Monitoring of no till cropping against grazing in winter and summer.
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Background:
A paddock scale comparison was established to monitor and quantify the effects of different crop and grazing interactions on a farm in South west Victoria. The interest was to compare the 'benefits' and 'costs' associated with two main issues over a period of time. These main issues to compare were:

- using livestock in the cropping program, in winter and/or summer compared to removing them permanently from the cropping system
- removing burning as a method of managing excessive stubble loads, meaning either inter-row sowing or grazing would be needed to manage the remaining stubble.

Apart from these broad issues, the tactical management decisions were made by Troy. Grain and Graze only recorded the actions taken and measured some of the impacts. Troy's decisions were based on the situation he confronted at any point in time and the adoption of new technologies and approaches.

The trial commenced towards the end of 2005. A 15.6 ha paddock that had been treated the same for many years was divided into three areas. Three treatments were applied. These were:

- **No till technology**, which excluded livestock. Wide row spacing (14') was used with the intention of leaving the stubble standing and sowing in between the rows the next year.
- Using **supplements to enhance the consumption of the stubble by livestock (called treatment)**. All other treatments were to remain the same.
- A **control**, using traditional district practice. This involved conventional row spacing (7'), burning when necessary and grazing the stubble after harvest.

Soil testings of the three areas showed the site was remarkably similar (appendix 1).

Evolution of the trial

2005

The crops yielded the same, with weed and stubble mass also very similar. Significant grazing was gained by grazing the stubble.

The main comparison in 2005 was the use of an additive for stock grazing stubble. Detailed monitoring showed the additive had no impact on liveweight compared to not using the additive. It was not continued in following years.

However Troy was becoming more concerned about the annual ryegrass resistance. Given the no till treatment sown at 14' row spacing had the same yield as 7' row spacing, he decided to sow one of the grazing treatments at 14" and use pre emergent chemicals (which cannot be used successfully on 7' row spacing).

2006

Drought and late season frost meant grain yields were much lower than expected. Because of the shortage of fodder, the remaining stubble was baled and sold, negating the need for burning.

There appeared to be an increase in weeds in the treatments because of grazing over summer. Troy's fear of resistance developing with post emergent herbicides used for ryegrass control also appeared well founded with resistance to Tristar confirmed.

The technology changes in 2006 were:

- Use of trifluralin at 14' row spacings
- the use of press wheels at 14' row spacing
- the decision to graze the crop over winter (except for the no till treatment)

Penetrometer results from August 2006 are presented (figure 1). A range of between 1000 kpa and 2000 kpa is reported to be ideal for plant root growth.

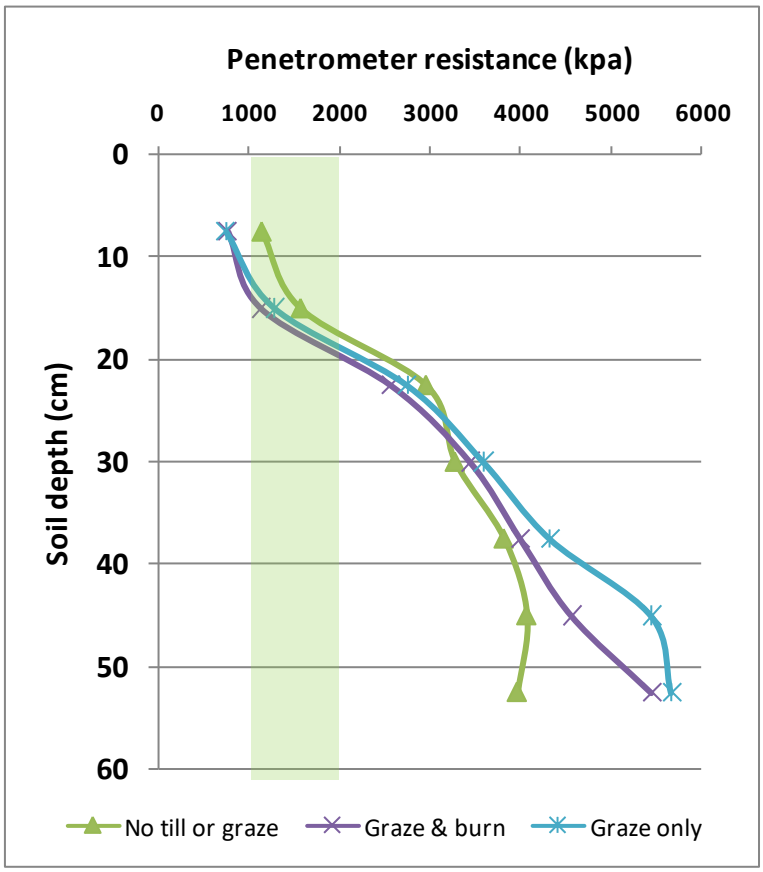


Figure 1: Penetrometer resistance under three treatments (August 2006)

2007

The confirmation of post emergent weed resistance required all treatments to be sown at 14' row spacings (so trifluralin could be used). Grazing treatments occurred in winter and summer.

Grain yield varied between 2.5 t/ha and 3.3 t/ha. The reasonable stubble loads meant burning was used on the control for the first time.

2008

Some green feed and grain left in the stubble that was grazed. The no till treatment was sprayed in Feb to control weeds, but surprisingly the ryegrass after the break was nearly as bad as the grazed areas.

The main technology change in 2008 was all paddocks were treated (spraying, sowing, spreading) with RTK autosteer, in an move to implement full controlled traffic farming. The sowing width was a changed to 375mm spacing and disc openers were fitted.

The paddock was sown to peas, so no grazing occurred. Peas were included in the rotation to increase soil nitrogen and provide an alternative weed control approach (because of the later sowing and herbicide chemistry).

Establishment was adequate and the no till paddock grew considerably more dry matter in the spring period than the grazed treatments (photo 1 & 2), suggesting a significantly higher potential grain yield. However this did not materialise.

Photo 1: Peas in no till treatment (visible drum is stacked on top of a second drum)

Photo 2: Peas in graze and burn treatment (one drum only)

Physical characterisation of the soil was undertaken by DPI in June 2008 (appendix 2). They concluded there was no difference in soil condition that could be attributed to the different treatments.

Additional penetrometer reading were taken in August 2008, suggesting there may be differences emerging between the no till treatments and the grazed treatment, with the no till showing considerably less resistance at depth (figure 2). However this difference may be due to increased moisture retention in the no till system.

Beneficial predatory inspects were measured in the three treatments in Spring 2008 by Neil Hives of IPM Technologies. Predatory mites (but not many) were found in all three treatments. There was also no major observable difference in carabid beetle populations (table 1).

Table 1: Carabid beetle populations under peas (average of 7 monitoring sites per treatment).

Treatment	Average	Range
No till, no graze, no burn	5.7	0 to 17
Graze and burn	7.7	0 to 19
Graze, no burn	2.7	0 to 7

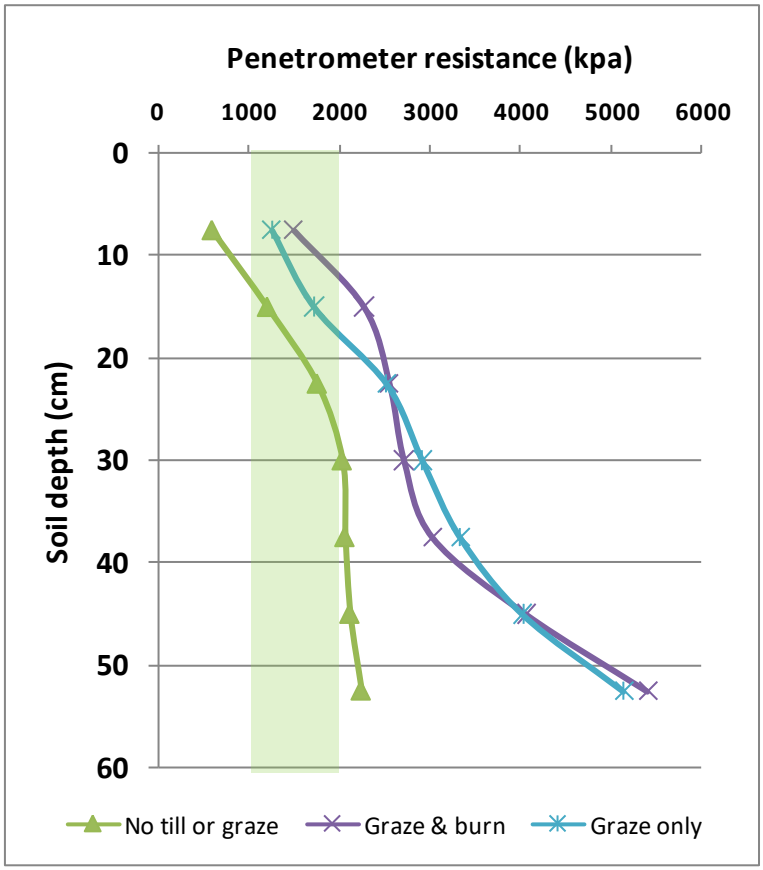


Figure 2: Penetrometer resistance under three treatments (August 2008)

2009

Barley was sown in 2009 to align these paddocks with the overall rotation on the farm.

The season was largely uneventful until November, where five days of 35+ degrees 'cooked' the plants. Yield was severely affected.

2010

Canola was sown in all three treatments. A large and persistent slug population in the no graze no burn treatment resulted in a failure of the canola crop, despite a repeated baiting program and resowing. The two grazed treatments showed a noticeable lack of slug population and the graze/no burn treatment did not need baiting (photo 3). It is speculated this was due to the sheep trampling the soil, destroying their habitat, physically damaging the slugs and the eggs. No grazing occurred in winter.

The no graze no burn (no-till) paddock was sown to chickpeas in September but this failed due to very wet conditions (164 mm in September and October). The paddock was then sown to safflower in November 2010 but was too poor to harvest.

An unusually wet late Spring and Summer created very challenging conditions for harvesting. The canola in the remaining two treatments were not windrowed but was affected by hail. An insurance assessment estimated yield at 1.98 t/ha. The remaining canola (after the insurance claim) was direct headed, but yields were less than anticipated.

Spraytopping was used for the first time to control annual ryegrass.

Photo 3: Failed canola crop in no graze, no burn treatment (left) compared with graze and burn treatment (right).

2011

Wheat was sown in mid June. Grazing was avoided in winter because of the later sowing and a dry August (18 mm). This was a wise decision given the low rainfall in September (20 mm).

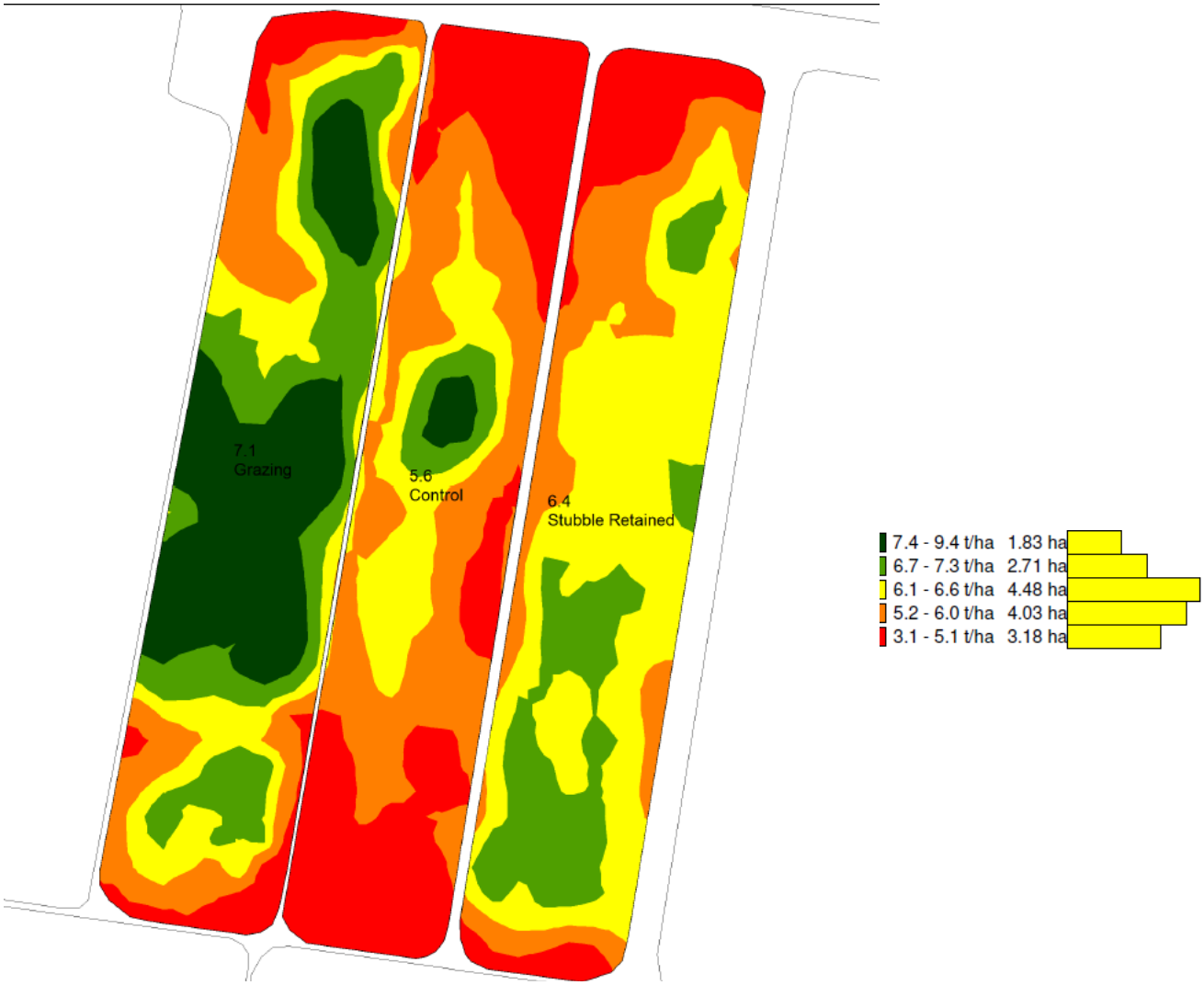
The low rainfall in August and September was thought to have affected potential grain yield. No spraytopping was undertaken.

2012

Slightly late break in May with average winter rainfall. Spring rains were average to above average, leading to a reasonable finish to the season.

Spraytopping was only undertaken on the No Till paddock, as grazing of the crop in inter delayed maturity and prevented optimum timing of chemical application.

The yield map appears to show distinction between treatments.



Yield map for Graze no burn (left), Graze and burn (middle) and no till (right).

2013

Received a good break. The season was even season with very soft finish. This probably contributed to favorable conditions for bean to yield well, however it prevented spraytopping because the maturity pattern of ryegrass was stretched over a long period.

Microbial soil testing of the three paddocks in November 2013 showed no obvious differences in results across a range of tests (appendix 3).

2014

2014 was a challenging year. The break was a bit early and follow up rains led to a wetter winter than the past few years. However the season cut out at the end of August, with little significant rain until November and December.

Slug damage was evident again in the No Till treatment. The graze and burn resulted in the best growth and reached maturity a few days earlier.

Traditional soil test were taken in March 2014 (appendix 4). There is little differences in the soil test results except for slightly higher phosphorus (Olsen P) and potassium (Colwell K) on the grazing only and grazing and burn paddocks.

Troy Missen Grazing V no till

Year	No till, no graze, no burn Wide rows press wheels	7 inch row spacings & harrows (graze & burn)	7 inch row spacings & harrows (graze, no burn)	14 inch row spacings (graze, no burn) Wide rows press wheels
2004	**Canola**	**Canola**	**Canola**	
	5.3 ha	**5.2 ha**	**5.1ha**	

Year	No till, no graze, no burn	7 inch row spacings (graze & burn)	7 inch row spacings (graze, no burn)	14 inch row spacings (graze, no burn)
2005	GSR April-Oct 275mm	GSR April-Oct 275mm	GSR April-Oct 275mm	
	Barley Sown at 85 kg/ha MAP at 85 kg/ha Roundup knockdown No post emergent weed control 110 kg/ha urea on 11th Sept	**Barley** Sown at 85 kg/ha MAP at 85 kg/ha Roundup knockdown No post emergent weed control 110 kg/ha urea on 11th Sept	**Barley** Sown at 85 kg/ha MAP at 85 kg/ha Roundup knockdown No post emergent weed control 110 kg/ha urea on 11th Sept	
	Crop – 139 planst/m2 ARG – 4 plants/m2 Others weeds – see spreadsheet	Crop - 150 planst/m2 ARG – 9 plants/m2 Others weeds – see spreadsheet	Crop - 168 planst/m2 ARG – 6 plants/m2 Others weeds – see spreadsheet	
	Penetrometer readings (17/08/05) – see spreadsheet	Penetrometer readings (17/08/05) – see spreadsheet	Penetrometer readings (17/08/05) – see spreadsheet	
	No winter grazing	No winter grazing	No winter grazing	
	Grain yield – **5.6 t/ha @$230/t**	Grain yield – **5.4 t/ha @$230/t**	Grain yield – **5.4 t/ha @$230/t**	
	No treatment	Control & grazing – see detailed grazing data in spreadsheet – but key finding are: • **Grazed 35 days large xb ewes** • **SR 34.6 DSE/ha** • Liveweight gain **211 gm/day** • Stubblemax $2.20/kg	Stubblemax treatment & grazing see detailed grazing data in spreadsheet – but key finding are: • **Grazed 35 days** • **SR 32.4 DSE/ha** • Liveweight gain **211 gm/day**	
	Remaining stubble • 1700 kg/ha (no windrows)	Remaining stubble • 1600 kg/ha (no windrows)	Remaining stubble • 1600 kg/ha (no windrows)	

Year	No till, no graze, no burn WHEAT	7 inch row spacings (graze & burn)	7 inch row spacings (graze, no burn)	14 inch row spacings (graze, no burn)

2006	Rainfall 281.5 GSR 236.5 mm, Sept Nov 59 mm	Rainfall 281.5 GSR 236.5 mm, Sept Nov 59 mm		Rainfall 281.5 GSR 236.5 mm, Sept Nov 59 mm
	March – 1 lt/ha Powermax + 7 gm/ha Ally Presowing – 1 lt/ha Powermax + 2 2l/ha Triflur IBS Triflur$6.40/lt Powermax$8.00/lt Ally$0.09/gm	Pre sowing 1 lt/ha glyphosate Sown with harrows		Presowing – 1 lt/ha Powermax + 2 2l/ha Triflur IBS Triflur$6.40/lt Powermax$8.00/lt Ally$0.09/gm
	90 kg/ha Whyla **wheat** 85 kg/ha MAP Sown with press wheels	90 kg/ha Whyla **wheat** 85 kg/ha MAP		90 kg/ha Whyla **wheat** 85 kg/ha MAP Sown with press wheels
	Crop – 148 planst/m2 ARG – 22 plants/m2 Others weeds – see spreadsheet	Crop - 183 planst/m2 ARG – 42 plants/m2 Others weeds – see spreadsheet		Crop - 143 planst/m2 ARG – 73 plants/m2 Others weeds – see spreadsheet
		1.5 l/ha Tristar (ineffective)		
		14/08 – grazed with **380 XBD ewes** + **500** one mth old lambs for **2** days. Grazed low lambs ave price $53/hd		11/08 – grazed with **380 XBD ewes** + **500** one mth old lambs for 3 days. Grazed low
	Grain yield – **1.4 t/ha** **Grain price $205/t**	Grain yield –**1.25 t/ha** **Grain price $205/t** Troy says frosted because of delay in ear emergence – but may also be GS at grazing		Grain yield – **1.04 t/ha** **Grain price $205/t** Troy says frosted because of delay in ear emergence – but may also be GS at grazing
	Stubble- no grazing/inter-row sown in 2007	Stubble- harvested low and **baled straw**. Insufficient to burn. Straw$20/bale@3.25 bales/ha (1.3bales/ac)		Stubble- harvested low and baled straw Straw$20/bale@3.25 bales/ha (1.3bales/ac)

Year	**No till, no graze, no burn**	**7 inch row spacings (graze & burn)**	**14 inch row spacings (graze, burn)**	**14 inch row spacings (graze, no burn)**
2007	GSR April-Oct 361mm April-Nov 495.5mm		GSR April-Oct 361mm April-Nov 495.5mm	GSR April-Oct 361mm April-Nov 495.5mm

	1/4/07 sprayed Powermax 1lt/ha Powermax $8/lt			
	2/5/07 applied 6.4mtr/ha chook manure		2/5/07 applied 6.4mtr/ha chook manure	2/5/07 applied 6.4mtr/ha chook manure
	Weeds 18/05/07 – 138 planst/m2 (57% less than control) – measurements taken from photos		Weeds 18/05/07 – 291 planst/m2 (control) – measurements taken from photos	Weeds 18/05/07 –348 planst/m2 (19% more than control) – measurements taken from photos
	17/5/07 sprayed 1.2 lt/ha Sprayseed & 1.8 lt Triflur X (IBS) Mckellar **wheat** @75kg/ha MAP@ 75kg/ha 14 in spacings and press wheels		17/5/07 sprayed 1.2 lt/ha Sprayseed & 1.8 lt Triflur X (IBS) Mckellar **wheat** @75kg ha, MAP@ 75kg ha 14 in spacings and press wheels	17/5/07 sprayed 1.2 lt/ha Sprayseed & 1.8 lt Triflur X (IBS) Mckellar **wheat** @75kg ha, MAP@ 75kg ha 14 in spacings and press wheels
			13/8/07 grazed **80 xbd** ewes & young lambs (ewes 80kg) for **7** days.	13/8/07 GS grazed **120 ewe lambs** (50kg) for **7** days.
	GS 31 on 19/8/07		GS 31 on 19/8/07	GS 31 on 19/8/07
			Feedtest: ME = 12.8, CP = 29.2% on 20/08	Feedtest: ME = 12.6, CP = 28.2% on 20/08
	2/9/07 31 l/ha EASY N		2/9/07 31 l/ha EASY N	2/9/07 31 l/ha EASY N
	Grain yield – **2.92 t/ha** **Grain Price $380/t**		Grain yield – **2.50 t/ha** Grain Price $380/t	Grain yield – **3.34 t/ha** Grain Price $380/t

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2008	GSR 223mm April to Nov Annual 352mm total	GSR 223mm April to Nov Annual 352mm total	GSR 223mm April to Nov Annual 352mm total
		Stubble Grain 122 kg/ha Green 650kg/ha Straw 3,600 kg/ha	Stubble Grain 86 kg/ha Green 425 kg/ha Straw 3,800 kg/ha
		Grazed 6th-14th March (8 days) 227 ewes ave wt 68kg Equivalent stock feed Oats $300/t Hay $400/t	Grazed 16th-23rd March (7 days) 227 ewes ave wt 68kg Equivalent stock feed Oats $300/t Hay $400/t
		Burnt on 10/4/08	
	21/2/08 spayed 0.4lt/ha glyphosate, 1.3lt Amicide	21/2/08 spayed 0.4lt/ha glyphosate, 1.3lt Amicide	21/2/08 spayed 0.4lt/ha glyphosate, 1.3lt Amicide
	11/06/2008 DPI soil assessment (appendix 2)	11/06/2008 DPI soil assessment (appendix 2)	11/06/2008 DPI soil assessment (appendix 2)
	9/8/08 sowed 150kg Kaspa **Peas** + 65kg MAP Sown with RTK autosteer (disc seeder / press wheels)	9/8/08 sowed 150kg Kaspa **Peas** + 65kg MAP Sown with RTK autosteer (disc seeder / press wheels)	9/8/08 sowed 150kg Kaspa **Peas** + 65kg MAP Sown with RTK autosteer (disc seeder / press wheels)
	11/08/08 Sprayed 1kg/ha propizomide (edge) + 2lt sprayseed	11/08/08 Sprayed 1kg/ha propizomide (edge) + 2lt sprayseed	11/08/08 Sprayed 1kg/ha propizomide (edge) + 2lt sprayseed
	Weeds 4/06/08 (just before sowing) Ryegrass 362 pl/m^2	Weeds 4/06/08 (just before sowing) Ryegrass 493 pl/m^2	Weeds 4/06/08 (just before sowing) Ryegrass 451 pl/m^2
	Pea establishment: 35 ppm2	Pea establishment: 32 ppm2	Pea establishment: 34 ppm2
	Penetrometer reading on 12/09/08 – see spreadsheet	Penetrometer reading on 12/09/08 – see spreadsheet	Penetrometer reading on 12/09/08 – see spreadsheet
	31/10/08 Sprayed 0.4ltha Maxi Mang (Agrichem product), 1kg zinc sulphate, 200gm copper sulphate, 25gm sodium molybdinate	31/10/08 Sprayed 0.4ltha Maxi Mang (Agrichem product), 1kg zinc sulphate, 200gm copper sulphate, 25gm sodium molybdinate	31/10/08 Sprayed 0.4ltha Maxi Mang (Agrichem poduct), 1kg zinc sulphate, 200gm copper sulphate, 25gm sodium molybdinate

	23/12/08 Sprayed 0.8lt ha Gamoxone	23/12/08 Sprayed 0.8lt ha Gamoxone	23/12/08 Sprayed 0.8lt ha Gamoxone
	15/1/09 Harvested Peas - 6680kg (1.26 t/ha), price $400/t on farm	15/1/09 Harvested Peas - 4686kg (0.9 t/ha), price $400/t on farm	15/1/09 Harvested Peas - 6116kg (1.20 t/ha), price $400/t on farm

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2009	GSR April to Nov 344 mm Annual 394mm	GSR April to Nov 344 mm Annual 394mm	GSR April to Nov 344 mm Annual 394mm
	17/1/09 Sprayed 0.8lt ha Estercide Xtra $9.25/lt + 5gm Ally $0.04/gm		
		10/2/09 Grazed 380 merino ewes for 12 days with free access to both treatments Stockfeed prices Oats$170/t Hay $230/t	10/2/09 Grazed 380 merino ewes for 12 days with free access to both treatments Stockfeed prices Oats$170/t Hay $230/t
		April 09 Pea straw raked and burnt	
	20-6-08 knockdown/pre-em spray 1.2 lt/ha Powermax 2.5lt/ha Boxergold 1.25 lt/ha Trifler 480	20-6-08 knockdown/pre-em spray 1.2 lt/ha Powermax 2.5lt/ha Boxergold 1.25 lt/ha Trifler 480	20-6-08 knockdown/pre-em spray 1.2 lt/ha Powermax 2.5lt/ha Boxergold 1.25 lt/ha Trifler 480
	20/6/09 Sowed Hindmarsh **barley** @ 50 kg/ha) with 45kg/ha MAP and 25lt/ha UAN	20/6/09 Sowed Hindmarsh **barley** @ 50 kg/ha) with 45kg/ha MAP and 25lt/ha UAN	20/6/09 Sowed Hindmarsh **barley** @ 50 kg/ha) with 45kg/ha MAP and 25lt/ha UAN
		Not grazed due to dry spring	Not grazed due to dry spring
	2-9-09 post-em spray 0.28lt/ha axial 0.5lt/ha lontrel 0.5lt/ha precept	2-9-09 post-em spray 0.28lt/ha axial 0.5lt/ha lontrel 0.5lt/ha precept	2-9-09 post-em spray 0.28lt/ha axial 0.5lt/ha lontrel 0.5lt/ha precept
	12/11/2009 Sprayed glyphosate 450 @ 1 l/ha (spray topping)	12/11/2009 Sprayed glyphosate 450 @ 1 l/ha (spray topping)	12/11/2009 Sprayed glyphosate 450 @ 1 l/ha (spray topping)
	29/12/2009 Harvested barley (3.4 t/ha) $165/t on farm	29/12/2009 Harvested barley (4.0 t/ha) $165/t on farm	29/12/2009 Harvested barley (3.4 t/ha) $165/t on farm

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2010	GSR April to Nov 525 mm Annual 718 mm	GSR April to Nov 525 mm Annual 718 mm	GSR April to Nov 525 mm Annual 718 mm
		Grazed 420 ewes +400 lambs for 7 days Oats $120/t Pasture hay $140/t	Grazed 420 ewes +400 lambs for 7 days Oats $120/t Pasture hay $140/t
	25/03/2010 Sprayed glyphosate 450 @ 1.4 l/ha + Hammer @ 22.5 ml/ha	25/03/2010 Sprayed glyphosate 450 @ 1.4 l/ha + Hammer @ 22.5 ml/ha	25/03/2010 Sprayed glyphosate 450 @ 1.4 l/ha + Hammer @ 22.5 ml/ha
	2/05/2010 Sowed canola 2.5kg/ha MAP 40kg/ha UAN 25lt/ha	2/05/2010 Sowed canola 2.5kg/ha MAP 40kg/ha UAN 25lt/ha 2/05/2010	2/05/2010 Sowed canola 2.5kg/ha MAP 40kg/ha UAN 25lt/ha 2/05/2010
	5/5/10 pre-em spray 2lt/ha Triflur 1.2lt/ha sprayseed 0.5/t/ha propizomide (edge)	5/5/10 pre-em spray 2lt/ha Triflur 1.2lt/ha sprayseed 0.5/t/ha propizomide (edge)	5/5/10 pre-em spray 2lt/ha Triflur 1.2lt/ha sprayseed 0.5/t/ha propizomide (edge)
	25/5/2010 - slug bait (5.5 ha) 5kg/ha multigard @$3.25/kg		
	8/06/2010 - slug bait (5.5 ha) 5kg/ha multigard@ $3.25/kg		
	19/7/2010 - slug bait 5kg/ha multigard @ $3.25/kg	19/7/2010 - slug bait 5kg/ha multigard @ $3.25/kg	
		No winter grazing	No winter grazing
	19/7/10 Sprayed Clethodim @ 0.35lt/ha	19/7/10 Sprayed Clethodim @ 0.35lt/ha	19/7/10 Sprayed Clethodim @ 0.35lt/ha
	15/9/10 Glyphosate @ 1.5lt/ha ($4/lt)		
	16/9/10 Planted Chickpeas 100kg/ha ($60/ha) MAP @ 25kg/ha ($20/ha)		
	7/11/2010 Sowed safflower Total cost $50/ha		
	11/11/2010 Sprayed Sprayseed @ 1.2 l/ha + dual gold @ 0.25 l/ha. Total cost $28/ha		

		22/11/2010 Sprayed glyphosate 450 @ 1.2 l/ha (spraytop) Total cost $10/ha	22/11/2010 Sprayed glyphosate 450 @ 1.2 l/ha (spraytop) Total cost $10/ha
		Canola harvested 7/12/10 Yield (0.75 t/ha). plus crop insurance from hail storm. Yield was assessed at 1.98 t/ha Price of canola$ 480/t on farm Cost of canola harvest $62.5/ha	Canola harvested 7/12/10 Yield (0.81 t/ha). plus crop insurance from hail storm. Yield was assessed at 1.98 t/ha Price of canola$ 480/t on farm Cost of canola harvest $62.5/ha
	Safflower not harvested		

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2011	GSR April to Nov 308 mm Annual 553 mm	GSR April to Nov 308 mm Annual 553 mm	GSR April to Nov 308 mm Annual 553 mm
		Grazed 325 ewes for 6 days Pasture hay $125/t Oats $180/t	Grazed 325 ewes for 8 days Pasture hay $125/t Oats $180/t
	31/5/2011 Sprayed Touchdown @ 1.3 l/ha Total cost $5.85/ha	31/5/2011 Sprayed Touchdown @ 1.3 l/ha Total cost $5.85/ha	31/5/2011 Sprayed Touchdown @ 1.3 l/ha Total cost $5.85/ha
	16/6/2011 Sprayed Boxer Gold @ 2.5 l/ha, Simagranz @ 0.3 kg/ha, Sprayseed @ 1.2 l/ha and Triflur @ 1.2 l/ha. Total cost $33.75/ha	16/6/2011 Sprayed Boxer Gold @ 2.5 l/ha, Simagranz @ 0.3 kg/ha, Sprayseed @ 1.2 l/ha and Triflur @ 1.2 l/ha. Total cost $33.75/ha	16/6/2011 Sprayed Boxer Gold @ 2.5 l/ha, Simagranz @ 0.3 kg/ha, Sprayseed @ 1.2 l/ha and Triflur @ 1.2 l/ha. Total cost $33.75/ha
	19/06/2011 Sowed wheat Total cost $85/ha	19/06/2011 Sowed wheat Total cost $85/ha	19/06/2011 Sowed wheat Total cost $85/ha
		Wheat not grazed in winter	Wheat not grazed in winter
	30/08/2011 Sprayed Coptrel @ 0.2 l/ha, Twin Zinc @ 0.3 l/ha, Bortrac @ 0.2 l/ha, Agtryne MA @ 1.5 l/ha and Deluge @ 0.17 l/ha. Total cost $18/ha	30/08/2011 Sprayed Coptrel @ 0.2 l/ha, Twin Zinc @ 0.3 l/ha, Bortrac @ 0.2 l/ha, Agtryne MA @ 1.5 l/ha and Deluge @ 0.17 l/ha. Total cost $18/ha	30/08/2011 Sprayed Coptrel @ 0.2 l/ha, Twin Zinc @ 0.3 l/ha, Bortrac @ 0.2 l/ha, Agtryne MA @ 1.5 l/ha and Deluge @ 0.17 l/ha. Total cost $18/ha
	08/09/2011 Spread urea @ 50kg/ha Total cost $32/ha	08/09/2011 Spread urea @ 50kg/ha Total cost $32/ha	08/09/2011 Spread urea @ 50kg/ha Total cost $32/ha
	12/10/2011 Sprayed Opus @ 0.25 l/ha Total cost $6.90/ha	12/10/2011 Sprayed Opus @ 0.25 l/ha Total cost $6.90/ha	12/10/2011 Sprayed Opus @ 0.25 l/ha Total cost $6.90/ha
	Date of wheat harvest 6/1/12 Yield of wheat 3.3t/ha Price of wheat $218t on farm Grade H2 Cost of harvest $35/ha	Date of wheat harvest 6/1/12 Yield of wheat 2.8t/ha Price of wheat $218t on farm Grade H2 Cost of harvest $35/ha	Date of wheat harvest 6/1/12 Yield of wheat 2.5t/ha Price of wheat $218t on farm Grade H2 Cost of harvest $35/ha

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2012	GSR April to Nov 396 mm Annual 518 mm	GSR April to Nov 396 mm Annual 518 mm	GSR April to Nov 396 mm Annual 518 mm
		Grazed 380 ewes for 5 days	Grazed 380 ewes for 5 days
	13/1/12 Summer spray @ $15/ha		
	26/4/12 Lime @ 400kg/ha Total cost $16.5/ha	26/4/12 Lime @ 400kg/ha Total cost $16.5/ha	26/4/12 Lime @ 400kg/ha Total cost $16.5/ha
		9/5/12 knockdown spray $8/ha	9/5/12 knockdown spray $8/ha
	Planting 12/5/12 80 kg/ha Westminster **barley,** with 40/kg/ha MAP Total cost $91/ha	Planting 12/5/12 80 kg/ha Westminster **barley,** with 40/kg/ha MAP Total cost $91/ha	Planting 12/5/12 80 kg/ha Westminster **barley,** with 40/kg/ha MAP Total cost $91/ha
	9/6/12 sprayed 2lt/ha Boxer Gold post-em Total cost $33.75/ha	9/6/12 sprayed 2lt/ha Boxer Gold post-em Total cost $33.75/ha	9/6/12 sprayed 2lt/ha Boxer Gold post-em Total cost $33.75/ha
		Grazed 27/8/12 -2/9/12 (6 days) 400 ewes + 400 lambs	Grazed 23/8/12 – 27/8/12 (5 days) 400 ewes + 400 lambs
	11/9/12 sprayed Opus fungicide Total cost $7/ha		
		13/9/12 sprayed Axial + opus Total cost $45/ha	13/9/12 sprayed Axial + opus Total cost $45/ha
	Spraytopping Total cost $3.50/ha		
	Date of barley harvest 14/12/12 Yield of barley 6.4 t/ha Price of barley $265/t[1] on farm Cost of harvest $35/ha	Date of barley harvest 14/12/12 Yield of barley 5.6 t/ha Price of barley $265t on farm Cost of harvest $35/ha	Date of barley harvest 14/12/12 Yield of barley 7.1 t/ha Price of barley $265t on farm Cost of harvest $35/ha

[1] Assumed malting – price at Geelong port 18/12/12

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2013	GSR April to Nov 474 mm Annual 534 mm		
		Summer grazing 144 Merino ewes+ 125 lambs April drop 15days	Summer grazing grazing 144 Merino ewes+ 125 lambs April drop 17days
	No summer sprays – too dry		
	Knockdown& Pre-em gramoxone/propizimide $31.75/ha	Knockdown& Pre-em gramoxone/propizimide $31.75/ha	Knockdown& Pre-em gramoxone/propizimide $31.75/ha
	Sowing details & costs 17/5/13 120kg beans 40kg MAP 2lt/ha zinc sulphate 3kg/ha granular inoculant $37/ha input costs	Sowing details & costs 17/5/13 120kg beans 40kg MAP 2lt/ha zinc sulphate 3kg/ha granular inoculant $37/ha input costs	Sowing details & costs 17/5/13 120kg beans 40kg MAP 2lt/ha zinc sulphate 3kg/ha granular inoculant $37/ha input costs
		No winter grazing	No winter grazing
	In crop sprays and costs grass selective spray $35/ha	In crop sprays and costs grass selective spray $35/ha	In crop sprays and costs grass selective spray $35/ha
	Fungicide Carbendazin 0.25lt/ha $4/ha	Fungicide Carbendazin 0.25lt/ha $4/ha	Fungicide Carbendazin 0.25lt/ha $4/ha
	Harvest no yield maps due to breakdown of equipment Yields 24.2 t over 5.3 ha (4.56t/ha) Price received $400/t del Smeaton Harvest costs - self harvested $20/ha	Harvest no yield maps due to breakdown of equipment Yields 26.7 t over 5.2 ha (5.13/ha) Price received $400/t del Smeaton Harvest costs - self harvested $20/ha	Harvest no yield maps due to breakdown of equipment Yields 31.8 t over 5.1 ha (6.23t/ha) Price received $400/t del Smeaton Harvest costs - self harvested $20/ha

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2014	Annual rainfall 425 mm GSR April to Nov 346 mm		
		Summer grazing 260 Merino ewes 18days	Summer grazing 260 merino ewes 21 days
	Summer sprays - None	Summer sprays - None	Summer sprays - None
	Knockdown sprays & costs 2.5lt/ha Paraquat $15/ha	Knockdown sprays & costs 2.5lt/ha Paraquat $15/ha	Knockdown sprays & costs 2.5lt/ha Paraquat $15/ha
	0.9kg/ha RR plantshield glyphosate $8/ha	0.9kg/ha RR plantshield glyphosate $8/ha	0.9kg/ha RR plantshield glyphosate $8/ha
	Sowing details & costs sown 28/4/14 Canola GT 50RR 2.3kg/ha $58 MAP 70kg/ha $43 Other $8/ha	Sowing details & costs sown 28/4/14 Canola GT 50RR 2.3kg/ha $58 MAP 70kg/ha $43 Other $8/ha	Sowing details & costs sown 28/4/14 Canola GT 50RR 2.3kg/ha $58 MAP 70kg/ha $43 Other $8/ha
		Winter grazing - none	Winter grazing - none
	In crop sprays and costs 0.9kg/ha Roundup Ready Plantshield $8/ha + $10/ha application cost	In crop sprays and costs 0.9kg/ha Roundup Ready Plantshield $8/ha + $10/ha application cost	In crop sprays and costs 0.9kg/ha Roundup Ready Plantshield $8/ha + $10/ha application cost
	Fert application broadcast 60kg/ha SOA 40kg/ha Urea Cost $48/ha	Fert application broadcast 60kg/ha SOA 40kg/ha Urea Cost $48/ha	Fert application broadcast 60kg/ha SOA 40kg/ha Urea Cost $48/ha
	Spraytop 3/11/14 2.5lt/ha Glypho 450 =$12/ha + $10/ha application.	Spraytop 3/11/14 2.5lt/ha Glypho 450 =$12/ha + $10/ha application.	Spraytop 3/11/14 2.5lt/ha Glypho 450 =$12/ha + $10/ha application.
	Windrowing 5/11/14 $35/ha	Windrowing 5/11/14 $35/ha	Windrowing 5/11/14 $35/ha
	1.95 t/ha @ $498/t del Geelong	2.35t/ha @ $498/t del Geelong	2.24t/ha @$498/t del Geelong

Year	375 mm disc seeder No till, no graze, no burn	375 mm row spacings disc seeder (graze, burn)	375 mm row spacings disc seeder (graze, no burn)
2015	Annual rainfall GSR April to Nov		
		Summer grazing 6/12/14 -10/12/14 (5 days) 220xb lambs April drop	Summer grazing 10/12/14 - 14/12/14 (5 days) 220xb lambs April drop
	84 bales (15.9 bales/ha) @ 420 kg/bale @$200/t. $1331/ha	56 bales (10.8 bales/ha) @ 420 kg/bale @$200/t. $905/ha	74 bales (14.5 bales/ha) @ 420 kg/bale @$200/t. $1218/ha

Appendix 1: Soil test results from three treatment paddocks

Client:	GRAIN & GRAZE	**Sample :**	FS 58054 / 5
Address:	C/- SOUTHERN FARMING SYSTEMS	**Received:**	06 May 2005
	32 STEVENS STREET	**Despatch:**	17 May 2005
	QUEENSCLIFF 3225	**Copy:**	Jennifer Clarke
		Email:	Cam Nicholson
Job Comment:			

ANALYSIS		UNITS	Laboratory Identification: FS 58054 - 58058					
			No Till, no graze no burn	Graze & burn	Graze no burn			
Phosphorus	(Olsen)	mg/kg	30.8	30.4	26.3			
Potassium	(Colwell)	mg/kg	188.0	208.0	193.0			
Sulphur	(KCL40)	mg/kg	27.3	23.4	21.3			
pH	(1:5 water)		5.4	5.6	5.6			
pH	(CaCl2)		4.8	5.0	5.0			
Salinity (EC)	(1:5 water)	dS/m	0.31	0.25	0.23			
Soil Texture			Loam	Loam	Loam			
Organic Carbon		%	2.61	2.34	2.23			
Nitrate		mg/kg	72.0	59.0	59.0			
Ammonium		mg/kg	3.0	2.0	2.0			
Reactive Iron		mg/kg	2088	2100	2448			
Phosphorus	(Colwell)	mg/kg	74.0	75.0	63.0			
Calcium	(Exch)	meq/100 g	4.85	5.35	5.10			
Magnesium	(Exch)	meq/100 g	1.01	1.11	1.14			
Sodium	(Exch)	meq/100 g	0.63	0.55	0.61			
Potassium	(Exch)	meq/100 g	0.44	0.50	0.46			
Aluminium	(Exch)	meq/100 g	0.05	0.03	0.03			
Calculations								
Sum of cations	(CEC)	meq/100 g	6.98	7.54	7.34			
Calcium/Magnesium ratio			4.8	4.8	4.5			
Sodium % of cations	(ESP)		9.0%	7.3%	8.3%			
Aluminium % of cations			0.7%	0.4%	0.4%			

Comments:

Sampled 0 - 10 cm. Refer paddock notes.

Appendix 2: DPI soil characterisation for the three treatment paddocks (June 2008)

Summary of Soil Analysis from Farming Systems Trial at Troy Missen's

Soil sample and Penetrometer Readings taken 11th June 2008

					Stable Aggregates		Reworked Aggregates			
	Depth (cm)	**Soil colour**	**Soil Texture**	**Clay Content**	**Slaking**	**Dispersion**	**Slaking**	**Dispersion**	**Soil Moisture (%)**	**Penetrometer (PSI)**
No Graze or Burn	0 to 10	dark brown	sandy loam	10-20%	no	no	yes <15min	no	12.5	98 @ 5cm
No Till	10 to 20	yellowish brown	light sandy clay loam	15-20%	partially <90min	no	yes <60min	no	10.9	458 @ 15cm
	20 to 30	brown with dominant red and grey mottling	medium clay	45-55%	yes <15min	no	yes <60min	yes <15min	17.5	708 @ 22.5cm
Graze and Burn Stubble	0 to 10	dark brown (slightly lighter than others)	loam, fine sandy	about 25%	no	no	yes <30min	no	12.1	123 @ 5cm
Conventional	10 to 20	brown/yellowish brown	sandy clay	35-40%	partially <90min	no	yes <30min	no	11.0	460 @ 15cm
	20 to 30	yellowish brown with some red mottling	light/medium clay	40-45%	yes <90min	no	yes <60min	yes <15min	10.5	768 @ 22.5cm
Graze Crop no Burn	0 to 10	dark brown	loam, fine sandy	about 25%	no	no	yes <30min	no	11.5	217 @ 5cm
Winter Grazing	10 to 20	brown/yellowish brown	sandy clay	35-40%	partially <90min	no	yes <60min	no	13.7	528 @ 15cm
	20 to 30	brown with some red mottling	light/medium clay	40-45%	yes <90min	no	yes <30min	yes <15min	16.5	875 @ 22.5cm

Comments: With considerations of the slight soil differences across the treatments, the potential for human error with bulk density calculations and the fact that the trial has only been running for 1yr makes it is fair to say that we cannot confidently identify any differences between treatments

Appendix 3: Microbial soil testing results – November 2013

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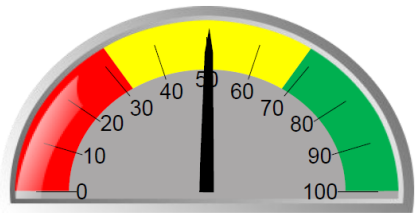
MICROBE WISE

Name: **Grain and Graze** Sample: **No till** Analysis no.: **455-1** Date:

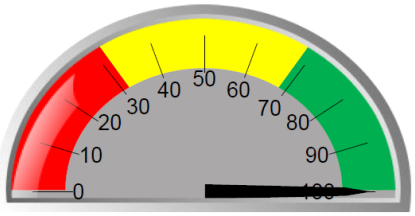
Customer name	Grain and Graze	**Sample date**	
Client or treatment name		**Received date**	28/11/2012
Sample or replicate name	No till	**Agent**	CIAAF
Crop or type		**Authorised by**	Dr Maria Manjarrez
Weeks after emergence		**Analysis no.**	455-1

Soil Indicators

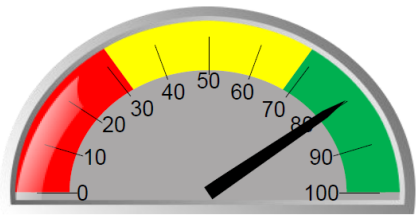
Nutrient solubilisation rate



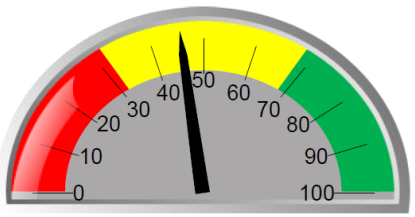
Nutrient cycling rate



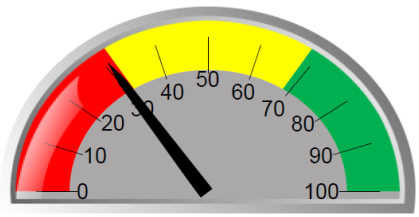
Disease resistance



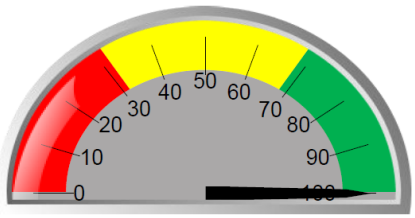
Drought resistance



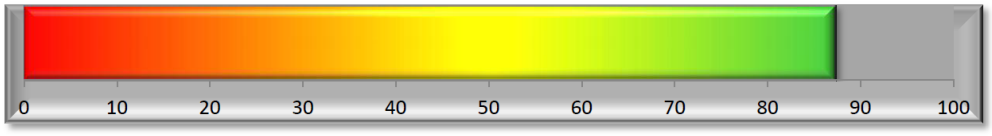
Nutrient accessibility (VAM)



Residue breakdown rate



Overall microbial balance



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Key Microbe Groups

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MICROBE WISE

Name: **Grain and Graze** Sample: **No till** Analysis no.: **455-1** Date:

Group	Biomass (mg/kg) Yours	Guide
Total microorganisms	**53.4**	50.0
Total bacteria	**10.5**	15.0
Total fungi	**41.9**	33.8
Bacteria		
Pseudomonas	**0.717**	1.000
Actinomycetes	**1.414**	1.000
Gram positive	**6.964**	11.250
Gram negative	**3.508**	3.750
True anaerobes	**BDL***	0.005
Eukaryotes		
Protozoa	**1.090**	1.250
Mycorrhizal fungi (including VAM)	**2.956**	10.000

*BDL = Below Detectable Limit (0.001 mg/kg)

Useful indicators	Yours	Guide
Microbial diversity	**93.6**	80.0
Fungi : Bacteria	**4.0**	2.3
Total : Anaerobic bacteria	**N/A**	3000

Nutrients held in microbes	Concentration (mg/kg) Yours	Guide
Nitrogen (N)	**3.141**	3.450
Phosphorus (P)	**1.603**	1.500
Potassium (K)	**0.534**	0.500
Sulphur (S)	**0.534**	0.500
Calcium (Ca)	**0.267**	0.250
Magnesium (Mg)	**0.267**	0.250
Carbon (C)	**24.074**	22.688

Key

Poor **Fair** **Good**

Comments (Detailed Custom Report available - see Order Form)

The total mass of microbes in your sample was good. Biomasses of other key desirable microbe groups ranged from poor to fair (Mycorrhizal fungi), to good in the case of Total fungi, Actinomycetes, etc. True anaerobes were below detectable level, which indicates that this soil has not been recently waterlogged or compacted. Protozoa were good, they are a good indicator of soil health, they are important for nutrient transfer and cycling between soil trophic levels and can be sensitive to agrochemicals. The Fungi to Bacteria ratio was elevated due to the low bacteria biomass. This ratio is common for some systems such as pastures, where the relatively large load of organic residues stimulate the growth of fungi, which breakdown those residues and release nutrients. Overall microbial balance was good but could be improved. These results suggest that management practices should initially focus on building general microbial biomass. Re-test periodically, and once biomass has improved concentrate on any key desirable groups that remain low such as Mycorrhizal fungi.

Explanations

The Microbe Wise test measures the biomasses of key microbial groups directly from your sample. It uses molecular ('DNA type') technology to analyse the unique cell membrane 'fingerprint' of each microbe type to identify and quantify key groups important to soil processes. This method is more accurate and precise than other methods, such as direct microscopy or plate culture, because it uses chemical extraction to remove the maximum amount of microbial material from the sample and is repeatable to 0.01% between replicate analyses. It measures organisms that are alive or recently dead (within a few days). Always compare your results with a control sample. Guide values are included as a help, but because a large number of factors affect microbiology the guide levels may not be optimal for your specific conditions. Visit www.microbelabs.com.au for more

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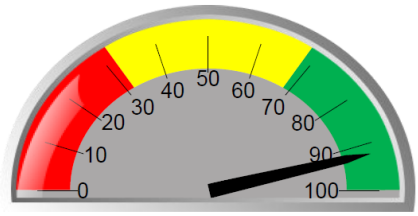
MICROBE WISE

Name: **Grain and Graze** Sample: Conventional graze and burn Analysis no.: **455-2** Date:

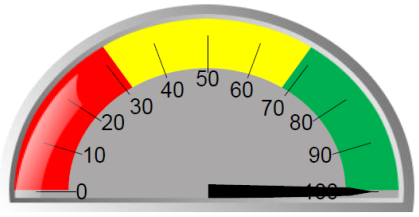
Customer name	Grain and Graze	**Sample date**	
Client or treatment name		**Received date**	28/11/2012
Sample or replicate name	Conventional graze and burn	**Agent**	CIAAF
Crop or type		**Authorised by**	Dr Maria Manjarrez
Weeks after emergence		**Analysis no.**	455-2

Soil Indicators

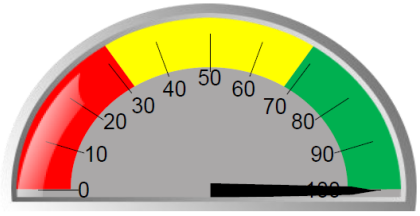
Nutrient solubilisation rate



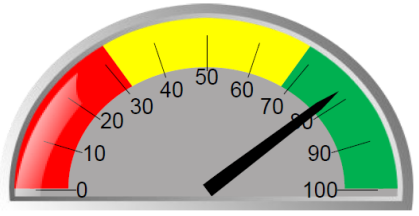
Nutrient cycling rate



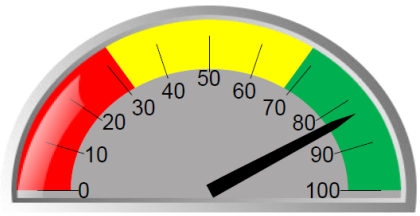
Disease resistance



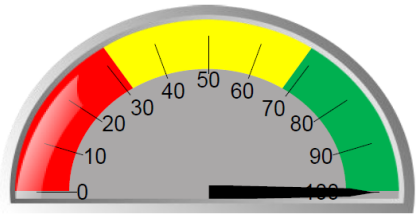
Drought resistance



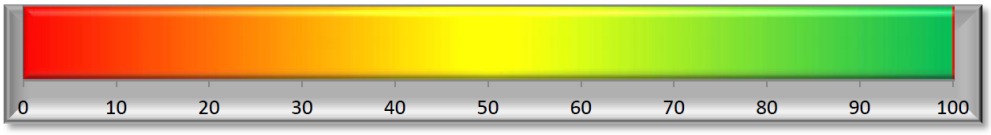
Nutrient accessibility (VAM)



Residue breakdown rate



Overall microbial balance



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Key Microbe Groups

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MICROBE WISE

Name: **Grain and Graze** Sample: **Conventional graze and burn** Analysis no.: **455-2** Date:

Group	Biomass (mg/kg) Yours	Guide
Total microorganisms	**56.4**	50.0
Total bacteria	**13.1**	15.0
Total fungi	**41.7**	33.8
Bacteria		
Pseudomonas	**1.009**	1.000
Actinomycetes	**1.296**	1.000
Gram positive	**8.444**	11.250
Gram negative	**4.666**	3.750
True anaerobes	**BDL***	0.005
Eukaryotes		
Protozoa	**1.584**	1.250
Mycorrhizal fungi (including VAM)	**8.422**	10.000

*BDL = Below Detectable Limit (0.001 mg/kg)

Useful indicators	Yours	Guide
Microbial diversity	**104.6**	80.0
Fungi : Bacteria	**3.2**	2.3
Total : Anaerobic bacteria	**N/A**	3000

Nutrients held in microbes	Concentration (mg/kg) Yours	Guide
Nitrogen (N)	**3.503**	3.450
Phosphorus (P)	**1.692**	1.500
Potassium (K)	**0.564**	0.500
Sulphur (S)	**0.564**	0.500
Calcium (Ca)	**0.282**	0.250
Magnesium (Mg)	**0.282**	0.250
Carbon (C)	**25.320**	22.688

Key

Poor | Fair | Good

Comments (Detailed Custom Report available - see Order Form)

The total mass of microbes in your sample was good. Biomasses of other key desirable microbe groups were good, except for total bacteria, which were fair. True anaerobes were below detectable level, which indicates that this soil has not been recently waterlogged or compacted. The Fungi to Bacteria ratio was elevated but this is common for some systems such as pastures, where the relatively large load of organic residues stimulate the growth of fungi, which breakdown those residues and release nutrients. However, with these microbe levels, nitrogen availability for the crop needs to be monitored as high amounts of this element are held by the microbes themselves. Overall microbial balance was good but could be improved as bacteria levels were low. These results suggest that management practices should initially focus on building bacterial biomass. Re-test periodically, and once biomass has improved concentrate on any key desirable groups that remain low.

Explanations

The Microbe Wise test measures the biomasses of key microbial groups directly from your sample. It uses molecular ('DNA type') technology to analyse the unique cell membrane 'fingerprint' of each microbe type to identify and quantify key groups important to soil processes. This method is more accurate and precise than other methods, such as direct microscopy or plate culture, because it uses chemical extraction to remove the maximum amount of microbial material from the sample and is repeatable to 0.01% between replicate analyses. It measures organisms that are alive or recently dead (within a few days). Always compare your results with a control sample. Guide values are included as a help, but because a large number of factors affect microbiology the guide levels may not be optimal for your specific conditions. Visit www.microbelabs.com.au for more

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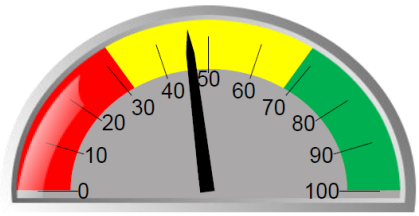
MICROBE WISE

Name: **Grain and Graze** Sample: **Grazing, no burning** Analysis no.: **455-3** Date:

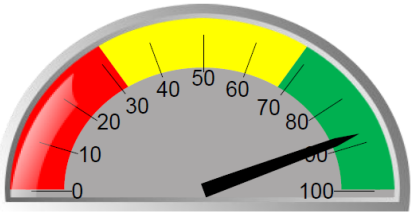
Customer name	Grain and Graze	**Sample date**	
Client or treatment name		**Received date**	28/11/2012
Sample or replicate name	Grazing, no burning	**Agent**	CIAAF
Crop or type		**Authorised by**	Dr Maria Manjarrez
Weeks after emergence		**Analysis no.**	455-3

Soil Indicators

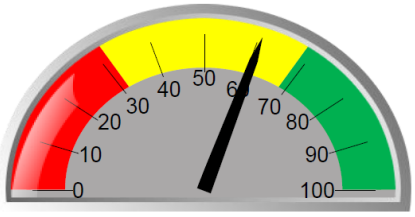
Nutrient solubilisation rate



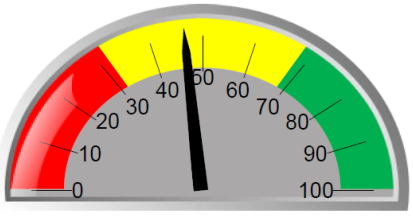
Nutrient cycling rate



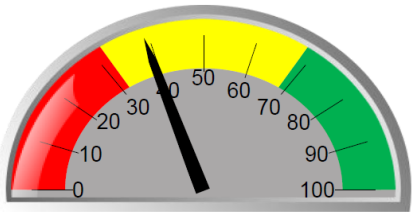
Disease resistance



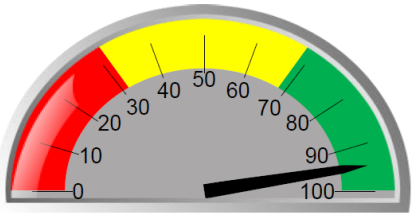
Drought resistance



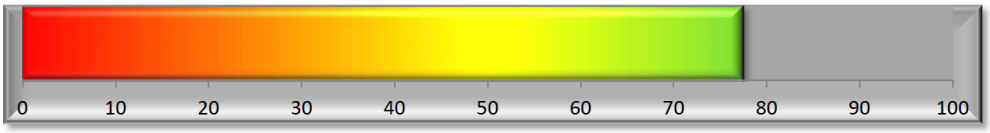
Nutrient accessibility (VAM)



Residue breakdown rate



Overall microbial balance



For more information about these indicators visit us at **www.microbelabs.com.au**

Key Microbe Groups

microbiology laboratories australia
agriculture • forestry • environmental

MICROBE WISE

Name: **Grain and Graze** Sample: **Grazing, no burning** Analysis no.: **455-3** Date:

Group	Biomass (mg/kg) Yours	Guide
Total microorganisms	**43.1**	50.0
Total bacteria	**9.7**	15.0
Total fungi	**32.5**	33.8
Bacteria		
Pseudomonas	**0.534**	1.000
Actinomycetes	**0.933**	1.000
Gram positive	**6.127**	11.250
Gram negative	**3.544**	3.750
True anaerobes	**BDL***	0.005
Eukaryotes		
Protozoa	**0.882**	1.250
Mycorrhizal fungi (including VAM)	**3.859**	10.000

*BDL = Below Detectable Limit (0.001 mg/kg)

Useful indicators	Yours	Guide
Microbial diversity	**108.2**	80.0
Fungi : Bacteria	**3.4**	2.3
Total : Anaerobic bacteria	**N/A**	3000

Nutrients held in microbes	Concentration (mg/kg) Yours	Guide
Nitrogen (N)	**2.655**	3.450
Phosphorus (P)	**1.292**	1.500
Potassium (K)	**0.431**	0.500
Sulphur (S)	**0.431**	0.500
Calcium (Ca)	**0.215**	0.250
Magnesium (Mg)	**0.215**	0.250
Carbon (C)	**19.471**	22.688

Key

Poor | Fair | Good

Comments (Detailed Custom Report available - see Order Form)

The total mass of microbes in your sample was good. Biomasses of other key desirable microbe groups ranged from poor to fair (Mycorrhizal fungi), to fair (total bacteria, Pseudomonas, Gram positive bacteria), to good in the case of Total fungi, Actinomycetes, etc. Mycorrhizal fungi help plants under drought conditions, they are also important for nutrient solubilisation and nutrient accessibility and you may be missing on these benefits. Gram positive help plants under drought conditions. True anaerobes were below detectable level, which indicates that this soil has not been recently waterlogged or compacted. The Fungi to Bacteria ratio was elevated due to the low bacteria biomass, but this is common for some systems such as pastures, where the relatively large load of organic residues stimulate the growth of fungi, which breakdown those residues and release nutrients. Microbial diversity was good to fair but could be improved. These results suggest that management practices should initially focus on building general microbial biomass. Re-test periodically, and once biomass has improved concentrate on any key desirable groups that remain low such as Mycorrhizal fungi.

Explanations

The Microbe Wise test measures the biomasses of key microbial groups directly from your sample. It uses molecular ('DNA type') technology to analyse the unique cell membrane 'fingerprint' of each microbe type to identify and quantify key groups important to soil processes. This method is more accurate and precise than other methods, such as direct microscopy or plate culture, because it uses chemical extraction to remove the maximum amount of microbial material from the sample and is repeatable to 0.01% between replicate analyses. It measures organisms that are alive or recently dead (within a few days). Always compare your results with a control sample. Guide values are included as a help, but because a large number of factors affect microbiology the guide levels may not be optimal for your specific conditions. Visit www.microbelabs.com.au for more

Appendix 4: Chemical soil test – March 2014

Farmright
TECHNICAL SERVICES
The Independent Alternative

FARMRIGHT PTY. LTD. – A.B.N. 38 816 254 454
Unit 7/1 Crichton Road, Kyabram, 3620
Telephone: (03) 5853 2484
Fax: (03) 5853 2485
Email: farmright@bigpond.com

Client: TROY MISSEN
Address: 779 BOYLES ROAD
WERNETH 3352

Sample : FS 142570 / 3
Received: 20 Feb 2014
Despatch: 05 Mar 2014

Interpretation: Cam Nicholson

Job Comment: GRAIN & GRAZE PROJECT

ANALYSIS		UNITS	Laboratory Identification: FS 142570 - 142572					
			No Till	Graze & burn	Graze, no burn			
Phosphorus	(Olsen)	mg/kg	29.9	34.9	37.8			
Potassium	(Colwell)	mg/kg	272.0	307.0	320.0			
Sulphur	(KCL40)	mg/kg	9.7	8.1	8.3			
pH	(1:5 water)		5.7	5.7	5.5			
pH	(CaCl2)		4.9	5.0	4.8			
Salinity (EC)	(1:5 water)	dS/m	0.14	0.17	0.19			
Soil Texture			Clay loam	Clay loam	Clay loam			
Organic Carbon		%	2.37	2.25	2.62			
Nitrate Nitrogen		mg/kg	16.0	22.0	27.0			
Ammonium Nitrogen		mg/kg	5.0	15.0	18.0			
Phosphorus	(Colwell)	mg/kg	105.0	100.0	106.0			
Calcium	(Exch)	meq/100 g	4.85	5.23	4.93			
Magnesium	(Exch)	meq/100 g	1.00	0.98	1.02			
Sodium	(Exch)	meq/100 g	0.51	0.63	0.50			
Potassium	(Exch)	meq/100 g	0.69	0.77	0.80			
Aluminium	(Exch)	meq/100 g	0.08	0.06	0.17			
Calculations								
Sum of cations	(CEC)	meq/100 g	7.13	7.67	7.42			
Calcium/Magnesium ratio			4.9	5.3	4.8			
Sodium % of cations	(ESP)		7.2%	8.2%	6.7%			
Aluminium % of cations			1.1%	0.8%	2.3%			

Comments:

Authorised Signature