

RETAINING STUBBLES FOR MOISTURE CONSERVATION AND EROSION PREVENTION



Retaining stubbles for moisture conservation and erosion prevention

RETAINING STUBBLES IN MODERN, broad acre cropping systems is widely acknowledged to offer both agronomic and environmental benefits for growers.

For farmers in the Mallee, the retention of stubbles offers an effective strategy to mitigate key regional factors that constrict productivity and profitability—sandy, highly erodible, non-wetting soils, low fertility and low growing season rainfall levels.

→ BETTER MOISTURE RETENTION

Of major benefit to growers is the positive impact retained stubbles systems have on soil moisture retention.

Standing stubble slows the evaporation rate of soil moisture through the creation of a microclimate and by reducing surface wind speed. Retained stubbles have a positive effect on soil structure that allows for better

water infiltration, reducing evaporation, minimising runoff and the impact of raindrops on the surface. Soils with crop stubble are more able to conserve moisture where rainfall is spread over multiple rainfall events and are less prone to run off, increasing infiltration.

However, the frequency, duration and amount of rainfall still play a significant role in developing adequate stores of moisture within the profile. While residue does play a vital role by slowing down evaporation, follow up rainfall events are still required to accumulate a sufficient amount of water so moisture moves down the profile below the evaporation zone.

To what extent these factors influence a farming system depends on the soil type, rainfall and evaporation rate. However, in sandy soils such as those common to the Mallee, an effect on water infiltration is more likely at a given level of rainfall than on clay soils.

→ IMPACT ON FARMING SYSTEMS

In low growing season rainfall environments such as the Mallee, stored soil moisture is of significant value in a drier year (growing season rainfall less than 264 mm), but of little consequence in wetter years.

Summer fallow rainfall provides the most value when the following crop is wheat and in environments where: summer rainfall contributes a significant amount of annual rainfall, where fallow efficiencies are high, where the soil's plant available water holding capacity is large relative to growing season rainfall and growing season rainfall is more variable.

The biggest impact upon fallow efficiencies is the timely and effective control of summer weeds. Where moisture is conserved through the elimination of weeds, moisture and nitrogen are available for the following crop. The presence of nitrogen is critical to capture the benefits of water stored from summer rainfall, and equally, moisture is required to fully realise the benefits of applied nitrogen.

Stored moisture can have a significant impact upon the time of sowing (TOS), flowing onto crop performance and season profitability. One study showed that sowing crops early to utilise stored soil moisture resulted in an improvement of water use efficiency (WUE) by 21-31%. Conversely, where seeding was delayed due to a lack of stored soil moisture and opening rains, a yield reduction of between 2-7% was recorded for every week past the optimum sowing time.

Lower down in the soil profile, stored moisture is particularly beneficial for crops during post anthesis (post flowering), when access to moisture is critical for adequate grain fill.

→ PROTECTION FROM THE ELEMENTS

Retained stubbles offer an effective method against **wind erosion**, preventing the loss of valuable topsoil rich in nutrients and organic matter. Wind erosion commonly occurs where soil particles are small (0.05-0.5mm), in dry, bare soil and where wind speeds exceed 20-35km/h. Mallee soils- including sand and sandy loams- are particularly susceptible to wind erosion.

GUIDELINES FOR OPTIMUM RETAINED STUBBLE IN MALLEE SYSTEMS

- Aim for at least 50% ground cover
- Leave stubble standing, anchored by its roots
- Stubble should ideally be 10cms or taller

→ IMPROVING SOIL BIOLOGY

Retained stubbles also offer a host of benefits in terms of **soil biology** that contribute to agronomic and financial gains. Improved soil biology reduces the risk of cereal root disease, providing more flexibility in rotation selection, better crop quality (protein, oil content) and can help to maintain and even improve soil quality.



Levels of biologically available carbon are higher in retained stubble systems, which is particularly beneficial in lightly textured Mallee soils. Similarly, nitrogen is available more consistently throughout the growing season, and will mineralize in response to rainfall. This often provides a valuable source of fertiliser towards the end of the season, when the crop needs it most.

Non-symbiotic bacteria – those able to fix nitrogen without the presence of legumes – flourish in retained stubble systems, further enhancing the level of available nitrogen for crops.

In long-term stubble retention systems, this form of nitrogen fixation has been shown to contribute up to 20kg of nitrogen per hectare per year, which is the equivalent of up to 40% of the annual N exported from paddocks in the Mallee. Conversely- in conventional farming systems- up to 50kg of nitrogen per hectare can be leached after just one rainfall event.

Improved soil biology also leads to an increase in soil structures including soil aggregation – the clumping of soil particles. Soil aggregates facilitate the storage and exchange of water and air, resulting in more fertile and resilient conditions.

→ GRAZING LIVESTOCK

For those running **livestock** in conjunction with a cropping enterprise, retained stubbles can offer a valuable source of feed, especially in summer and autumn when pasture levels are low.

Livestock tend to seek out spilt grain, leaves, weeds and self-sown cereals in favor of stubble, offering an important mouse control strategy for the following season.

While grazing stubble offers many benefits, care must be taken to adequately manage grazing pressure. In order to keep minimum cover levels on the most vulnerable soil types in the paddock, livestock should be removed before overgrazing occurs.

Grazing high stocking rates for short periods of time directly after harvest is the most effective way to extract the most nutritional benefit from stubble paddocks, without risking soil health.

MORE INFORMATION

For other stubble project Farm Talks visit at www.msfp.org.au

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