

# Stubble

# Management



## What's important for success?

- ▶ Take a long term approach to planning and consider all the options suitable for your farm
- ▶ Learn from others, but remember every farm is different so be flexible to deal with variable conditions
- ▶ Don't let stubble compromise 'the big six' drivers of crop profitability
  1. Summer weed control
  2. Timely sowing
  3. Adequate and even crop establishment
  4. In-crop weed control
  5. Foliar and root diseases
  6. Nitrogen nutrition

Ariah Park farmer Paul Buerckner with 4-year-old son Jake and two-year-old daughter Lucy, standing in a canola crop sown into retained wheat stubble



# Stubble retention: BENEFITS and CHALLENGES

## Benefits

The benefits of stubble retention have been shown over several decades. Initially adoption was driven by reducing tillage using chemical weed control to give labour and fuel savings, and the desire to improve soil structure and reduce erosion. During the recent drought years (2002-2009) moisture conservation became the main incentive for farmers converting to this system. Farmers engaged in this practice need to be flexible with their management to successfully implement what can be a complex system. Retained stubble protects soils from wind erosion and surface runoff, gives greater infiltration and lower evaporation rates. Stubble adds to particulate soil carbon reserves that increase microbial action and maintain soil structure. However, stubble retention can present a range of problems that can threaten crop profitability. This tends to happen when stubble compromises one of the 'big six' key drivers of crop profitability – summer weed control, timely sowing, adequate and even crop establishment, in-crop weed control, foliar and root diseases and nitrogen nutrition. Solutions to many of these issues involve reducing or removing the stubble prior to establishing the next crop. Farmers experienced with stubble retention use all options to manage stubble if crop profitability is at risk.

## Challenges

### Physical

**Machinery blockage** at sowing can mean interruptions to the operation and leave paddocks with uneven coverage or clumps of residue that can prevent even seedling emergence. Some varieties of crops can have different residue characteristics such as volume and straw strength that needs to be taken into account when considering the next crop. Problems can also occur where residues build up over a number of years particularly where GPS guidance or tram tracks are used and residues are thrown onto the same harvest trails.

**Poor establishment** of crops has been a concern for farmers, especially when sowing small seeded crops like canola into heavy cereal stubbles. This can be due to several factors including the physical barrier, reduced soil temperatures under mulch, or from low light in standing stubbles. Poor seedling vigor in cereal crops using direct drilling techniques has also been a problem and research has shown that crop roots can be restricted by soil structural conditions that then leave them exposed to inhibiting soil bacteria (Pseudomonads).



*Photo 1 - Canola inter-row sown into tall standing stubble avoids the problem of stubble residue affecting establishment  
Photo: Tony Pratt*

*For management of residues to avoid blockages and poor crop establishment, consider -*

- ▶ Crop rotation – legumes leave little residue, cereals higher loads.
- ▶ Low cut stubble (10-15cm) at harvest spread evenly across paddock (tined seeders)
- ▶ High cut stubble at harvest, use wider row spacing and inter-row sowing into standing stubble (better suited to disc seeders)
- ▶ Livestock grazing to consume and trample residues
- ▶ Incorporating stubble by tillage after harvest
- ▶ Mulching after harvest
- ▶ Baling and removing from paddock.
- ▶ Burning prior to sowing
- ▶ Improving seedling vigor by using more vigorous varieties, planting earlier into warmer soils, or with seeder points that give greater soil disturbance.

### Pests

**A range of arthropod pests** is associated with high volumes of organic material including slaters, earwigs, millipedes and weevils, which have often damaged emerging crops. Slugs and snails are also showing increased activity in the higher rainfall areas or in high rainfall years, where increased stubble loads have improved their habitat. The shift towards minimum tillage and retained stubble has changed



*Photo 4 - Earwig in canola.  
Photo: Sandy Biddulph*

the complex of crop pests, but it has also increased the biodiversity and the range of beneficial arthropods as well.

**Mouse plagues** have increased in frequency with the change to stubble retention. The increase in quantity and quality of feed available in paddocks is the primary driver of mouse populations.

*Options when dealing with pest problems include -*

- ▶ Incorporating stubble by tillage after harvest
- ▶ Livestock grazing to consume and trample residues
- ▶ Burning prior to sowing

## Weeds

**Herbicide resistant weeds** have become the greatest challenge for reduced tillage cropping systems due to the high dependence on chemical weed control. Resistant weeds in paddocks require integrated management using all the control options available to reduce weed seed banks.

**Pre-emergent herbicide efficacy** may be adversely affected by high stubble loads due to the stubble preventing herbicide from contacting the soil or by tie-up of active ingredients on stubble. Herbicide dose and water rates can be increased in some cases to improve efficacy, but the risk of crop damage is increased as well.

**Stubble management options when dealing with weeds include -**

- ▶ Low cut stubble (10 - 15cm) at harvest spread evenly across paddock (tyned seeders)
- ▶ Narrow windrows (500 – 800mm) burnt at high temperature in early autumn
- ▶ Hay or silage crops cut before weeds set seed
- ▶ Chaff carts to collect residues to be burnt
- ▶ Harvest weed seed destruction when available
- ▶ Inter-row sowing using a disc seeder (low soil disturbance)
- ▶ Burning prior to sowing



*Photo 8—Sclerotinia disease can remain viable in stubble residues for many years.  
Photo: Phil Bowden*

## Disease

**Plant diseases** can carry over from previous crops in stubble residues and then infect the following crops. Yellow leaf spot, Septoria Blotch and crown rot are common cereal diseases that need to be managed by reducing the inoculum that carries over on stubble residue. Blackleg and Sclerotinia diseases remain viable for many years in crop residue to infect canola and other broadleaf crops.

**Options to combat plant diseases include -**

- ▶ Using break crops that do not host the existing disease and using resistant cultivars
- ▶ Incorporating stubble by tillage after harvest
- ▶ Livestock grazing to consume and trample residues
- ▶ Burning prior to sowing

## Nutrients

**Nutrient tie-up** is well demonstrated when fresh straw comes into contact with soils. During decomposition of cereal stubble, increased microbial activity results in Nitrogen (N), Phosphorous (P), Sulfur (S) and Calcium (Ca) being immobilized and unavailable to crops. Additional nutrients (N, P, S and Ca) need to be added to soils to hasten the breakdown of stubble and support the crop. Stratification of nutrients at the soil surface and in the row with immobile nutrients such as phosphorus, copper and zinc is also a problem when soils are left undisturbed. Acidification in the topsoil (5-10cm) can also occur in no-till systems.

**Options to avoid pH and nutrient problems include -**

- ▶ Incorporating stubble by tillage after harvest
- ▶ Applying some N (15-20 kg/ha N) either with seed or deep banded at sowing
- ▶ Allowing an additional 5 kg/ha N per 1 t/ha retained stubble when N budgeting to allow for tie-up, and adding P, S and Ca.
- ▶ Increasing soil-throw with sowing or tillage gear to mix nutrients through the topsoil.
- ▶ Strategic cultivation following lime application to incorporate lime to depth



*Photo 6—Windrows burn in early autumn. Photo: Phil Bowden*

# Seasonal Tools

Applying a combination of stubble management tools at the right time, while responding to the demands of a mixed farming enterprise and seasonal conditions, is the key to maintaining profitable farming systems with retained stubble.

Pre-sowing	Harvest	Post Harvest
<ul style="list-style-type: none"> <li>▶ Crop Rotation – wheat into canola stubble, canola into legume stubble</li> <li>▶ Variety selection</li> <li>▶ Row spacing/inter-row sowing – disc seeder</li> <li>▶ Seed points to give increased soil disturbance</li> <li>▶ Strategic cultivation</li> </ul>	<ul style="list-style-type: none"> <li>▶ Low stubble and evenly spread</li> <li>▶ High stubble and inter-row sowing</li> <li>▶ High stubble and post-harvest management</li> <li>▶ Chaff carts to collect residues to be burnt</li> <li>▶ Harvest weed seed destruction</li> </ul>	<ul style="list-style-type: none"> <li>▶ Hot blanket burn</li> <li>▶ Mulching and/or incorporating and early additional Nitrogen, Phosphorous, Calcium and Sulfur</li> <li>▶ Baling/silage</li> <li>▶ Narrow windrow burning</li> <li>▶ Grazing</li> </ul>

## Discussion of best options

The choice of stubble management on each farm depends on a number of factors including -

- ▶ Stubble load (t/ha) at harvest
- ▶ Mixed farm or continuous cropping (grazing or not)
- ▶ Sowing system by disc or tyne
- ▶ Weed, disease or pest threats

The stubble load will determine the management options in many cases. In high stubble loads farmers are left with no option but to reduce the levels by mulching, grazing or burning to reduce the detrimental effects at sowing. Mixed farming enterprises generally rely on the grazing value of stubbles immediately after harvest and to rest pastures, so have little choice but to cope with trampled residues. Use of mulching equipment after grazing can even out the residues and help the breakdown prior to sowing. Continuous cropping enterprises without livestock can choose options

such as inter-row sowing and CTF into standing stubbles so the problem of machinery blockage at sowing is avoided. The type of sowing equipment that farmers have invested in will determine the stubble load that can be retained, as discs will generally handle higher loads than tynes. Each system then comes with

its own set of parameters that need to be used to cope with stubble. Likewise with pests and diseases. Many plant diseases are hosted on retained stubbles so breaking the cycle may require incorporation or burning of residues. The mulch provided by stubble is often perfect habitat for seedling pests such as earwigs and slaters.



*Photo 9—An even stubble burn will give the best result. Photo: Phil Bowden*

Every farm and farmer is different, so when developing cropping systems all options need to be considered. What works in some regions generally needs some development “tweaking” to get similar results in others. When dealing with complex systems and variable seasonal conditions, there is a need to be flexible. The best guiding principal is to ensure that stubble is not impacting on the ‘big six’ drivers of crop profitability on your farm. This is best done by having a plan to pro-actively manage stubble before this happens.

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