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Closing the gap

between actual and attainable yields in the Mallee

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The Issue

Everybody knows that water supply constrains yields in the Mallee. But what goes on in the field is complex, and single factors rarely limit crop yield.

- Focus paddock data across the Mallee indicates that wheat yields fall by an average 17kg per hectare per day if sowing is delayed from mid April onwards.
- Low levels of organic matter in the soil and low rates of nitrogen fertiliser often lead to shortage of nitrogen in cereal and oilseed crops.
- Low availability of phosphorous and micronutrients are common in Mallee soils.

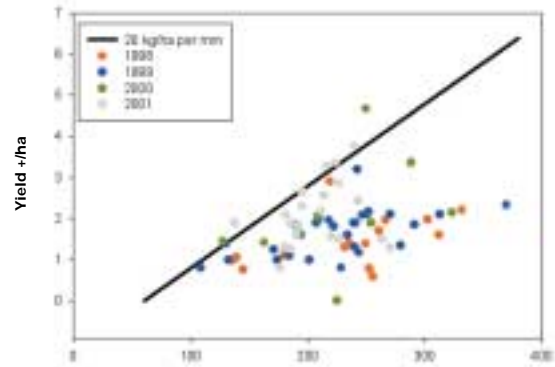
Late sowing, shortage of mineral nutrients, weeds and diseases, and water availability, among other factors, thus constrain crop yield. **Therefore, the bottom line is that many crops in the Mallee do not reach their attainable yield as determined by water availability** (see Figure 1).

What we know about crop growth

Crops grow in proportion to the amount of water that goes through the plants in the form of transpiration. Water may be lost to crop plants through weed competition, runoff, deep drainage, and soil evaporation. All water that is removed in these ways is lost to potential crop yield.

What this means to Mallee farming

There are **REAL** opportunities to increase yields and profitability in the Mallee. The gap between actual and attainable yield



Growing season rainfall + soil available water (mm)

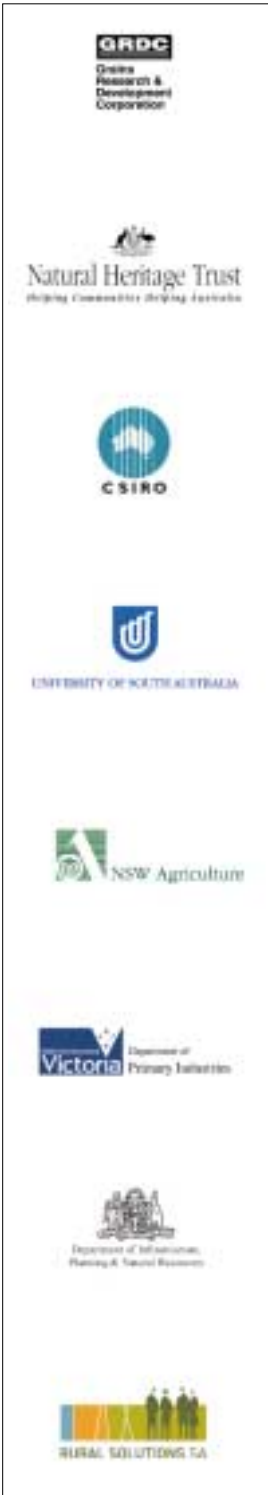
Figure 1: Relationship between wheat yield and seasonal rainfall plus soil available water in Focus Paddocks across NSW, Victoria and SA. The solid line indicates the attainable limit of 20 kg of grain per millimetre of water per ha.

could be reduced by improved management of weeds, diseases and nutrition. Management practices should target these agronomic constraints and thereby increase the amount of water available for crop growth.

MSF Inc. has shown that yields closer to 20 kg ha per mm water can be achieved more often by improving crop selection and management.

However, the following factors need to be considered:

- **Soil organic matter content and N fertiliser**-Mallee soils are not good at providing enough plant-available nitrogen. Fertiliser N is needed to ensure soil supply and plant demand are aligned. Low N levels are a common cause of wasteful use of water. In particular, if



canopy growth is restricted by lack of nitrogen, winter rainfall can be lost through soil evaporation.

- **Subsoil constraints** - Chemical factors such as boron or salinity in the subsoil, and physical barriers such as compacted layers, can restrict the availability of water to crops. Likewise, root diseases would restrict crop water uptake, and therefore transpiration and yield.

- **Rainfall distribution** - Grain number is the most important yield component, and the 40–60 days around flowering are the most critical period for grain set. Thus, with the same amount of rainfall, crops could be closer or further away from attainable yield depending on the rainfall distribution, particularly around flowering.

- **Temperature and radiation**- A high ratio of radiation to temperature around flowering favours grain set and yield. High ratios are achieved with early sowings. This benefit of early sowing needs to be balanced against frost risk around flowering.

- **Weeds** - Removal of summer weeds could reduce summer losses of available water in the subsoil.

What you can do

There are a number of things that you can do to improve crop performance and subsequent yield and quality.

Key management tools to achieve these targets include:

- **Maximising transpiration**-i.e. the amount of water moving through the plant. This may be achieved by determining pre-sowing soil water and nitrogen reserves that will help to set more realistic targets for crop yield and proteins. Fertiliser rates may then be varied to fine-tune crop nutrient decisions more accurately to potential growing season conditions.

- **Minimise soil evaporation and weed transpiration**-more water will be channelled through the crop plants to promote growth and yield. This can be achieved by agronomic practices that enhance early crop vigour and subsequent

ground cover. This will allow more water through the plants and less water lost by evaporation from the soil.

Where to from here?

- A calculator has been developed to estimate target yield and nitrogen fertiliser requirements for individual paddocks

- Link into MSF Inc. activities that improve your understanding of soil and crop monitoring processes

- Contact your local agronomist or departmental extension officer for more information

- Visit www.msfp.org.au for further project research information

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