



farmtalk



This article contains information most relevant to the less than 350 mm rainfall mallee farming region

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Benefits of Managing your Microbes in the SA Mallee Region

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The Issue

Increasing the cropping intensity and reducing tillage helps to encourage microbial activity in Mallee soils. An increase in microbial activity can lead to real economic advantages through increased fertility, improved soil structure, reduced leaching and improved disease suppression.

Microbial populations in the Mallee are crying out for carbon. By growing more crops and retaining as much stubble as possible we can maximise the amount of carbon returned to the soil, leading to an increase in microbial functions.



Figure 1: Stubbles are a readily available source of carbon for Mallee soils.

What we know

Well-managed intensive cropping systems that retain stubble have improved nutrient efficiencies, particularly nitrogen. An increase in microbial activity and biomass has resulted in an increase of mineralised nitrogen (N). Importantly, in No-Till systems this extra

N is spread out through the season. This means more N is available when the crop needs it, towards the end of the growing season.

Non-symbiotic bacteria that can fix atmospheric nitrogen, without the aid of legume plants, supply further N. The N provided by these bacteria increases with the amount of cereal stubble retained in the system.

These systems also have improved soil stability, as increasing the microbial populations increases the formation of stable aggregates by binding the fine particles in the topsoil and reducing erosion. These fine particles are the most valuable because they contain a greater concentration of nutrients and organic matter than the rest of the soil. No-Till systems help maximise this effect through the reduction in soil disturbance.

Disease suppression is possible on all soils. Increasing the microbial population and activity, is a key factor to achieving suppressive soils.

Increases in microbial populations enhance competition for soil resources and along with predation amongst microbes and inhibition of pathogens, leads to more suppressive soils.

Losses of up to 50kg/ha of nitrogen due to leaching have been measured in Mallee soils. But an improved microbial biomass will hold nitrogen against leaching and improve the carryover of N from one season to the next.

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What it means

There are real economic benefits to managing your microbes well. Intensifying cropping and increasing the retention of stubbles, reducing soil disturbance by moving to a No-Till system and applying the right inputs all contribute to creating a microbe friendly soil, and increasing microbial activity in Mallee soils through providing both short and long term benefits.

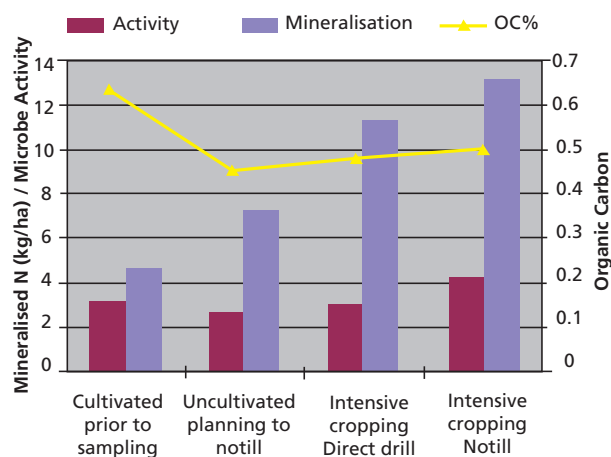
A No-Till system of sowing into standing stubble with minimal soil disturbance combined with intensive cropping and adequate inputs is the quickest way to help improve the microbe resource. This is by reducing erosion and increasing carbon inputs into the soil.

Changes in the mineralisation of nitrogen under a No-Till system need to be taken into account. In conventional systems, cultivation creates a flush in microbial activity and mineralisation of N. Whereas in a No-Till system, rainfall and the time the soil remains moist are the major factors influencing mineralisation. This creates a better match between supply and demand, as crops need nitrogen as they use moisture to grow.

This has two consequences, firstly No-Till crops generally require higher inputs at seeding to offset the lack of mineralised N from cultivation and improve establishment. But secondly the relationship between moisture and mineralisation creates a better match between supply and demand for the growing crop throughout the season.

Soil tests have demonstrated at seeding, conventional systems will often have higher available nitrogen, but less will mineralise over the year. Whereas, a No-Till system will have much more potential to mineralise N during the growing season. As shown in Graph 1. there can be large variation in potential mineralisation of nitrogen across similar soil types with close to the same organic carbon. The effect of management can be seen on potential for mineralization during the season, with systems returning the most carbon (ie stubble) and minimizing soil disturbance having the greatest potential.

Effect of management on Soil Microbes



Graph 1. Difference in potential mineralisation in farmers' paddocks in 2003.

In addition to the supply of an energy source and providing an optimum habitat, microbial activities can also be influenced by other management practices involved in grain and pasture production e.g. herbicide application during off-season or in crop, application of pesticides, manures and crop rotation.

Managing your soil microbes, can be very profitable, particularly for risk management in low rainfall environments. Microbes protect nitrogen from leaching over summer, and improve the balance of nitrogen availability with crop requirements.

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