7.10 STUBBLE MANAGEMENT PRACTICES IN HRZ TO MINIMISE THE REQUIREMENT OF BURNING AND POTENTIAL FOR YIELD AND SOIL BENEFITS (INVERLEIGH, MINGAY, LAKE BOLAC, PENSHURST VIC)

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Location:
Four long-term sites have been developed across the SW of Victoria, including trials at Inverleigh (Mt.Pollock), Mingay, Lake Bolac and Penshurst.

Acknowledgements:
The authors would like to thank the kind supporters of these trials, namely the National Landcare Program along with the Glenelg Hopkins and Corangamite CMAs. Additionally, much thanks to all farmer co-operators who assisted greatly in providing paddock area to conduct each of these trials.

Rainfall :
Rainfall data for each site is taken from the nearest measuring point:
Mt.Pollock (548 mm Annual, 354 mm GSR),
Lake Bolac (543 mm Annual, 359 mm GSR),
Mingay (577 mm Annual, 371 mm GSR),
Penshurst (535mm Annual, 379 mm GSR).

Summary:
Stubble retention requires a careful understanding of the interaction between both mechanical operation and the environmental consequence. As with many practices, attention to detail forms successful outcomes, so in any stubble retention strategy, effective establishment using a purposely designed toolbar is critical in maximising yields. No real conclusions can be drawn from 2005 data, although the use of scratch tillage at the Inverleigh and Mingay sites showed some promise, but did come at a financial cost if implemented on raised-beds. Burning was not the best treatment in any of the trials, denoting that success does come with hard work and long term benefits.

Background:
The purpose for undertaking this vast and complex trial is to assess the potential to minimise the impact that burning may have on the environment and seek alternatives to this practice to realize yield and soil health improvements.

Objectives:
All four trials were aiming to evaluate what alternative stubble retention practices can be implemented into the cropping system, without incurring yield penalty or significant cost to the grower. Burning has been the traditional control tool used to manage high loads of stubble, but faces poor perceptions as a practice on the local environment and does not adequately contribute to improved soil health and biodiversity.

Methodology:
At each site, a number of stubble handling treatments were evaluated. Due to the difficulties of assessing stubble yields from harvested treatments, only one replicate of each treatment was assessed, offering no randomization.

With initiation of each of these trials not occurring until late March 2005, some of the stubble treatments that may have benefited from immediate post harvest management, may not have realized their true potential, allowing for some potential bias toward burning and stubble removal, where little breakdown or management at seeding was required.

Across three of the four locations, some difficulty with blockages occurred at seeding, due mainly to minimal autumn rainfall, which meant that there was minimal breakdown of the stubbles. The seeder chosen to sow three of the trials was fitted with reconfigured residue managers (although each of these additions was designed for use in wider rows found in summer crops). As initial seeding progressed with continuous blockages, wider row spacings were established from removal of some tines within each of the toolbar ranks.

Physical capabilities/trash handling is thus a critical component of seeding efficiency. Overhead satellite imagery at anthesis has shown each blockage and resultant lack of plant establishment following each of the treatments. These blockages impacted on plot yield.

Treatments:

Table 7-18: Treatment List For Each Stubble Retention Site – SW Victoria 2005

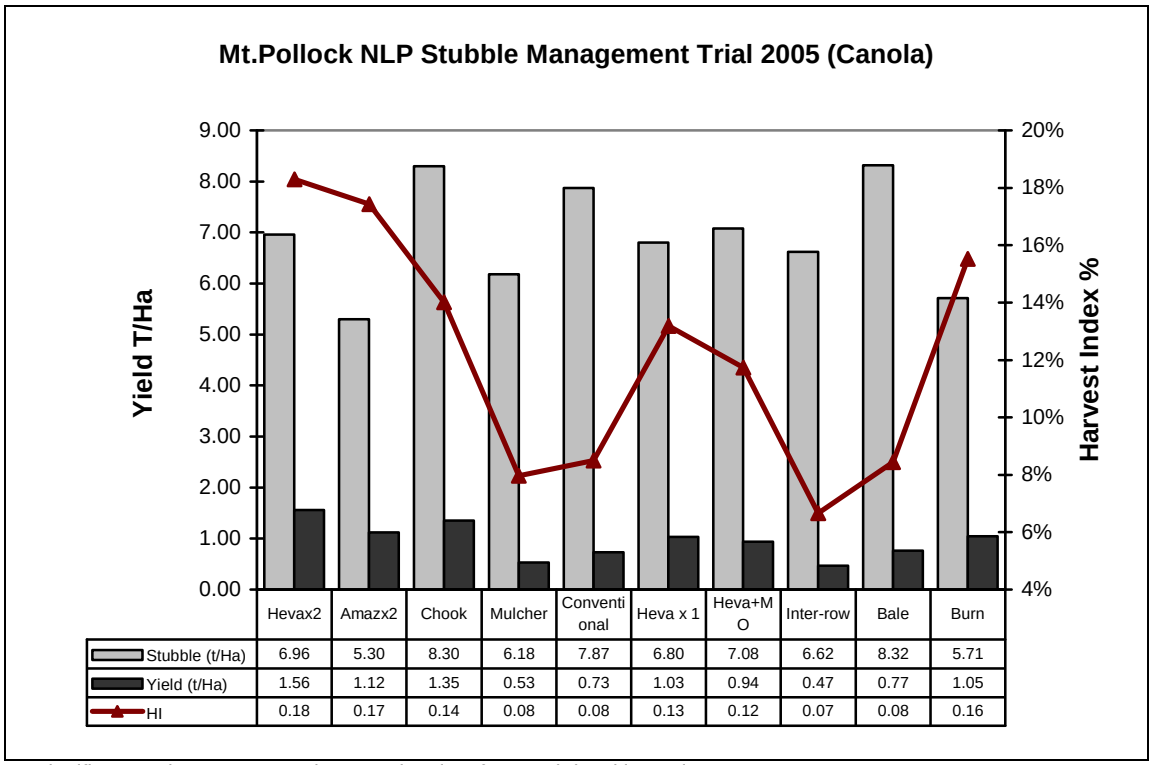
Trt/Location	Mt.Pollock	Mingay	Lake Bolac	Penshurst
Scratch Tillage – 2 passes (Heva Disc)	✓			
Catros Disc – 2 passes	✓			
Chook Manure + Catross Dics 1 pass	✓			
Mulcher	✓		✓	✓
Conventional Harvest	✓			✓ (direct drill)
Harvest Low				✓
Scratch Tillage – 1 pass	✓	✓	✓	✓ (disc)
Microbe Brew + Disc	✓		✓	
Inter-row skip seeding	✓		✓	
Bale & Remove	✓			✓
Burn	✓	✓ (+graze)	✓	✓
Chook Pellets				✓
Prickle Chain				✓
Previous Crop:	Barley	W Wheat	Barley	Wheat
Crop Sown:	Canola	Canola	Canola	Barley
Harvest Date:	27/12/05	28/12/05	21/12/05	18/1/06

Results and Discussion

Results from each site were confounded by site variability and lack of replication. When analyzing the Inverleigh site (Figure 7-12), findings showed that light incorporation offered better results in terms of crop yield than the control (Burn).

Plot sizes at this location were approximately 1.6ha each. Mechanical incorporation offered a yield benefit over surface retention. In the relatively dry year, surface treatments such as slashing resulted in off site stubble losses due to wind, possibly reducing the surface protection against moisture evaporation. Other poor yields may have been attributed to weak establishment from residues falling across the seeding path when an abundance of stubble lay on the surface, however there appeared to be no significant difference in establishment across all treatments.

Figure 7-12: Biomass Comparison For Grain And Residue Yield With Resultant Harvest Index (Mt.Pollock).

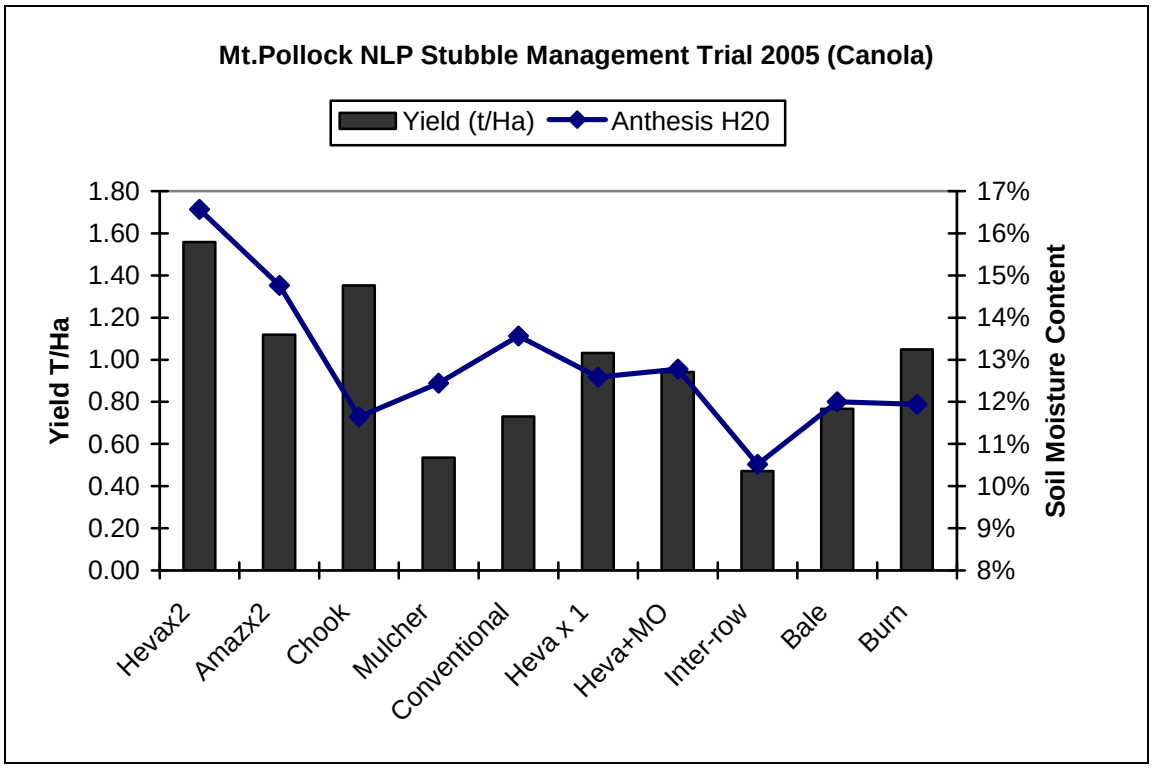


	Hevax2	Amazx2	Chook	Mulcher	Conventional	Heva x 1	Heva+MO	Inter-row	Bale	Burn
Stubble (t/Ha)	6.96	5.30	8.30	6.18	7.87	6.80	7.08	6.62	8.32	5.71
Yield (t/Ha)	1.56	1.12	1.35	0.53	0.73	1.03	0.94	0.47	0.77	1.05
HI	0.18	0.17	0.14	0.08	0.08	0.13	0.12	0.07	0.08	0.16

No significant variances occurred across the sites for weed densities or insect pressures.

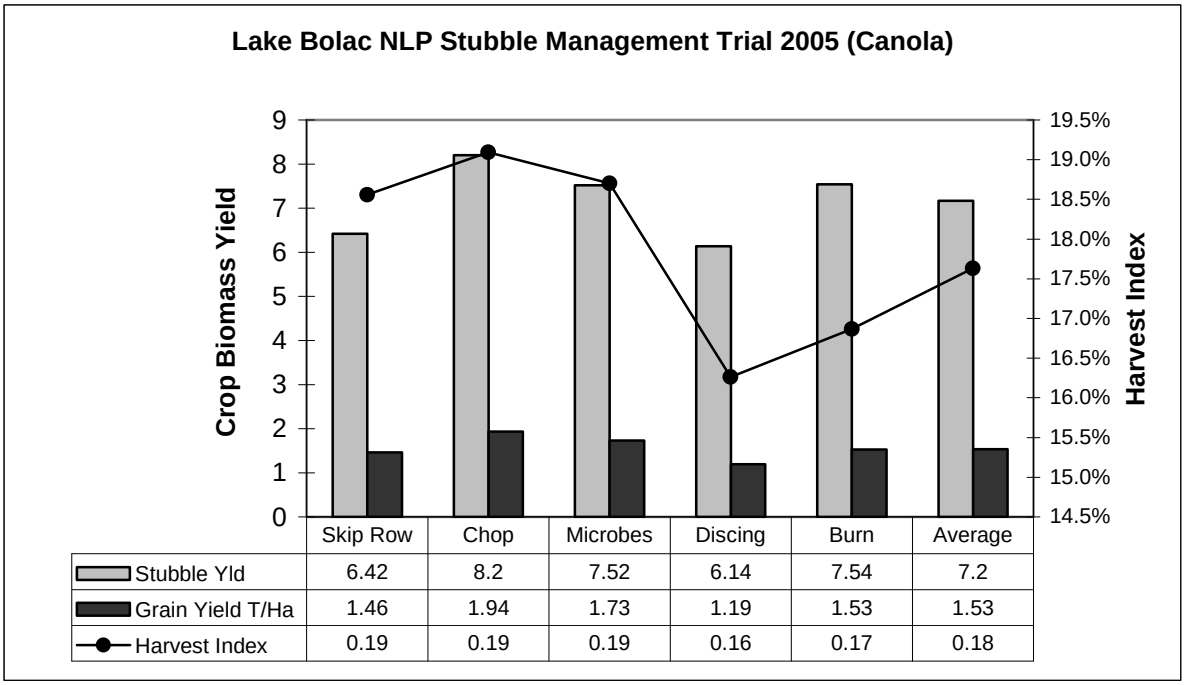
To determine if each of the mechanical treatments had an impact on moisture retention, various soil samples were collected during the season with Figure 7-13 showing yield responses in comparison to soil water content. Examining this data offers a very rough trend, although when comparing the addition of chook manure to the inter-row seeding, both had low soil moisture percentages, whereas yields were comparably different.

Figure 7-13: Grain Yield As A Comparison To Soil Moisture Content – Mt.Pollock



Similarly to Inverleigh, the Lake Bolac site showed grain and stubble yield variances as can be seen in Figure 7-14. The highest yielding treatment at this site was however the chopped treatment post harvest, which retained the stubble (that which remained after all wind events) at the soil surface. In this treatment, the stubble yield and harvest indices were also the highest.

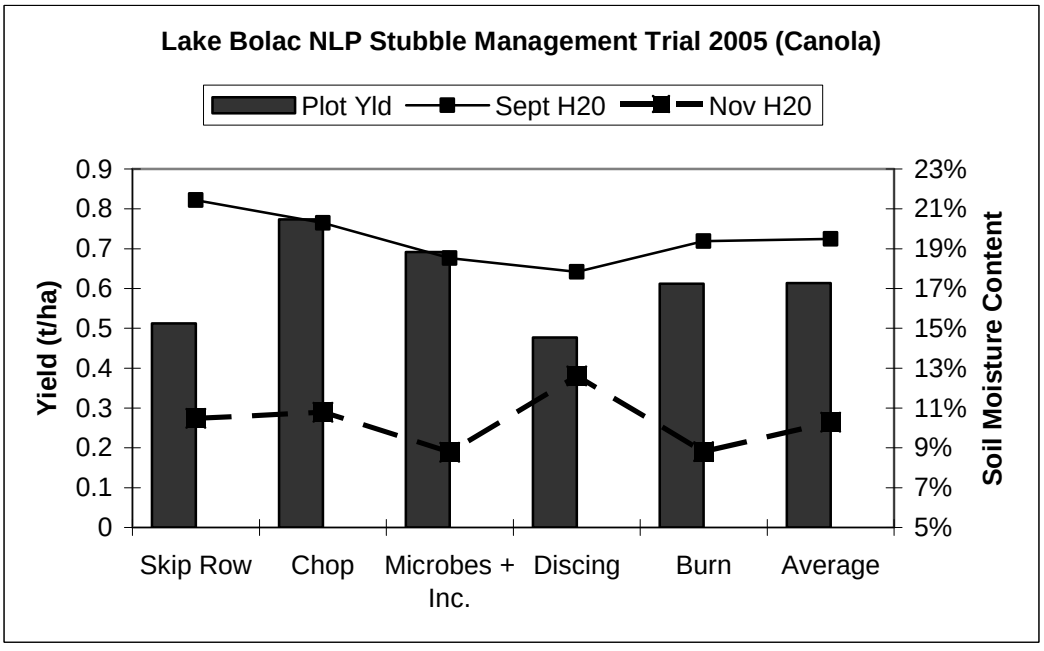
Figure 7-14: Biomass Comparison For Grain And Residue Yield With Resultant Harvest Index



	Skip Row	Chop	Microbes	Discing	Burn	Average
Stubble Yld	6.42	8.2	7.52	6.14	7.54	7.2
Grain Yield T/Ha	1.46	1.94	1.73	1.19	1.53	1.53
Harvest Index	0.19	0.19	0.19	0.16	0.17	0.18

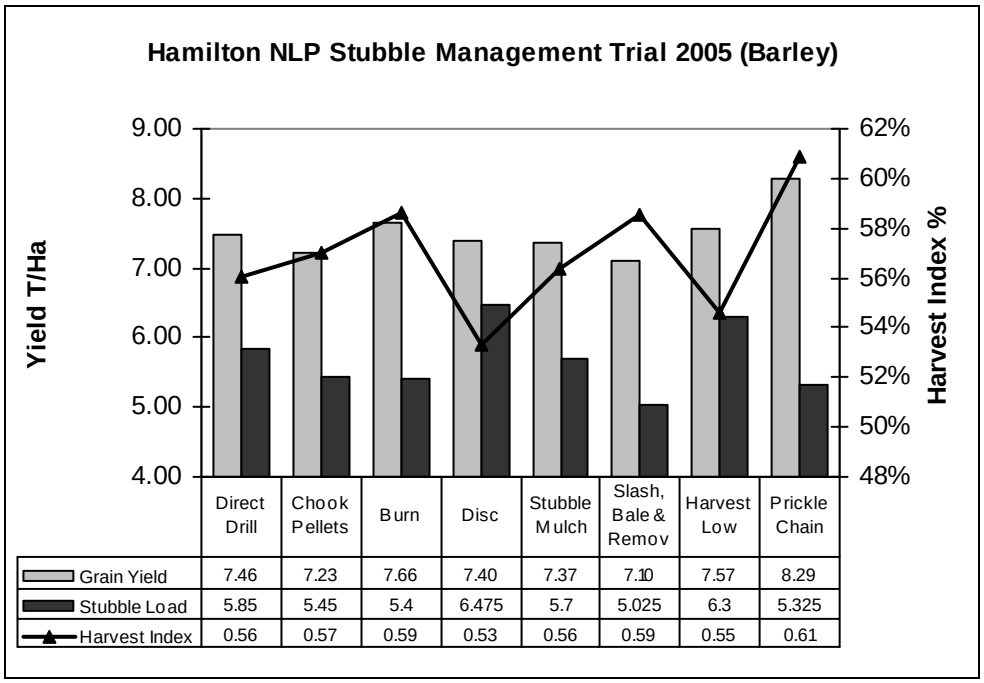
Discing at this site appeared to offer the lowest yield, which when compared to soil water content, showed considerable deficits in September (Figure 7-15), although anthesis soil water content was greatest. When reviewing Figure 7-15, no real conclusion can be drawn as soil moisture content was not consistent in its crop yield response. Initial hypothesis suggested that when there is greatest soil moisture retention through minimising losses with surface coverage and increased infiltration, then yields would respond to this available water. Unfortunately the dry season did not offer enough potential to show vast difference, or that the infancy of this trial cannot allow for true comparison until completion in 2007.

Figure 7-15: Grain Yield As A Comparison To Soil Moisture Content – Lake Bolac



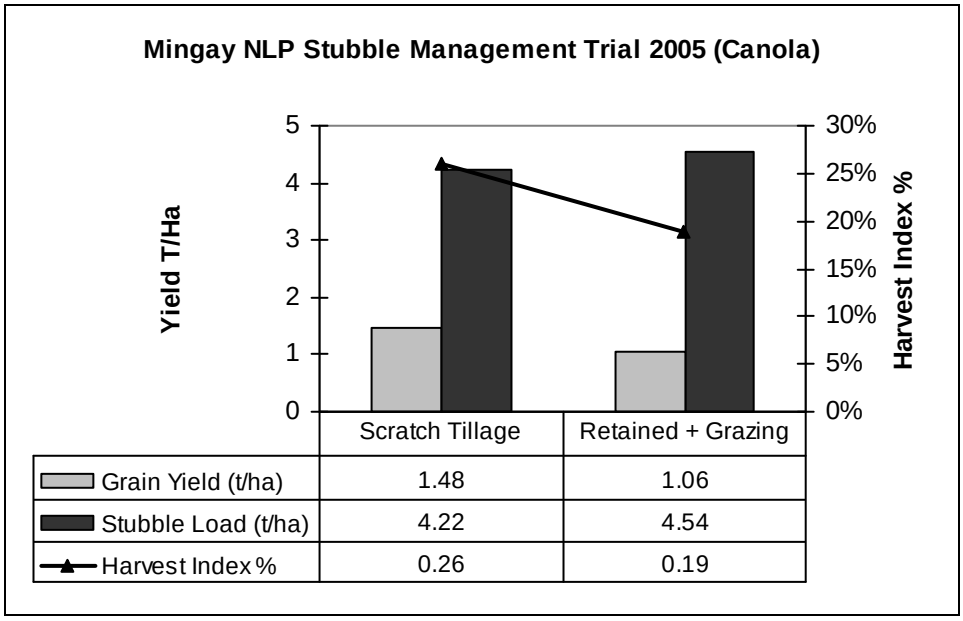
When examining the Hamilton site (Figure 7-16), yield differences were not as significant when compared to the previous sites. The trial was sown to barley using farmer owned machinery modified for stubble retention. Prickle chaining the 2004 wheat stubble did show the highest yield for the trial, although little difference in yield was recorded across all treatments. Where stubble was surface retained at this site from 2004, some of this residue carried over into the following stubble loads, potentially biasing these Harvest Indices. The key finding from this site is that good yields with stubble retention can be achieved throughout high rainfall locations. Barley stubble when cut low and processed through the harvest operation posed few problems in achieving high yields. A key finding from this site, suggests that each crop will require its own management system, which will be influenced by the environmental conditions throughout the year.

Figure 7-16: Biomass Comparison For Grain And Residue Yield With Resultant Harvest Index - Hamilton



The Mingay trial was the first sown using the reconfigured seeder. This posed some variable establishment across both treatments, however it appears that the scratch tillage treatments showed again a positive response when compared to the control. The data from this site may be limited, but did offer a good understanding of what was needed to ensure that the operation could take place using residue managers in seeding the crop.

Figure 7-17: Biomass Comparison For Grain And Residue Yield With Resultant Harvest Index - Mingay



No statistical analysis has been included or discussed throughout this report. Costs for each operation has been considered but again not discussed in this summary of results. Most operations that required soil disturbance have an upward cost of $50/ha which includes reforming of raised beds where necessary. Surface treatments were costed up to $25/ha, while burning was costed at $5/ha.

This project is ongoing until the end of 2007.
It is therefore hoped that stronger trends can be determined and better recommendations given