NO-TILL INTO PASTURE GROUND
MAKING IT WORK

JUNE 2013

THE KEYS TO SUCCESSFUL NO-TILL INTO PASTURE ARE:

- **early grass control**
- **good chemical summer and autumn weed control**
- **robust no-till seeding machinery**
- **good nutrition**

BACKGROUND

Around 70% of farmers in the Mallee have mixed farming systems incorporating cropping, pastures and livestock. As more farmers switch to no-till seeding into stubble ground, many have found no-till into pasture far more challenging.

This means pasture ground is often cultivated prior to sowing, increasing time and energy required to get the crop in, decreasing soil moisture at seeding and increasing erosion potential, particularly when worked early in the year.

The advantage of traditional tillage has been breaking up root diseases (including rhizoctonia), reducing residues, controlling weeds, incorporating herbicides and mineralising nutrients. Some farmers trying no-till into pasture ground have observed poorer crop establishment, less vigour and more root disease.

However, many farmers can consistently no-till into pastures with success, demonstrating that it can work in a variety of soil types and seasons.

Why are some more successful than others?

Research from Grain & Graze 2 and Caring for our Country Projects in the SA mallee have uncovered many factors influencing these systems, highlighting the key strategies that farmers need to successfully no-till into pasture ground.

THE ISSUES

In mixed farming systems there will always be compromises between trying to meet the needs of both livestock and cropping enterprises. Livestock play a vital role in many mallee farms, providing valuable income often with lower input costs and lower risks than cropping. Good pastures can improve soils by building organic matter and fixing nitrogen. They are also used to clean up problem weeds and diseases.

However, livestock systems can negatively impact on cropping when they:

- lead to soil compaction
- rely on pasture growth that leads to:
  - increased crop disease and weed competition,
  - decrease in crop available water
  - nutrient tie-up

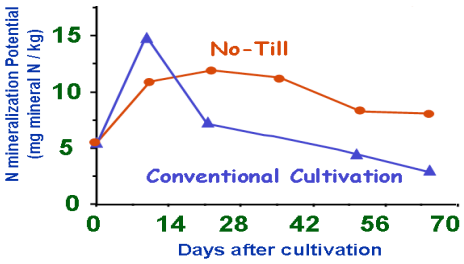
Cropping systems can reduce livestock feed and quality by:

- requiring weed control through Winter (grass removal or chemical fallow), Spring (spray topping or hay freezing), Summer (early chemical weed control) and Autumn (knockdown control of early volunteer growth) leading up to sowing a crop
- grazing delays caused by chemical withholding periods
- in-crop broadleaf herbicides and residues, along with extensive cropping phases greatly reducing medic regeneration and growth

Paddock cultivation can lead to:

- Delayed seeding
- Moisture loss (up to 10-20mm depending on soil)
- Burying weed seed (brome and ryegrass) throughout the topsoil, staggering their germination and reducing herbicide efficiency
- The reduction in organic carbon
- A flush of early nutrient mineralisation leading to less becoming available later in the growing season when required (see graph below)
- Costs in time, tractor hours and maintenance, diesel etc.
- Increased potential for soil loss through wind erosion

Cultivation effect on soil N availability, after 5 years of tillage system (MSF, Waikerie 2003).



Source: MSF Research - Vadakattu Gupta CSIRO

Despite competing issues there are management strategies that can be used to help enterprises complement each other, while reducing farmers' reliance on cultivation.

WHAT HAVE WE LEARNT AND HOW TO MAKE IT WORK

Many factors lead to successful no-till after pasture. Taking a farming systems approach involves management strategies for the pasture phase, over summer and no-till cropping fase.

PASTURE PHASE

The most successful farmers manage pastures as they would manage a crop. For no-till, the key to pasture management is early grass control.

A good clean medic pasture can simplify the transition to no-till, providing a disease break and fixing nitrogen in soil. However, a volunteer pasture with little medic can also be managed in preparation for no-till but greater focus on weed management is required, addressing potential feed gaps after spraying and nutrition for the following crop.

Pastures fall into many different categories. The following points compare desirable and problematic features of pastures in a no-till system.

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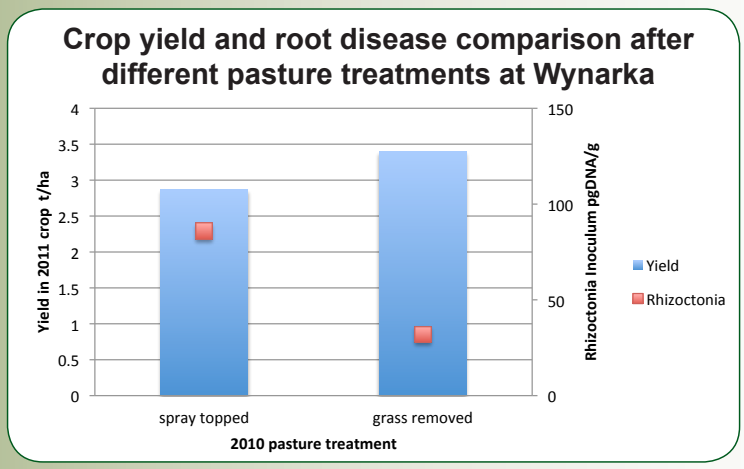
Pastures that promote no-till success
- Good medic base
- Sown legume or cereal with good nutrition
- Grass weeds controlled early
- Grass weeds spray-topped
- Good phosphorous history
- Summer weeds well controlled.

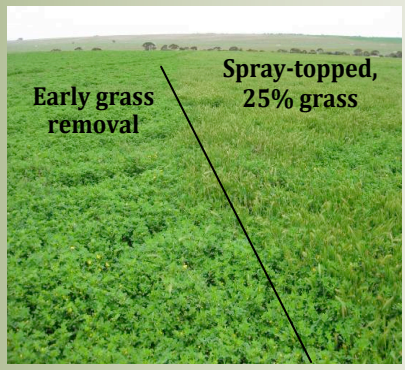
Pastures that are problematic
- Rarely cropped
- Low nutrition
- Problem weeds/ woody weeds
- Rough surface
- Trash issues
- No summer weed control

Many pastures will fall somewhere in between these two categories. This can also cause problems as they are only partly prepared for no-till.

Early Grass Removal
Trial results have consistently shown that early grass weed control is the key to reducing root disease carryover, reducing grass weed competition and increasing crop yield. Ideally this is followed up with a chemical fallow in spring that will prevent grass escapes and minimise herbicide resistance.

Early grass selective control gives greater yield responses than spray topping and is the preferred option. The results below are from the trial paddock at Wynarka in 2011 but similar results were observed in other trial paddocks.

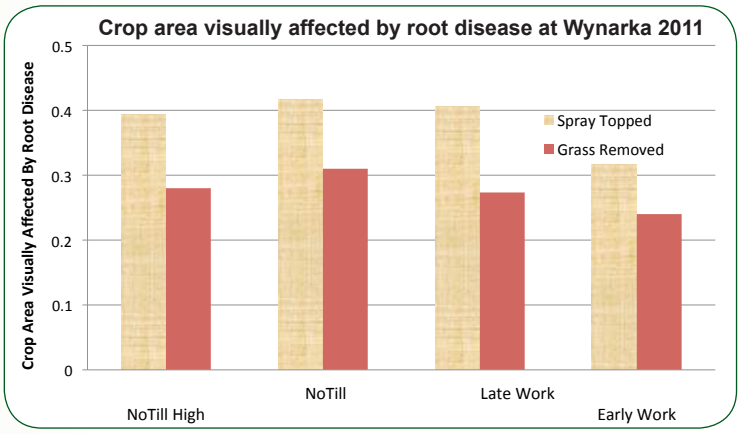




Early grass control improves pasture composition

Spray topping
Be aware that spray-topping alone does not control root disease for following crops, nor does guarantee 100% grass weed control. An early spray top for early maturing grasses followed by a second application to catch later populations will improve accuracy of timing and ensure the best control.

The following graph shows the crop area visually affected by root disease in the various treatments strips at Wynarka.



In every instance, the crop on the spray-topped areas showed greater disease symptoms than the crop on early grass removed areas.

Sown crops for pastures
Sown cereal pastures have many benefits including provision of early feed and ground cover, more bulk, opportunities for weed control and with fertiliser inputs can help maintain nutrition levels in a paddock. Choosing varieties that will not carry over disease risks to the following crop is essential.

Vetch for grazing can improve soil nutrition, clean up various weeds and disease while producing a bulk of feed. Care must be taken with such a high protein diet for your stock and grazing levels managed to minimise wind erosion.

Sown crops for pasture can be an excellent option for bringing a rough paddock into line for future no-till cropping and can be used as a 'clean up year' with the option of hay freezing for grass control.

Sown crops as an alternative pasture

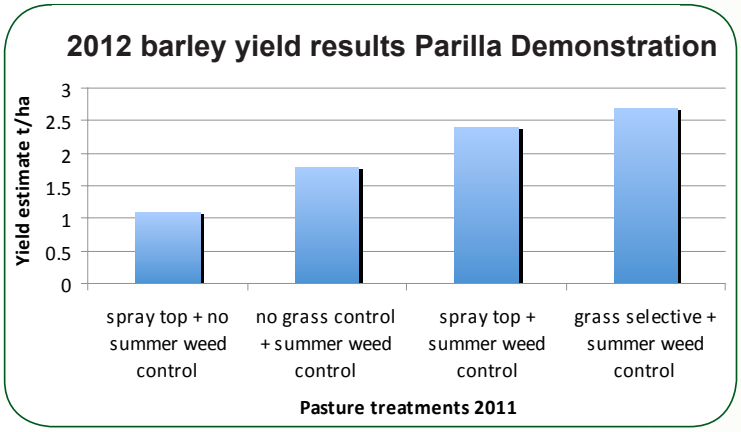
Choosing the right cereal for feed - Make disease resistance a priority when selecting the right cereal variety to sow for feed. Check the resistance ratings for root diseases - Cereal Variety Disease Guides or NVT.

The importance of choosing disease resistance for pasture was made clear in 2011 trials at Wynarka where it was found that Bevy rye built up Bipolaris (common root rot).

SUMMER AND AUTUMN WEED CONTROL

Excellent summer weed control has always been a key to achieving no-till success. Grazing summer weeds on its own does not adequately kill them. It can lead to prolonged moisture loss, nutrient tie up and build up root disease.

This is considered by grazing farmers as one of the main reasons for lack of no-till success. While grazing alone can be cheaper and provide convenient stock feed, growing weeds will always compromise the success of any no-till seeding. To achieve benefits from summer weed control, weeds need to be sprayed till they are dead. This was clearly demonstrated in numerous mallee trials.



Summer weeds are significant

The demonstration paddock at Parilla further supported findings that chemical summer weed control is the most important factor in no-till yield benefit and can often be neglected when livestock are continually grazing weeds over summer.

Spraying summer weeds conserves moisture and nutrition and also reduces rhizoctonia disease build up. In dry years good summer weed control can be the difference in being able to sow, grow and harvest a profitable crop.

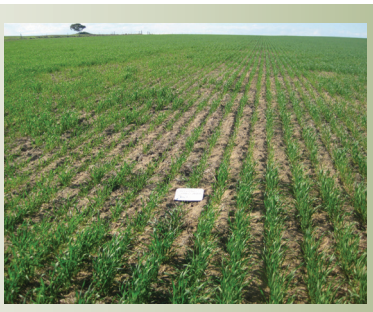
Summer weeds controlled early are easier to kill and also reduce the likelihood of trash build up, making seeding easier. Gauging the best timing for summer weed control can be difficult, particularly in wet summers when the cost of multiple spays becomes challenging. Generally, the better the control the greater the benefit to the following crop.

In the cropping year early autumn weed control is just as important as summer spraying. This was demonstrated at the Wynarka trial in 2011. A spray miss prior to sowing showed the emergence of a high level of grass weeds. If left too long these weeds would quickly build up disease levels, compromising the establishment of the crop.

Many farmers are finding long term benefits to spraying summer weeds prior to pasture years, as this is often when many problem weeds left unattended can dramatically build up. Farmers report that this can also greatly improve their pasture growth.

For cropping paddocks, autumn should be considered a weed free zone. It's optimal to try and control autumn volunteer weeds as soon as practical to conserve moisture and limit disease build up.
The pictures show autumn volunteer growth and subsequent crop damage resulting from a spray miss. The rhizoctonia soil inoculum level at seeding

Autumn volunteer growth strip left unsprayed.



Clear rhizoctonia barepatch resulting.

time at this area was a very high risk 257 pgDNA/g, which was 3 time higher than spray topped pasture areas and 8 times higher than the grass removed pasture areas where this early season growth was controlled.

NO-TILL CROPPING PHASE

Managing the pasture phase and summer weeds for no-till will get you part way to success. The final consideration is getting the crop in at the start of the season. Seeding early or on time (balanced with the need to manage weeds and frost) usually ensures crops are sown when conditions are warmer and helps crops establish quickly. This means deep working below the seed with a narrow point to break up root disease while providing a channel for rapid root growth into deeper moisture and away from rhizoctonia. Effective commercial seed dressings are now available for rhizoctonia control and these should also be considered.

Autumn volunteer growth strip left unsprayed.

KEEP IN MIND THAT RHIZOCTONIA IS WORSE

- when sowing into cold soils
- in the presence of group B herbicides
- in the absence of summer rain
- when grassy host weeds are present

Most of the benefits from cultivation are short term and come from the flush of nitrogen at seeding, so no-till crops may require extra nutrition at seeding too. Soil nutrition tests are recommended in paddocks that have had a poor fertiliser history.

Low fertile paddocks will benefit from increased phosphorous and zinc, as well as extra nitrogen where the legume content of the pasture was low. Fertilisers with a higher percentage of nitrogen should be used when no-tilling for the first time or after a low rainfall summer, in paddocks with stubble or trash that tie up nitrogen and especially on sandy soils.

The general principles for no-till seeding should be applied, including:

- good stubble/ trash clearance with 10-12" row spacing
- adequate tine break out pressure
- deep working narrow points, with good seed and fertiliser placement.
- press wheels providing good seed soil contact and water harvesting furrow,
- good nutrition and weed management at/ prior to seeding
- timely sowing into warm soils

No-tilling into pasture ground will require higher draft force and use more diesel than seeding into stubble but this will still be more economical than cultivating and sowing the paddock.

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Timing of Mineralisation

The main benefit of cultivating pasture ground in the Mallee trials was not root disease control. Root disease levels at seeding time generally remained similar across early and late tillage treatments and no till. The main difference across a number of trials and seasons was that early cultivated areas showed between 10 to 30 kg per hectare more available nitrogen at seeding time (depending on soil type) giving a short term boost in nitrogen. Less difference was on the less fertile sandy areas.

However, at Wynarka in 2011, the no till areas, while having less N available at seeding and showing slightly higher levels of root disease damage early on, produced significantly higher yields at the end of the season. This confirms that no-till systems can mineralise more nitrogen later in the season when needed by crops.

MANAGING EXPECTATIONS

Managing cropping, pastures and livestock often involves compromise and situations will change from season to season.

Some years extra grazing may be required, chemical costs may be high and the temptation will be to leave grasses or summer weeds for feed. It's important to understand the impact of these sorts of decisions on the system in the future. Farmers wanting to no-till may have to consider other options for managing livestock feed requirements such as feedlotting, saltbush, hay production or agistment, to overcome issues created by chemical weed control.

No-till cropping will also expose any weaknesses in a farming system. Rather than abandoning no-till, it is better to correctly identify the issue and work out the best ways to correct it. Keep in mind that a paddock will become easier to no-till and will improve over time, so perseverance pays off.

Aim for the best practice approach as outlined above. If this cannot be achieved then be realistic and be prepared to modify expectations.

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WHERE TO FROM HERE

Mallee farmers can successfully no-till into pasture ground with sound planning and preparation that begins in the pasture phase.

Visually no-till crops may look poor early compared to cultivated areas and giving the impression that potential yield is lost but may not be the case. No-till crops in well managed farming systems pick up nitrogen released slowly throughout the season when crops need it and this can lead to higher yields.

Pasture and good summer weed control is very important. Both practices may increase initial costs but will provide greater benefits in the long run.

Successfully no-tilling into pasture offers timeliness of seeding with less labour and diesel required, increased yields and the protection and improvement of our most valuable resource, our soils.

ACKNOWLEDGMENTS

Co-authored by Chris McDonough, Rural Solutions SA and Tanja Morgan, Tanja Morgan Project Services.

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