

# What sort of stubble?



## It all begins at harvest

### - Key stubble management considerations -

- ▶ What is my preference for tillage system?
- ▶ What is my seeding system?
- ▶ What is my row spacing and accuracy of sowing?
- ▶ What is the type of crop residue?
- ▶ What is the amount of crop residue?
- ▶ Is the crop lodged or standing at harvest?
- ▶ What is the desired harvest speed and height?
- ▶ What crop will be planted into the paddock next season?
- ▶ Will the stubble be grazed by livestock?
- ▶ Should I spread residue or put in a narrow windrow?
- ▶ How uniform is the spread of straw from my harvester?
- ▶ Am I prepared to process stubble further post-harvest: mulch, incorporate, bale or burn?
- ▶ Do I have a weed problem which requires intensive Harvest Weed Seed Capture?
- ▶ Do I have a weed problem in canola that may be best managed by spray topping?
- ▶ What is the risk of stubble-borne disease to next season's crop?
- ▶ Am I likely to encounter a pest problem next season: slugs, earwigs, weevils, snails?
- ▶ What is the erosion risk based upon soil type and topography?



# What stubble needs to be produced by the harvest process?

Stubble management starts at harvest! Retaining stubble has become a priority for farmers to increase moisture conservation, protect soils from erosion, increase nutrient cycling or avoid burning. The way stubbles are left following harvest needs to be considered when setting up the header prior to harvest. Thought needs to be given to how you want the stubble to look over the fallow period and what condition it will be prior to planting the next crop.

## Assessing stubble loads

When crops are assessed prior to harvest, grain yields and stubble loads need to be estimated so that the best management practices can be planned and implemented at harvest, post-harvest and pre-sowing. Estimating stubble load is important. As a rule of thumb, the remaining stubble load will be about 1.5-2 times the grain yield for wheat and about 3 times the grain yield for canola (Figure 1). i.e. for a 4 t/ha wheat crop = 6-8t/ha stubble, and for a 2t/ha canola crop about 6t/ha.

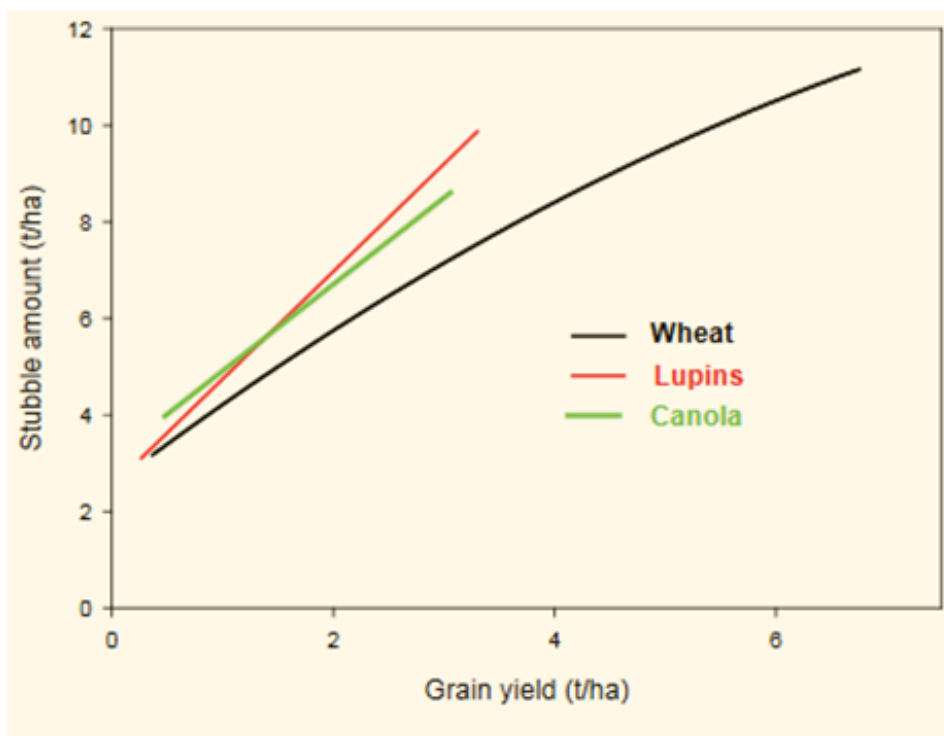


Figure 1: Assessing stubble loads (Heenan)  
Wheat Lupins Canola

## Effect of stubble load on sowing

How much stubble can be handled at sowing will be determined by the sowing method (disc or tines), whether sown inter-row, at 15 degrees to the sown row or randomly, stubble height, stubble stability, and the crop type to be sown the following season.

A tine seeder needs to have stubble that has shorter straw lengths (< tine spacing), evenly spread across the swathe width and generally 3-4 tonne/ha. However, heavier stubble loads can be handled

with a tine seeder when sowing inter-row, at 15 degree angle to the stubble row and/or when using a coulter. However, a disc seeder can handle heavier stubble loads (loads > 9t/ha), but the discs need clear soil conditions to reduce hair pinning and work efficiently.

The crop type that is to be sown into the stubble during the following season can also influence what type of stubble management is used. Small seeded crops such as canola need a clear surface to

emerge and compete (figure below illustrates improved canola emergence where there is less stubble). If there is a heavy surface stubble load or large clumps of residue, risk of uneven emergence and poor crop establishment is increased in all crops except large seeded legumes. Wheat varieties with short coleoptiles dwarfing genes have reduced capacity to emerge through thick stubble. So check crop type, variety, seeding depth and stubble cover to match.



Large clumps of residue can affect crop emergence. (Photo Tony Pratt, FarmLink)

## Major Factors: Header height and straw spread pattern

### High Cut or Stripper front resulting in tall stubble

- If using a disc seeder
- If there is NOT enough time at harvest to cut low
- If the stubble is to be left standing for inter-row sowing the next crop using a disc seeder
- If stubble will be grazed, mulched or burnt prior to next crop

Harvest time can be very stressful as all the major costs have been incurred, NO income has been generated and no one can predict the weather. Possible downtime due to adverse weather can alter the harvest management strategy and stubble management. If rain or high temperature is likely to interrupt harvest then a fast high cut leaving tall stubble may be the best option. CSIRO/FarmLink Research found that a wheat crop harvested at a height of 60cm using a John Deere Header 9770 STS header has a harvest efficiency of 9.5 tonne/hr compared with 5.7 tonne/hr when it was cut short at 15cm, a difference of 40% ([Appendix 1, Table 1](#)).

### Effect of tall stubble on seeding decisions

For a disc seeder, tall standing stubble inter-rowed sowed on wider rows is the easiest to deal with, but will need 2 cm accuracy GPS guidance. High cut using header fronts like a Honey Bee™ will give less residue that needs to be spread, or a header with a straw chopper helps to spread residues evenly across the swathe. This will reduce the possibility of "hair pinning" with a disc seeder when inter-row sowing. Using a coulter or row cleaner such as an "Aricks wheel" will remove the stubble away from the disc and assist in reducing "hair pinning". They will also improve crop establishment if sowing into grazed, heavy stubble or on when sowing with narrower rows (18cm row spacing).

Stubble that will be grazed after harvest can be cut high as it will be eaten and trampled, with a lot of the remaining residues being in contact with the soil and broken down by the microbes. If using a tine seeder, tall stubble will often need to be mulched or burnt prior to sowing the next crop as livestock selectively graze and leave the residues uneven across the paddock. CSIRO/FarmLink Research has

shown that grazing stubbles do not cause any permanent compaction damage in a tined seeding system, as long as 70% of groundcover or 3 tonne/ha is maintained.



Photo 8—Stubble cut high and inter-row sown Photo: Tony Pratt, FarmLink

### Cut low and spread evenly across the swathe width.

- If using a tine seeder
- If there is time at harvest and no other post-harvest treatments are planned
- To allow as much time for biological breakdown of residues

Harvesting low (<20cm) and spreading the straw evenly across the entire header width is optimal if you intend to sow the following crop with a tined seeder or if the crops are lodged. If harvest needs to be completed quickly due to weather, a mulcher or slasher can be used post-harvest, at an additional cost.

For best results, the residue needs to spread evenly across the swathe rather than concentrated in a header trail where it increases nutrient tie up and impedes crop establishment in the following crops (especially canola or wheat on wheat stubble). To get an even spread the header needs to be fitted with MAV™ straw choppers or a Powercast™ tailboard. Adjusting the rotor speed and vane settings will help give even spread.

### Cut low for managing weeds (windrowed or spread after iHSD)

- If there is time at harvest to spend extra time
- If herbicide resistant weeds are a problem

Cut low and windrowed: As part of the latest integrated weed management package originally developed in Western Australia but being adapted locally, narrow windrows at harvest using a chute to drop chaff residue directly behind the header, has been shown in local trials to capture up to 80% of weed seeds in wheat crops (<http://www.farmlink.com.au/LiteratureRetrieve.aspx?ID=202795>).

With a hot burn (temperatures up to 600° C) in late summer or early autumn, 99% of these weed seeds (annual ryegrass and wild radish) can be destroyed. Using this method only 10% of the paddock will be burnt. The stubble needs to be cut low (10-15cm) and not grazed, as livestock will destroy the windrows and a complete burn to the soil surface is not possible. This method works extremely well for wheat.

If farmers intend to use this method when harvesting canola, windrows will need to be cut lower as many weed seeds will be below the windrowing height if cut at normal height.

Anecdotal evidence suggests that annual ryegrass will grow tall in canola crops in search of light and a large percentage of the seed is captured if windrowed lower similar or the results in wheat. However, other integrated weed management options for canola should be considered such as spraying Weedmaster®DST® or diquat over the crop using coarse-very coarse nozzles at water rates >80L/ha prior to windrowing or spraying under the cutter bar (30-50L/ha water) while windrowing.

Nufarm and leading agronomists have found at that there was at least a 70% reduction in annual ryegrass germination in the following crops when Weedmaster®DST® was applied at 2.8-4.1L/ha when the canola crop was at 20% colour change (Figure 1 and 2, [Weedmaster DST brochure, GRDC pre-harvest fact sheet \(2014\)](#)). Spraying over the crop works more effectively on lower yielding open canopy crops (< 2.5t/ha crops), whereas spraying under the cutter bar is necessary on high yielding thick canopy canola crops due to poorer penetration of the chemical.

It is important to adopt integrated weed management strategies to minimise the risk of glyphosate resistance.

# What stubble needs to be produced by the harvest process?

## Integrated Harrington Seed Destructor (iHSD)

An alternative solution to a windrow burn for herbicide resistant weed control is to harvest using a HSD or iHSD. Similarly, if a canola crop was spray topped the previous year with Weedmaster@DST®, harvesting with a HSD or iHSD in a cereal crop the following year will continue to reduce the paddock weed seed bank. The iHSD is a machine that grinds the chaff and weed seeds coming through

the header. It is now available as an integral part of a header rather than a tow behind unit. This enables one pass weed seed processing, to eliminate all weed seeds that are picked up with the crop. For efficient weed seed collection the straw needs to be cut low so that as many weed seeds as possible are put through the grinder. CSIRO/FarmLink found that there was a significant cost involved in using the iHSD when harvesting at 15cm with a decrease in fuel efficiency of 38% ([Appendix 1 Table 3](#)).

Retaining stubble can increase the level of disease, reduce the efficiency of herbicides and increase the number and type of pests in the following crop if not managed carefully. For more information see previous guidelines that include “Break Crops in Stubble, Herbicide Application in Stubble, and Stubble Disease Strategies” in the Stubble Project section on the FarmLink website <http://www.farmlink.com.au/project/maintaining-profitable-farming-systems-with-retained-stubble>



Photo 8—The iHSD prototype trialled at Holbrook in 2014 (Photo. Grassroots Agronomy) and Stubble cut low and narrow windrowed burnt)

A number of resources for additional reading can be found in the [Harvest Process Resources document](#), which resides on the FarmLink website in the Maintaining Profitable Farming Systems with Retained Stubble section in the Projects folder <http://www.farmlink.com.au/project/maintaining-profitable-farming-systems-with-retained-stubble>

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November 2016