A Murrumbidgee Catchment Management Authority Project

'*Profitable Farmers, Sustainable Systems, Healthy Landscapes*'

Cereal Stubble Management Project
Summer of 2004 / 2005

Managed by

Harden Murrumburrah Landcare Group

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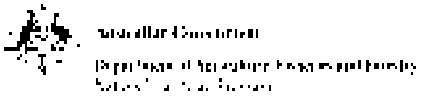


Chandlers

Harden Murrumburrah Landcare Group

Cereal Stubble Management Project – Summer of 2004 / 2005

Introduction:

The Harden Murrumburrah Landcare Group (HMLG), which is located in the south west slopes region of NSW undertook a project to investigate alternative management options for cereal crop stubbles.

The region is generally classed as a mixed farming area, with most farms cropping between 50 and 60 % of total farm area. Of this crop area, around 60 % is cereal, primarily wheat but also including a small area of oats and triticale.

The current management of stubbles is to graze them after harvest then burn the residual stubble at some point prior to sowing the paddock again the following autumn. There are many variations on this general practice and HMLG members were keen to look at management techniques that would allow them to more fully utilise the stubble resource without having a negative impact on their crop production.

HMLG members felt that it was important to investigate the biological products that are being promoted as assisting with stubble breakdown and to look at mechanical treatments as key parts of the project. The other key element of the project was to look at ways to remove the requirement to burn stubbles.

As part of the project a survey of HMLG members was conducted in early 2005, the results of which are outlined in this report.

Key Objectives:

- How to manage stubble efficiently and cheaply.
- What impacts do various management techniques have on soil moisture and nitrogen levels.
- What impacts do various management techniques have on ground cover.
- A survey to investigate what management techniques have been attempted on individual farms and what was the result? For what reasons are these methods still being used or dropped (eg.workload, logistics, economics, environment, machinery).

Materials & Method:

As part of the National Landcare Program project, "Profitable Farmers, Sustainable Systems, Healthy Landscapes" two non replicated on farm demonstrations were established to investigate the effect of various techniques for managing cereal stubbles.

Mechanical treatments:
Prickle Chain one and two passes
Harpers Stubble Cruncher one and two passes

Nitrogen and Biological treatments:
BioAg – Digest It 4L/ha
Nutri–Tech Solutions Stubble Digestion Program –10L/ha brewed product
Nitro Humus 40 L/ha + Sugar2kg/ha
Nutri Soil 5L/ha

Demonstration Layout

Table 1. Demonstration Layout

	A	B	C	D
1	BioAg 4 L/Ha + Harpers Stubble Cruncher Once	NitroHumus + 2kg Sugar + Harpers Stubble Cruncher Once	NutriTech + Harpers Stubble Cruncher once	Nutrisoil + Harpers Stubble Cruncher Once
2	BioAg 4 L/Ha+ Harpers Stubble Cruncher Twice	NitroHumus + 2kg Sugar + Harpers Stubble Cruncher Twice	NutriTech + Harpers Stubble Cruncher Twice	Nutrisoil + Harpers Stubble Cruncher Twice
3	BioAg 4 L/Ha + Prickle Chain Once	NitroHumus + 2kg Sugar + Prickle Chain Once	NutriTech + Prickle Chain Once	Nutrisoil + Prickle Chain Once
4	BioAg 4 L/Ha + Prickle Chain Twice	NitroHumus + 2kg Sugar+ Prickle Chain Twice	NutriTech + Prickle Chain Twice	Nutrisoil + Prickle Chain Twice

Wallendbeen Site description – In 2004 the paddock was sown to H45 wheat at 100 kg/ha. The crop yielded 4.5 t/ha. The demonstration site was located on a uniformly sloping area of the paddock which had an easterly aspect. The soil type changed slightly moving down the hill with heavier clay soils toward to top of the hill moving gradually to lighter loam soils. There were no sheep camps or tracks through the site.

Jugiong Site description – In 2004 the paddock was sown to Diamondbird wheat at 70 kg/ha. The crop yielded 3.0 t/ha. The trial was located on an undulating area of the paddock. Soil type varied from heavier red soils on the ridges to lighter greyer soils in the gully areas.

Prickle chain

Stubble cruncher

Results:

Wallendbeen

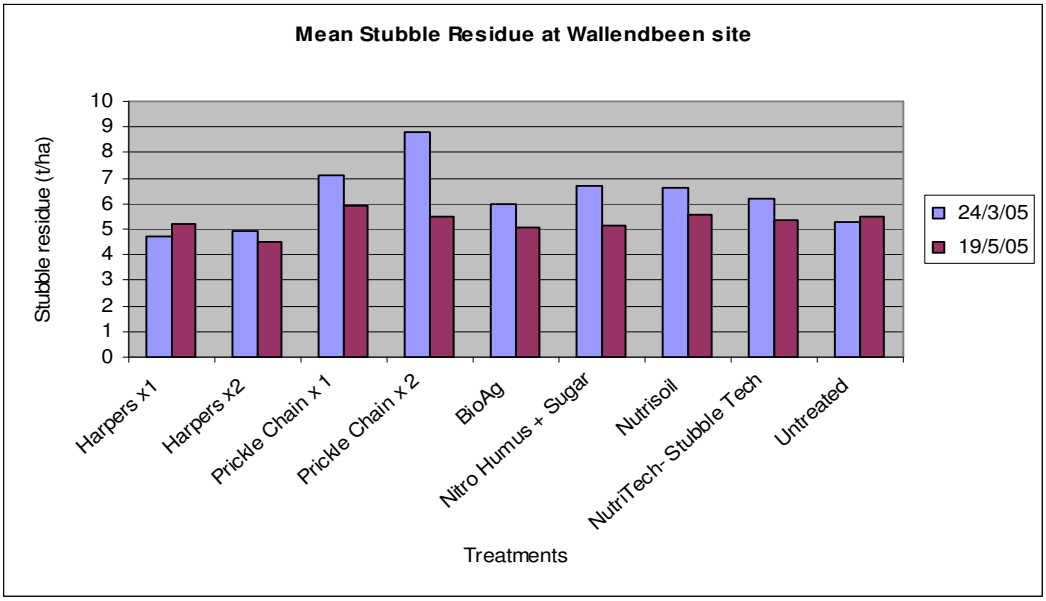
Stubble samples were collected and weighted at two dates in an attempt to determine the rate of breakdown.

Table 2. Mean stubble remaining (t/ha)

Mean for each treatment (t/ha) 24/3/05	
Harpers x1	4.7
Harpers x2	4.9
Prickle Chain x 1	7.1
Prickle Chain x 2	8.1
BioAg	6.0
Nitro Humus + Sugar	6.7
Nutrisoil	6.6
Nutri-Tech Solutions	6.2
Untreated	5.3

Mean for each treatment (t/ha) 19/5/05	
Harpers x1	5.2
Harpers x2	4.5
Prickle Chain x 1	5.9
Prickle Chain x 2	5.5
BioAg	5.1
Nitro Humus + Sugar	5.1
Nutrisoil	5.6
Nutri-Tech Solutions	5.3
Untreated	5.5

Graph 1. Mean stubble residue t/ha



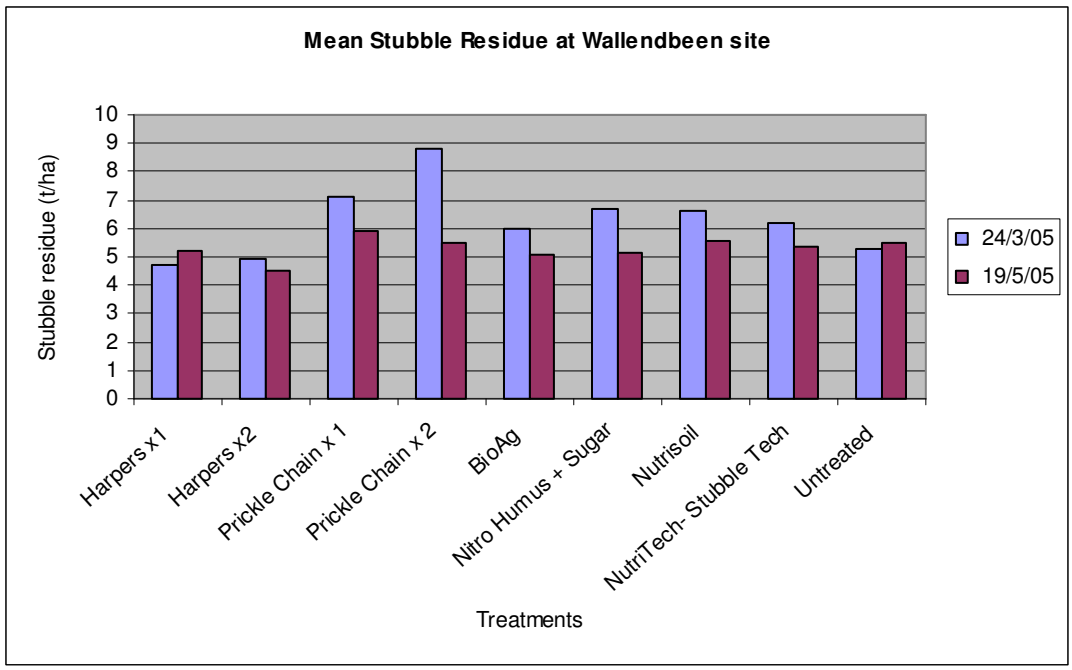


Table 3. Basic Treatment Costs $/ha

	Costs		$/ha
Harpers Stubble Cruncher	Machine Hire	$	4.00
	Labour/Contractor	$	8.00
	Total	$	12.00
Prickle Chain	Contractor	$	11.50
	Total	$	11.50
Nutri soil	Labour/Machinery	$	8.00
	Product	$	6.00
	Total	$	14.00
Nutri Tech Solutions	Labour/Machinery	$	8.00
	Product		$12 - $20
	Total		$20 - $28
Bio Ag Digest it	Labour/Machinery	$	8.00
	Product		$75 - $86
	Total		$83 - $94
Nitro Humus + Sugar	Labour/Machinery	$	8.00
	Product	$	120.00
	Total	$	128.00

Rainfall at Wallendbeen 1/2004 –6/2005

Jan	Feb	Mar	Apr	May	Jun 04
23	27	0	3.5	27	88.5
Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
58	71	35	36	76.5	63.5
Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun 05**
40.5	81	18	5	2	119.5

Jugiong

Several factors had a combined negative impact on the Jugiong site which prevented any reportable data from being collected. Low speed of travel was an issue with the stubble cruncher, heavy winds blew significant areas of stubble away and onto other plots and the location of a tree near the site encouraged sheep to camp on one section of the trial area.

Discussion/Observations:

As the trial was a non replicated demonstration site no statistical analysis was applied. The following is a discussion of the measurements that were taken and key observations from the project. Again these discussions relate primarily to the Wallendbeen site.

There was a visual difference between the two mechanical treatments. The Harpers stubble cruncher appeared to cut the stubble into smaller pieces 10-15cm and the stubble lay flat on the ground. The Prickle Chain pushed the stubble over however did not knock all the stubble over and did not cut the stubble into pieces to the same extent as the Harpers Stubble Cruncher. As a consequence the stubble treated with the Harpers Stubble Cruncher appeared to break down faster and the samples collected were in fact lighter than the stubble treated with the prickle chain. Two treatments with the Stubble Cruncher gave the best final results leaving 4.5t/ha of stubble compared to 5.2t/ha left in the untreated area. However it should be noted that some broken down stubble had blown across the paddock and the measurement taken on the 19/05/05 may not be entirely accurate due to this factor. There did not appear to be any visual difference between the Nitrogen and biological treatments and the untreated area.

The paddock was stocked heavily over the summer with both sheep and cattle, this made a huge contribution to stubble knockdown and breakdown. After stock had been in the paddock the stubble appeared to have been broken down into smaller pieces and was laying flat on the ground. The stock were supplementary fed with high protein silage. This may have increased their consumption of stubble even though the feed value of the stubble was very low at 1.7% crude protein and 4.6% metabolisable energy. By June 2005 the stubble residue was light enough to sow directly into in 2005 and burning was not required. The paddock was sown to H45 wheat @ 30 kg/ha, Undersown with a lucerne, chicory and clover pasture.

Deep N soil tests were taken in each block, it was hypothesised that there would be very little difference between treatments as there had not been a sufficient amount of time, or enough summer rainfall for mineralisation. The results show a trend of the stubble cruncher treatments producing higher levels of N as seen in table 4, however it was felt that the primary driver of this difference was soil type. The results reflected soil type with the heavier clay soil showing higher available N while the clay loam soils showed slightly lower available N. There was no observable trend between N availability and any of the biological treatments.

Table 4. Results from 0 – 60cm Deep Nitrogen tests = kg of N

	A	B	C	D
1	BioAg 4 L/Ha + Harpers Stubble Cruncher Once **N=167**	NitroHumus + 2kg Sugar + Harpers Stubble Cruncher Once **N = 123**	NutriTech + Harpers Stubble Cruncher once **N=144**	Nutrisoil + Harpers Stubble Cruncher Once **N = 167**
2	BioAg 4 L/Ha+ Harpers Stubble Cruncher Twice **N = 144**	NitroHumus + 2kg Sugar + Harpers Stubble Cruncher Twice **N=159**	NutriTech + Harpers Stubble Cruncher Twice **N=83**	Nutrisoil + Harpers Stubble Cruncher Twice **N=104**
3	BioAg 4 L/Ha + Prickle Chain Once **N=53**	NitroHumus + 2kg Sugar + Prickle Chain Once **N=72**	NutriTech + Prickle Chain Once **N=94**	Nutrisoil + Prickle Chain Once **N=75**
4	BioAg 4 L/Ha + Prickle Chain Twice **N=60**	NitroHumus + 2kg Sugar+ Prickle Chain Twice **N=69**	NutriTech + Prickle Chain Twice **N=63**	Nutrisoil + Prickle Chain Twice **N=26**

(N = Nitrate + Ammonium * Bulk density * Depth)

Table 5. Mean Nitrogen results for each treatment=kg/N

Treatments	Mean Nitrogen
Prickle Chain one pass	73.5
Prickle Chain two passes	54.5
Harpers Stubble Cruncher one pass	150.25
Harpers Stubble Cruncher two pass	122.5

Application observations:

Several issues arose whilst conducting the demonstrations that are worth covering.

Using Biological products;

Two of the Biological sprays required urea to be dissolved into the brew, this proved very difficult in some spray tanks and required preferably warm water or large volumes of water and agitation to be successful. At one site the filters on the nozzles were blocked with the Nutri–Tech Solutions Stubble digestion product, it is recommended by Nutri-Tech Solutions that large orifice nozzles (producing coarse droplets) and high water rates be used and pressure no greater than 60 psi.

It was recommended for the BioAg treatment that the stubble be incorporated into the first few centimetres of soil then sprayed with the product. It should be noted that neither of the mechanical treatments used with this product incorporated stubble into the soil, they just lay the stubble on top of the soil surface.

Mechanical Treatments;

At the Jugiong site the Harpers Stubble Cruncher was not terribly effective at laying stubble flat on the ground however at the Wallendbeen site it was more successful than the prickle chain. It is thought that its success was related to speed as the machine was pulled at a higher speed at the Wallendbeen site. Growers who use this machine are best advised by the manufacturer as to how to operate it effectively.

Field Day:

On the 4th of May HMLG held a field day at the Wallendbeen site. This day was attended by 50 growers who contributed to plenty of good group discussion. This highlights the interest and importance that growers in the region place on cereal stubble management. From these discussions and the survey results the need for further research on this issue has been highlighted.

Field day at Wallendbeen 5/05

Prickle chain v stubble basher

Survey:

A survey was conducted to determine current management techniques for cereal stubble and to determine the direction of future demonstrations in the Harden area. There were 42 responses from growers that gave a good representation of the cross section of growers in the HMLG. The key finding of the survey was that many growers use different terminology to describe different aspects of stubble management. The biggest area of confusion is over the use of the word "retention". Most growers (86%) retain stubble for a period of time, however many growers (86%) still burn it prior to sowing the next seasons crop. The reasons for managing stubble in this way are listed below.

Main reasons for retaining stubble:
86% Ground cover/prevent wind and water erosion
67% increase organic matter
60% Prevent nutrient loss
57% Encourage stubble breaks down and return nutrients to soil
55% Stock feed
36% Reduce pollution form burning
31% No- till &/or tram tracked cropping systems

Main reasons for burning stubble:
67% Too thick or disoriented to sow in some years
64% For disease control
61% Weed control / seed bank management
49% For Pre-emergent herbicide use
34% Management ease

Other Notable responses:
79% acknowledged they used some form of grazing to manage their stubbles
62% of respondents used a supplement when grazing stubbles
12% of people surveyed said they had used a biological product
100% said they supported further research,
29% said mechanical treatment research, 20% said research using stock to breakdown stubbles, 4% said biological treatment research, others ideas included comparing cereal varieties and break down rate, harvesting at different heights.

Acknowledgements:

The project committee would like to thank the growers who co-operated with the project by hosting the sites, Chris Blanchard and Peter & Jeremy Webber. Thanks to Col Harper and Hugh Flanery for organising the mechanical treatments and to Col for transporting a Stubble Cruncher over for the field day. Thank you also to Terry Koen, Cowra Research Centre,Central West Region, Dept Natural Resources. who collated the survey results, BioAg Pty Ltd who donated their product in this trial and finally thank you to all the Harden Murrumburrah Landcare Group members & committee who supported this project by completing survey forms and assisting in management of the project and planning the 2006 project.
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