 cm spaced rows and their establishment and biomass production assessed:

- Panicum maximum cv Petrie
- Panicum coloratum cv Bambatsi
- Chloris gayana cv Katambora (Rhodes grass)
- Digitaria smutsii cv Premier

The grasses were sown at a seed rate of 5 kg/ha and 50 kg/ha of DAP was added. In June 2011, 2 rows of barley were sown in between the grass rows with 50 kg/ha DAP and 35 kg/ha urea added. A high N rate was applied to the crop because of the N depletion by the grasses over summer. A winter dormant Lucerne variety (Line DT1) was also sown in June 2011 together with a barley crop. In these treatments,
Lucerne and barley were sown on alternating rows with 23 cm spacing and 50 kg/ha DAP was added.

Although they cannot be used in pasture cropping systems, three temperate perennial grasses (*Austrodanthonia caespitosa*, or Wallaby grass; *Phalaris aquatic* cv. Atlas PG; *Dactylis glomerata* cv Kasbah, or Cocksfoot) were added to the trial, together with a control barley crop and a sown Medic pasture.

**Results**

The barley crop has been successfully established between the rows of dormant perennial grasses (Figure 1).

Establishment of the summer growing grasses in 2010 was good in the plots towards the northern end of the trial, with plant density reaching 4, 6 and 8 plants/m² for Digitaria, Bambatsi and Petrie respectively in April 2011. With its stoloniferous growth pattern, Rhodes grass quickly invaded the plots by sending out runners, which form new roots. By April 2011, Rhodes grass had a plant density of 26 anchored runners per m². In the plots on the south side of the trial, establishment was very poor. A higher percentage of coarse sand with non-wetting characteristics in the topsoil might have been the reason for this.

The average standing biomass at the end of the first summer ranged from 1500 kg/ha to 2800 kg/ha for Digitaria and Petrie respectively (Figure 2). These average values hide a high degree of variation, as in some plots, no biomass was recorded. In the plots with good establishment, biomass amounted to 2 to 8 tonnes/ha.

![Figure 1: Petrie cultivar in April 2011 (left) and pasture cropping with Petrie and barley in July 2011 (right)](image)
Figure 2: Average standing biomass for four summer growing grasses on 1 April 2011, with indication of the standard error

Further information Katrien Descheemaeker, CSIRO Ecosystem Sciences, Waite Campus 0882738106, katrien.descheemaeker@csiro.au
CSIRO Trial Plots

CSIRO Karoonda Fertiliser N x P Trial: 2010/11

<table>
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<th>Treatment</th>
<th>Plots</th>
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<th>P kg/ha</th>
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<td>18,38,45</td>
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<td>20</td>
</tr>
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</table>

Wheat 2011 cv Mace sown at 70 kg/ha 25th May, P applied as triple super phosphate and N as Urea, all applied below seed as a blend. Split N treatments half N (urea) applied as top dressing at GS31.
### CSIRO Cereal Strategies Trial: 2009-11

<table>
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<td>District practice phase 2 – cereal (2009) followed by winter pasture (2010) and cereal (2011/12)</td>
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<td>Control -Continuous cereal- district practice fertiliser inputs</td>
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<td>Continuous cereal –high N inputs upfront</td>
<td>DAP @ 50 kg/ha + 67 kg/ha Urea (upfront)</td>
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<td>Continuous cereal – reactive to positive seasonal conditions (top dress N)</td>
<td>DAP @ 50 kg/ha (+ 67 kg/ha Urea top dressed GS31)</td>
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<td>7</td>
<td>4,9,19,25</td>
<td>Continuous cereal – reactive to negative seasonal conditions (cut for hay)</td>
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<td>Opportunistic -reactive to positive sowing conditions- wheat 2009/10, Canola cv Snapper 2011</td>
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</table>

Wheat 2009/10 cv Correll, 2011 cv Mace sown at 70 kg/ha on the 23rd May
CSIRO Break Crops Trials 2009-11

Sowing and Fertiliser rates
Wheat 70 kg/ha, Cereal rye 80 kg/ha and Brassica 5 kg/ha all with 50 kg/ha DAP and 35 kg/ha Urea. Peas 100 kg/ha and Lupins 90 kg/ha with 50 kg/ha DAP, Volunteer pasture has no inputs. Sown 24/5/11.

Hill (sand)

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### Flat (Swale)

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Pioneer Seeds - Canola Demonstration Plots

In 2011 Pioneer Seeds has a demonstration of our Clearfield varieties and hybrids:

Varieties Planted:

43C80
44C79
*NEW* 43Y85
44Y84
45Y82

The other part of the trial is a Nitrogen application timing demonstration.

The trial has a Clearfield Open Pollinated variety and Clearfield Hybrid with 3 timings of Nitrogen application:

80 kgs Urea early post sowing
40 kgs Urea early post sowing/ 40 kgs Urea at Bolting
80 kgs Urea at Bolting.

For more information please contact

Paul Jenke
Area Sales Manager - South Australia
Pioneer Hi-Bred Australia Pty Ltd
0408 807 809
0885 364 712
http://australia.pioneer.com/
# Waikerie Field Day: Precision Agriculture Expo Information

## Waikerie Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Topics</th>
<th>Facilitator</th>
<th>Speaker</th>
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<tr>
<td>8:30</td>
<td>Registration and Coffee</td>
<td></td>
<td>Leighton</td>
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<tr>
<td>9:00</td>
<td>Introductions and welcome</td>
<td>Precision Ag in Cropping</td>
<td>Gemma Walker</td>
<td>Gemma Walker</td>
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<tr>
<td></td>
<td></td>
<td>Precision Ag in broadacre</td>
<td>Richard</td>
<td>Sam Trengove</td>
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<tr>
<td></td>
<td></td>
<td>Variable rate seeders</td>
<td></td>
<td>Paul Kaesler</td>
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<tr>
<td></td>
<td></td>
<td>Mapping and data</td>
<td></td>
<td>Peter Treloar</td>
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<tr>
<td></td>
<td></td>
<td>Panel Session</td>
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<tr>
<td>9:45</td>
<td>Precision Ag in Livestock</td>
<td>Livestock PA</td>
<td>Daniel Schuppan</td>
<td>Michelle Cousins</td>
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<td></td>
<td>Tagging, Pastures</td>
<td></td>
<td>Paul Drendel</td>
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<td></td>
<td>from Space</td>
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<td></td>
<td></td>
<td>Panel Session</td>
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<tr>
<td>10:15</td>
<td>Machinery - walk and talk</td>
<td>Local innovations</td>
<td>Richard</td>
<td>Various</td>
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<tr>
<td></td>
<td></td>
<td>New innovations</td>
<td></td>
<td>Errol &amp; Dean</td>
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<tr>
<td>12:00</td>
<td>Cereal trials</td>
<td></td>
<td>Allen</td>
<td>Hadyn Kuchel</td>
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<tr>
<td>12:30</td>
<td>Lunch</td>
<td>Ad hoc discussions between growers and suppliers</td>
<td>Allen</td>
<td>Hahn</td>
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<tr>
<td>1:00</td>
<td>Afternoon</td>
<td>Next Gen Young Farmers seminars</td>
<td>Sam Trengove</td>
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<tr>
<td></td>
<td></td>
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<td>Paul Kaesler</td>
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<tr>
<td>1:00</td>
<td>Afternoon</td>
<td></td>
<td>Peter Treloar</td>
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</table>
Waikerie Information 2011

Waikerie Site Map

ENTRANCE

PARKING

REGISTRATION

PARKING

NORTH

ENRICH

WHEAT
Justice CL Plus

SWEET

Cookstent

MAIN TENTS

COOKSTENT

EVERCROP

SOWN CALIPH MEDIC
Under sown under wheat

VARIETIES
WHEAT BARLEY TRITICALE
AU DURUM

VARIETIES
MUSTARD

PERENNIAL GRASSES-SHRUBS
Mapping and data in Precision Ag
Peter Treloar, Precision Ag Services

TAKE HOME MESSAGES

- Precision Ag is easy. (but there are steps to consider)
- Check Yield Data at the start of harvest
- Permanent management zones make decision making easy and cuts down on computer time.
- Use the technology to its fullest with on farm trials

WHAT IS PRECISION AG (PA)?

PA is the use of GPS in agriculture, this includes everything from guidance and autosteer to mapping and variable rate.

A key component of PA is information or data. All data is just a location and a value, for example GPS coordinates and Yield creates a Yield Map. This is the same with Elevation, EM38 Soil Surveys and even Google Earth images.

The maps tell us there is a difference between point A and B, it is up to the user to decide what that difference is. Ground truthing is just as important as the actual mapping, ie soil testing an EM38 survey or tissue testing any Crop Sensoring etc.

Where to start?

Yield data is generally the first exposure farmers have to mapping, it is also the most important data available to farmers in PA for two reasons. Firstly it is a historic record
of production for each area of the farm and can be used to create management zones, secondly it is used to measure the success of any changes such as the use of variable rate.

Farmers with Yield Mapping can easily begin to assess potential for Variable Rate with different treatment strips placed in the paddock. This is often the best way of beginning Variable Rate as different zoning methods can be then be tested, all using the one trial.

**Managing Data**

Because Yield Data is such an important layer of information, management is a crucial step in PA and Variable Rate.

Keeping a copy of the ‘raw’ data separate and stored on CD or USB drive is the simplest and easiest step farmers can take to protect themselves. Technology is not full proof and computer crashes occur, or programs change – but that ‘raw data’ can always be referred back to.

**On farm Trials**

The most powerful benefit of using VR and collecting Yield Data is for on farm trials. Every year after harvest farmers should have a clear result from any trials they have undertaken, this includes negative results because it is just as important to know if VR is costing you money.

Our farming systems are always changing and using available technology to its fullest is a key part in maximising our profitability and sustainability.

**Variable Rate in the Mallee**

As the majority of the Mallee is a Dune-Swale landscape VR can be seen as a simple case of managing sand and clays, but there is a lot of soil types in between and not all paddocks have hills in.

To quote David Roget from one of Chris McDonough’s posters about farming in the mallee, ‘Know your subsoils’. Extensive work by MSF has shown that subsoil constraints and soil water availability are major factors in the yield potential of crops.
Yield potential is the first step in managing inputs, it provides both a target and a measure of risk. By understanding both the risk and rewards for increasing/decreasing inputs farmers have a much easier decision to make.

Work conducted by Rural Solutions SA has shown that EM38 soil surveys can accurately map subsoil constraints. This combined with targeted soil testing, using the ‘Your Soils Potential’ Model, can create management zones based on plant available water characteristics and therefore yield potential.

These Management Zones are seasonably stable and provide a good basis for farmers to make management decisions on.

For example the lighter country in the mallee has very little subsoil constraints and plant roots can potentially reach a long way into the soil. But these soils also have low nitrogen and crops have been shown to benefit from extra seeding nitrogen.

The other extreme of heavy soils with subsoil constraints have shown increased yields from reduced inputs. This has a double effect on gross margin by reducing costs while improving returns.

**Conclusion**

The Mallee environment is well placed to take full advantage of new technology like VR. Work of MSF and others have shown the benefits of VR and how soil surveys such as EM38 can form a good basis to make decisions about inputs. VR has the double benefit of reducing risk and increasing returns through improved management of inputs.

**Further information**

Peter Treloar, Precision Ag Services

0427 427 238

pete.pas@internode.on.net
Monitor and manage your pastures with Pasture Watch
Paul Drendel, Capitis Accounting Solutions (Fairport Farm Software Distributor for South Australia)

TAKE HOME MESSAGES

- ARE YOU WASTING TOO MUCH PASTURE?
- WANT TO OPTIMISE YOUR PASTURE USAGE?
- TOO BUSY? UNSURE HOW TO? NEED HELP?

NOW YOU CAN MONITOR YOUR PASTURE PADDOCKS FROM YOUR OFFICE!

Pastures from Space delivers pasture growth rates (PGR) information paddock by paddock directly to your computer.

Subscribe to the Pastures from Space service to receive the farmer friendly Pasture Watch software which will:

- View paddock by paddock pasture growth rates and pasture production
- Compare your paddocks (even compare paddocks with previous years, or the farm average).
- Know your paddock by paddock pasture status without leaving the office...or even while you are on holidays!
- Budget and Plan your grazing with the powerful “Green Field Planner” module.
- With the click of a button, zoom to your farm map on the Pastures From Space web site to show current or past paddock PGR information.
PastureWatch for PAM with Mapping users.

The benefits of being a PAM (with mapping) user as far as Pastures from Space is concerned are these:

- Your farm maps are already set up, so the process of subscribing to the service is very simple.
- Your pasture data is inserted right into your PAM database and can be used to generate reports that don't appear in PastureWatch.
- Your farm maps can be used to display a number of special PGR map reports.
- The Pasture Budgeting system is easier to set up as it can use the stocked paddocks information in the livestock section of PAM to get you up and running quickly.
- The livestock diary (stocked paddocks information) can provide pasture utilisation information to the special PGD and total dry matters production graphs.
- The farm mapping system is a fully functional and very powerful mapping system allowing unlimited layers and much more.

Level 1: PGR Subscribers up to 4000 hectares: $363  
Level 2: PGR subscribers up to 8000 hectares: $605  
**Pasture Watch software**: $880  

Paul Drendel, Capitis Accounting Solutions, Horsham, VIC  
Phone: 03-5381 1655, 0427-373656