

Grazing Stubble

Maximise your stubble value

- ▶ To protect soils from erosion maintain a minimum of 70 per cent ground cover (equivalent to 2-3t/ha of cereal stubble cover)
- ▶ Soil compaction by sheep is shallow and easily fixed by disturbance at sowing and has no effect on yields
- ▶ Weed control by livestock is unreliable so spraying weeds is important to conserve stored soil moisture during the summer fallow period
- ▶ Grazing stubble after harvest will have benefits that far outweigh the negative effects in a well managed mixed farming enterprise
- ▶ To estimate stubble load, for every 1t/ha of grain yield about 1.5 /ha of cereal stubble will be left as residue

Sheep grazing cereal stubble is an important tool in mixed farming operations throughout Southern New South Wales



Grazing in stubble retained farming systems

Balancing mixed farming

Grazing stubbles after harvest provides a valuable feed resource and allows pastures to be spelled during summer - forming the basis of mixed farming systems in southern NSW. However, stubble is also essential in order to protect soil from rain-drop impact damage, which breaks up soil surface aggregates and reduces soil water infiltration rates, which increases the likelihood of surface run-off and water erosion. A minimum of 70% ground cover is needed to prevent this from happening. This level of stubble cover is also required to protect soil from wind erosion.

Feed value of stubble

Most mixed farms graze sheep on stubble and grain residues left in cropping paddocks immediately after harvest. There is considerable feed value in the grain that has been blown out the back of the header (80% digestibility), and the leaf material (55% digestibility), but standing straw (30% digestibility) which comprises the bulk of the residue is of little value, except in very dry years. Sheep will quickly use this feed resource eating around 1kg/day.

Livestock will be selective, concentrating their grazing effort on spilt grain, on any germinating "green pick" and on the relatively small proportion of leaf in the stubble. A short period of weight maintenance (about 2-4 weeks) is generally followed by

significant weight losses once these higher-quality components of the stubble are exhausted. There will be value in supplementary feeding either grain or a lick such as molasses/urea to give better utilization of this roughage if stock need to be left on stubbles any longer than 2-4 weeks.

It should be noted that with most modern headers, un-harvested grain is only a small fraction (<1%) of the residues and the first rain event after harvest will see a significant decline in feed value as energy and protein is leached out of residues and broken down by fungi and bacteria.

Farmers have traditionally used livestock to clean up weeds in cropping paddocks, but this is mostly ineffective. Grazing does not



Photo 1 - Sheep grazing and trampling cereal stubble
Photo: Ben White

completely kill weeds and they still transpire water and tie up N. Weeds in stubble paddocks should be sprayed before stock are allowed to graze them, and all withholding periods observed. 'Spray-grazing' can be a cost effective way of controlling some species of summer weed e.g. flax leaf fleabane and melons.

Soil compaction

Research on the effect of grazing shows that while sheep do compact the soil, it is only in the top few centimetres. This can be overcome by natural shrinkage and swelling of soils (by wetting and drying) and by disturbance at sowing with knife points. After harvest, soils are usually dry and compaction is minimal.

A major concern of growers is that soils will 'dust up' if livestock are left on paddocks too long. However, the latest research shows any reduced water infiltration and yield effects from grazing are mainly due to re-

Table 1: Grain yield from Phase 1 between 2010 and 2012

Graze treatment	2010 Canola (Tawriffic) (t/ha)	2011 Wheat (Bolac) (t/ha)	2012 Wheat (Wedgetail) (t/ha)
Nil graze	4.1	4.6	4.7
Stubble graze	4.2	4.6	4.8
Winter and Stubble Graze	4.0	5.2	4.7
P - value	0.62	<0.001	0.768
LSD (P=0.05)	NS	0.2	NS

NOTE: Gregory wheat was sown in 2009 with the effects from the winter and stubble or the stubble only grazing starting from 2010 onwards

moval of cover, not compaction or physical damage by sheep. Arguments that the full potential of no-till and controlled traffic may not be realised

if sheep are grazed on cropping country, removing residue cover and trampling soils, have not been supported by research.

Compaction concerns

Over-grazing can reduce the amount of water that can infiltrate into the soil surface, but this is due to removal of plant cover, not compaction. In the un-grazed treatments with no grazing or wheel traffic for nine years, the steady state infiltration rate of water in March 2017 was 28 millimetres per hour compared to an infiltration rate was 23 mm/hr where canola or wheat

stubble was grazed post-harvest every year. Although the water infiltration rate is slightly lower in the grazed treatment, there are few rainfall events with intensity greater than 23 mm per hour over the summer fallow, which explains why careful grazing had little impact on stored soil water and subsequent yield.

Interestingly, when comparing the

effect of establishing a crop with either a disc or tine seeder, there was no difference in the steady state infiltration rate across all treatments where stubble was grazed or not. So, in a no-till controlled traffic system, the full crop potential can be reached when carefully grazing crop stubbles sown with either a disc or a tine seeder.

Grazing to reduce stubble

Livestock will eat some of the stubble, but in the process trample a large proportion putting residues in contact with soil. This has advantages especially in the higher yielding paddocks where residue levels need to be reduced before sowing the next crop in autumn. Managing stubble is a compromise between protecting the soil surface with adequate groundcover and not having too much stubble at sowing time where it can cause machinery blockages and problems with emergence. There are several methods used to reduce stubble either alone or in addition to grazing, including mulching, baling or burning.

Increased nutrient cycling with grazing

Livestock grazing stubbles will redistribute nutrients across the paddock in urine and manure, and speed breakdown by trampling residues to bring the straw in contact with soil. The availability of carbon from crop residues is the primary driver of soil microbial activity and this, in turn, will lead to release of other plant nutrients from the breakdown of microbes. However, there can be short-term tie-up of nutrients, particularly nitrogen, as microbes require these as substrates for growth. Soil microbes have a Carbon:Nitrogen (C:N) ratio of around 10:1.

When stubble with a ratio of 80:1 is added as a feedstock for microbes, they will consume some carbon and strip available nitrogen reserves from the soil. The importance of this is that stubbles need to be in contact with soil as long as possible after harvest to allow adequate decomposition and mineralisation of nutrients for the following crops. The benefit of having livestock graze stubbles is that when stubble is broken down in the gut there is no tie-up of N. Measurements made in the FarmLink and CSIRO trial at Temora have shown twice as much soil mineral N being available after grazing stubble compared to leaving it undisturbed on the soil surface.

In some seasons increased soil mineral N has translated into yield benefit (Table 1). This will depend on the seasonal conditions prior to sowing, if there has been moisture available for mineralisation, the C:N ratio of the stubble and the soil contact with the residues, and how much fertilizer N are applied to crops.



Photo 2 - Large clumps of residue that can impede crop emergence Photo: Tony Pratt

How much stubble can be retained?

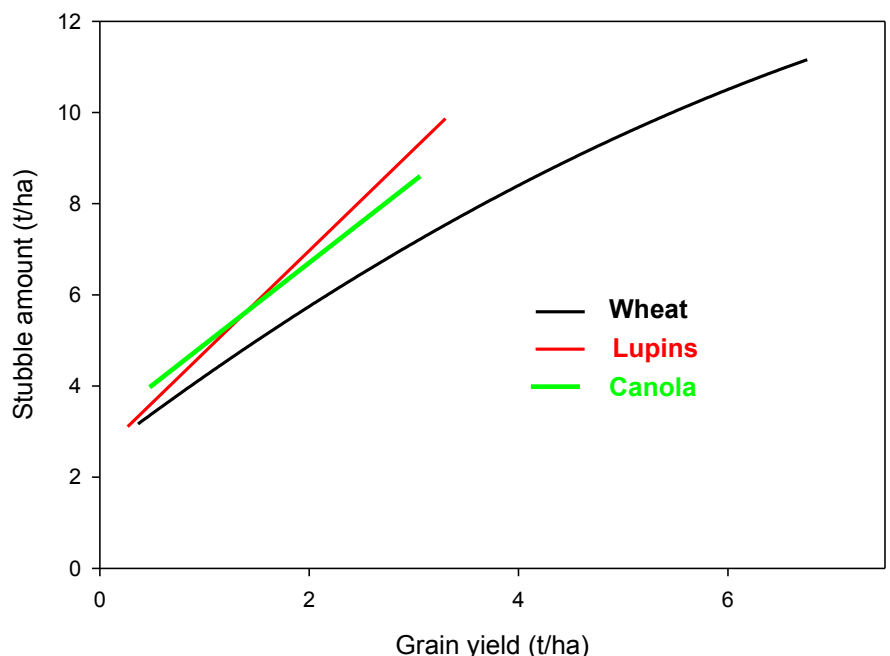
In southern NSW research has shown the need to maintain at least 70% ground cover, or about 2-3 t/ha of cereal stubble cover over summer to minimise erosion and run-off.

A four-year experiment (2009-2012) at Temora and Condobolin (part of the GRDC Water Use Efficiency initiative), examined the impact of stubble retention on stored soil moisture and crop yields. The experiment demonstrated that provided summer weeds are controlled and 70 per cent ground cover maintained, allowing sheep to graze stubble does not reduce subsequent grain yield.

From the work done by Mead and Quasrani (2003) stubble loads greater than 3 t/ha led to blockages with many types of seeders. As well as blockages, stubble can clump up across the paddock when the seeder has dragged it along the rows, which can then be a barrier for crop emergence (Photo 2).

Calculating stubble from grain yield

Stubble present after harvest is approximately 1.5 times the grain yield in cereals and 2.0 times grain yield in canola and pulses. An estimate of stubble amount from grain yield based on data over 27 years (wheat and lupins) and 12 years (canola) from Wagga Wagga is given in Figure 1 below.



Grazing in stubble retained farming systems



2% groundcover



35% groundcover



75% groundcover

Estimating ground cover

The ability to visually interpret ground cover levels is important for many farm management decisions including:

- ▶ grazing management
- ▶ herbicide application
- ▶ seeding equipment set up

This photographic guide is designed to assist farmers and advisors to monitor the ground cover provided by stubble under different stubble management situations.

Photographs from Sheila Lee, Murrumbidgee CMA.



97% groundcover

References for further reading can be found on the FarmLink website

<http://www.farmlink.com.au/project/maintaining-profitable-farming-systems-with-retained-stubble>

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