# 4. STUBBLE MANAGEMENT TRIALS

## 4.1 Increasing farmer knowledge and skills in stubble management systems in south west Victoria - Dunkeld, Vic

**Location:**
Dunkeld research site.

**Funding:**
This was an SFS Geelong Branch funded trial and La Trobe University..

**Researchers:**
Clive Kirkby – CSIRO Plant Industries, Charles Sturt University, EH Graham Centre for Agricultural Innovation.
Steve Holden – Department of Primary Industries, Hamilton.

**Author:**
Steve Holden – DPI Hamilton

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**Paddock History:**
2006: Pasture
2007: Canola
2008: Wheat

**Soil Characteristics:**
Soil Type: Medium clay
Soil test: pH(1:5 water) = 5.3
Organic Carbon (%) = 3.35

**Take home messages:**
- Yield differences were observed between the incorporated stubble and standing stubble plots.
- The hot dry conditions during November had a major impact on grain yield.
- Lodging was a problem in all of the plots with the incorporated plots particularly affected.
- At this stage no significant increase in soil organic carbon was observed.

**Background/Aim:**
In our cropping systems of southern Australia concern has been raised that our soil organic carbon levels have not been increasing (or if they do then it is a very slow increase) despite many years of stubble residue retention by many growers.

Recent work by Clive Kirkby from CSIRO Canberra has shown that incorporation of the carbon rich stubble into the soil will not necessary increase the humus content of the soil. He has found that if the maximum conversion of stubble into humus is to occur, then extra nutrients are required to feed the microbes that convert the carbon rich stubble into the more stable form of soil organic matter known as humus.

This project is into the second year of a five year study investigating Clive's hypothesis and comparing it with other stubble management systems and in particular examining the impact these systems have on the soils organic matter levels over a period of time.

**Rainfall:**

| | |
|---|---|
| Avg. Annual: | 696 mm (Dunkeld Post Office 1898 – 2007) |
| Avg. G.S.R.: | 535 mm (Dunkeld Post Office 1898 – 2007) |
| 2009 Total: | 466 mm (Dunkeld Research Site. |
| 2009 G.S.R.: | April – November = 380 mm (155mm below average) |

**Variety:** Gairdner Barley

**Sowing rate:** 80 kg/ha

**Sowing date:** 29th May

**Fertiliser:**
- 100 kg/ha MAP
- 80kg/ha Urea top-dressed on the 11th Sept.

**Treatments:**
1. Common Practise (Control) – This year the control was standing stubble
2. Standing stubble
3. Standing Stubble with additional nutrients applied after harvest
4. Incorporation – occurring soon after harvest
5. Incorporation with additional nutrients applied after harvest.

**Plot size:**
Dimensions, 12m wide x 286m long x 2 replicates with every third plot a control.

**Yield Limiting Factors:** 11 days above 30°C during November.

**Results and discussion**:
Following the 2008 harvest, there was 8.5 t/ha of wheat stubble remaining and this was incorporated on February 4, 2009 with an additional 130 kg of urea and 230 kg/ha of single super. This equates to 60 kg/ha of nitrogen, 20kg/ha of Phosphorus and 25kg/ha of sulphur. The nutrients were applied to treatments 3 and 5 on the same day as incorporation. Incorporation was performed using a He-Va Disc Roller.

Soil samples taken during autumn 2009 (see Table 1) were analysed by Clive Kirkby for soil organic carbon and soil nitrogen and while there was a slight trend for the plots incorporated with extra nutrients to be higher after one year, it was found not to be significantly different between the treatments.

There was a significant difference in the Barley yield this year (see table 2), with the incorporation with additional nutrients performing poorly. Incorporation with no additional nutrients also performed poorly although not significantly. All the plots had problems with lodging this year, due in part to the harsh end of the season but also due to the delay in harvesting. Both incorporation plots had significantly higher scores for lodging with the extra nutrient plots performing the worse.

Gairdner Barley has a moderately weak straw and is notorious for lodging under high yielding situations. Whilst 2009 was not a high yielding year it is possible that the delay in harvesting had an impact on final yield. Interestingly the protein levels of the incorporated with additional nutrients plots were significantly lower.

After the 2009 harvest the stubble load in the plots that were not incorporated was 8000 kg/ha and was made up of not only the Barley stubble from 2009 but also the remains of wheat straw from 2008. A small quantity of canola straw from 2007 was also observed. As was expected in the incorporated plots the stubble load of 8500 kg/ha was only comprised of Barley straw from 2009. The increase in straw in the incorporated plots after harvest was due to the harvest difficulties encountered harvesting the badly lodged incorporated plots.

**Summary:**
At this stage it is too early to see any significant increase in the soil organic matter of any of the treatments. What is obvious however is that, at the present moment in time, the additional nutrient plots have incurred additional costs over the more conventional treatments, for no additional yield and at this stage no significant increase in soil organic matter. This trial will need to be ongoing for a number of years to observe increases in the soil matter and also to determine if or when the economic breakeven point is reached.

**Table 1.** Soil Results from 2009

| Treatments | Soil Organic Carbon (%) | Soil Nitrogen |
|---|---|---|
| Control | 3.2 | 0.26 |
| Standing stubble | 3.44 | 0.29 |
| Standing stubble with additional nutrients | 3.28 | 0.27 |
| Incorporation | 3.35 | 0.28 |
| Incorporation with additional nutrients | 3.61 | 0.31 |
| Least significant difference(LSD) | **0.53 - ns** | **0.06 - ns** |
| CV% | **7.8** | **10.7** |

**Table 2.** Harvest Results from the Barley in 2009

| Treatments | Lodging Score * | Yield (T/ha) | Test Weight | Screenings |
|---|---|---|---|---|
| Control | 3.9 | 3.48 | 59.4 | 24.8 |
| Standing stubble | 4.0 | 3.44 | 65.9 | 28.5 |
| Standing stubble with additional nutrients | 4.5 | 3.69 | 58 | 28.5 |
| Incorporation | 5.5 | 2.76 | 63.1 | 15.5 |
| Incorporation with additional nutrients | 6.5 | 2.21 | 61.2 | 10 |
| Least significant difference(LSD) | **1.0** | **1.1** | **10.3 - ns** | **29.8 - ns** |
| CV% | **10.4** | **16.9** | **8.2** | **66.2** |

* Lodging score is based on a visual assessment with being 1 upright and 9 being flat on the ground.



Figure 1. Hamilton committee members Steve Holden and Kathryn Robertson spreading nutrients just before incorporation