Mallee Calculator

A user-friendly decision support aid to calculate potential yield and nitrogen requirements of cereals and canola

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The Issue

Grain yield is constrained by a combination of factors such as inadequate nutrition, disease, subsoil compaction and chemical constraints in the low rainfall Mallee. While water availability is an obvious constraint for grain production, shortage of nitrogen often co-limits grain yield, as Mallee soils can provide a limited amount of nitrogen to crops, and fertiliser rates are usually low.

Inside the model

The Mallee Calculator is a simple spreadsheet model tailored to Mallee conditions. It was devised to help farmers in their estimates of potential yield and nitrogen fertiliser requirements of cereals and canola.

Information provided by the model

It is important to add enough nitrogen to a crop to match the demand determined by the availability of water.

The critical issue Mallee farmers face is the uncertainty of actual rainfall during the growing season. To deal with this uncertainty, users select a nearby location that will automatically link the calculator to long-term rainfall records.

Users can then select a decile rainfall option that reflects their desired risk exposure. For instance:

- “decile 5” can be selected when there is an expectation of an average season;
- lower deciles (1 to 4) would account for the expectation of drier than normal seasons; and
- higher deciles (6-9) would account for the wetter end of the range.

Seasonal rainfall and plant available water at sowing are added to calculate potential yield. Fertiliser requirements are calculated from potential yield, target protein content and soil available nitrogen. Figure 2 shows the outputs of the Mallee Calculator.
Key model outputs are:

- The potential or target yield of a series of crops – wheat, barley, canola, oats, cereal hay.
- The estimated rate of nitrogen fertiliser required to achieve target yield and protein content.

What this means

The Mallee Calculator can be used in two decision making modes:

- To determine a single application of nitrogen fertiliser at sowing. This is the simplest strategy, but involves the full risk of uncertain seasonal conditions.
- To determine a split application of nitrogen fertiliser. The model allows for a revision of nitrogen fertilisation decisions in August-September which takes into consideration the actual amount of rainfall from sowing to the time of revision, and the initial amount of fertiliser applied. If farm logistics allow it, split or delayed application of nitrogen fertiliser is a valuable tool for management of risk associated with uncertain seasonal rainfall.

The experience so far

The model was released in 2003. Through the efforts of Rural Solutions SA, the calculator has been demonstrated to about 250 growers in South Australia. The use of the model highlighted a large gap between current use of nitrogen fertiliser, and the amounts required to achieve higher yields, particularly in wet seasons.

Where to from here?

- Download your free Mallee Calculator from www.msfp.org.au. At this site, you will also find step-by-step instructions to run the model, and background information on the science behind it.
- Contact your local agronomist for support on the methods to collect the key data required to run the model – plant, available water and inorganic nitrogen.
- Contact the authors for feedback and more information.

Technical contacts

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![Growing season rainfall (mm)](192)
Estimated total available water (mm) 242
Potential yield with given rainfall and soil water (t/ha) 1.1
Potential yield (accounting for sowing date (t/ha) 1.8
Attainable yield (accounting for nominated maximum) (t/ha) 1.8
N requirements to achieve nominated yield/protein (kg/ha) 96
N from incrop mineralisation of soil organic matter (kg/ha) 39
N contribution or uptake due to stubble (kg/ha) -4
N available (inorganic at sowing + stubble + soil) (kg/ha) 80
Estimated fertiliser requirement (kg N/ha) 16

**Figure 2: Key model outputs**

**Outputs**

<table>
<thead>
<tr>
<th>Output</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing season rainfall (mm)</td>
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</tr>
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<td>Estimated total available water (mm)</td>
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<tr>
<td>N available (inorganic at sowing + stubble + soil) (kg/ha)</td>
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</tr>
<tr>
<td>Estimated fertiliser requirement (kg N/ha)</td>
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