



SA Graingrowing

Getting into no-till cropping

by Dr Rohan Rainbow

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'No-till' is a cropping system where the aim is to avoid tillage. It is a relatively new farming system being widely adopted, particularly in SA and WA, because it:

- Lowers farm costs.
- Reduces wind and water erosion.
- Leads to improvements in soil structure.
- When combined with stubble retention, increases soil moisture levels.
- Over time can reduce weed populations.
- Increases farm efficiency levels as less time is needed to prepare land and sow crops.

Generally in a no-till system, surface residues are retained and crops are sown in one pass using knife points. In SA, some farmers have been practising no-till since the 1970s but it has become more universal with improvements in herbicide technology since the 1980s, and greater knowledge of weed population dynamics. In 2002, the SA No-Till Farmers' Association (SANTFA) estimated that 15 per cent of the cropping area was no-till.

Why change?

Tillage – Tillage can have a deleterious impact on soil health because it breaks down soil aggregate size. The presence of these fine particles means that the soil has lower oxygen levels, it is more prone to wind and water erosion and water infiltration levels are reduced. Tillage can have both beneficial and detrimental effects on populations of soil organisms. Frequent tillage can reduce the populations of beneficial organisms, while tillage below the seed bed has been shown to cut *Rhizoctonia* fungi levels.

Costs – No-till reduces expenditure on labor, equipment, and fuel which are significant components of cash costs. In the three years to 2001, the average expenditure on fuel, oil and grease on SA grain farms was \$15,255 per farm per year. Plant and machinery repairs and maintenance cost graingrowers more than \$13,000 a year on average (ABARE-Australian Grains Industry 2002). These costs are reduced under no-till because the range of equipment needed to sow a crop is reduced and the equipment is used less frequently.

Timeliness – Getting a crop established quickly and efficiently has a major bearing on water use efficiency levels and ultimate crop yields. No-till has enabled farmers

to expand the size of their cropping programs while maintaining timeliness of sowing.

Yields – Because no-till is a relatively new farming system, there is little data available about its effects on yields although individual no-till farmers are claiming yield increases under the system. In the drought year of 2002 no-till, combined with stubble retention, generally resulted in higher soil moisture levels, better plant establishment and increased yields compared to crops sown under a multiple tillage system.

Associated issues

Weeds – Most weeds will be hard to control in farming systems where their seed is buried and so germinates irregularly making control difficult. Under no-till using knife points, weed seeds are not buried as much as with cultivation and, over time, more even germination of weeds occurs facilitating their control. No-till also enhances the efficiency of many soil-incorporated herbicides. Development of herbicide resistance in a no-till system can be slowed by using herbicides from different groups and by non-chemical weed control measures including crop competition, green manuring, strategic burning and weed seed collection at harvest.

Diseases – Where stubble is retained in a no-till system less 'rain splash' occurs and this reduces the spread of some crop diseases. However, some leaf diseases can also build-up where stubble is retained and need to be managed



through rotational flexibility. The root disease, Rhizoctonia, can increase under a no-till system. However, CSIRO Land and Water research has shown that disease-suppressive soils can develop where there is intensive cropping accompanied by high production levels and stubble retention.

Pests – Snails and slug numbers can build-up in farming systems, including in a no-till/stubble retained system and a range of measures is being developed to control these pests. No-tilled crops need to be monitored very closely at establishment for presence of insect pests, particularly red-legged earth mite and lucerne flea.

Rotations – No-till has allowed farmers to intensify cropping on their farms because fallowing is not involved. Crop and variety choices need to take into account any threats from disease and weeds.

Livestock – The compatibility between livestock and no-till is subject to debate. Certainly heavy grazing post-harvest means less cover and more land prone to erosion, and the burial of weed seeds, yet many no-till farmers are successfully grazing livestock in a no-till system.

Fertiliser – In a no-till system there is less mixing of the fertiliser with the soil so the application of immobile trace elements such as zinc, copper and molybdenum in the seed row becomes important. It is imperative to provide crops with balanced nutrition in no-till and because soil mineralisation is reduced under no-till, special attention needs to be given to a crop's nitrogen requirements. To facilitate stubble handling, farmers moving to wide row spacings and narrow points may pre-dispose germinating plants to fertiliser toxicity unless the fertiliser, especially nitrogen, is banded. Equipment able to do this is widely available.

Plant and equipment

A prime requirement in no-till is a seeder with high breakout tines, (at least 90 to 150 kg per tine) preferably able to be operated hydraulically in stony country. The seeding frame needs to have good flotation capability so it can follow ground contours and ensure good seed placement. Other equipment includes:

- Knife points.
- A second seed opener to facilitate accurate seed placement.
- Fertiliser banding capability on the airseeder cart and a second set of delivery tubes if high seed row concentration and fertiliser toxicity is likely to be an issue.

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- A soil covering device – press wheels work well in no-till as do rotary harrows although the latter may encourage more weeds to germinate.
- Some farmers have used no-till disc seeders, however, careful attention needs to be paid to 'hair-pinning' of stubble in the seed row in heavy stubble. Disc seeders appear to be a good alternative to tined seeders in many soils as long as the seedbed does not have significant hard pans or is hard-setting. Sticky clay soils can also pose some problems in wet conditions. Disc seeders do not pull stones to the soil surface but generally are as hard to pull per seed row as a tined machine.

While existing equipment can be modified to be used in no-till, the extent of the modification needed will determine whether this is an economically feasible option or whether new equipment should be purchased. Most of the new seeding plant now being marketed has no-till capabilities.

Changing to no-till

Don't rush in. Do your homework and study what is working locally. If you feel you are not ready to make the personal commitment or the capital investment in no-till now, wait until you are.

When the decision to change to no-till is made, preparation begins at harvest when stubble is cut short but left anchored. Summer weeds need to be controlled when they are young and to maximise kill, sprayed in low temperature, higher humidity, non-dusty conditions. Paddocks with high weed populations should not be used for no-till. Fencelines and tree lines need to be kept free of weeds to prevent paddock re-infestation and snail reinfestation in areas where snails are common. Paddock hygiene is a key to the success of no-till.

In changing to no-till also consider controlled traffic where wheel traffic is confined to specified areas of paddocks so reducing compaction. No-till and the controlled use of equipment, particularly seeders and sprayers, work well together. Overcoming hard pans with controlled traffic will improve the effectiveness of a disc seeder in hard soils.

Help is available

The SA No-Till Farmers Association provides its members with a quarterly printed newsletter and with access to conferences, crop walks and regional workshops.

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