



2013 Seasonal effects of strategic stubble treatments on wheat, barley and oats in CWFS districts; Year 1 of a 5 year investigation

John Small, Central West Farming Systems

This trial report is an interim report for 2013 only. More detailed reports will be made once grain quality data is available

GRDC project CWF00018 – Maintaining profitable farming systems with retained stubble in Central West, NSW

Rankins Springs trial management and data collection was undertaken by AgGrow Agronomy and Research



Key Points

- Stubble treatments involving late burning or cultivation resulted in significantly different yields in wheat, barley and oats at 4 of 6 trials conducted at Rankins Springs, Weethalle, Wirrinya, Tottenham, Tullamore and Euabalong during 2013. The yield effects were not consistent and these initial trials could not be used to predict response.
- Crop establishment was not affected by stubble or tillage treatment at five of the six sites. At Rankins Springs, however, establishment was 15% higher in the burnt stubble than in the standing stubble treatment.
- Visual differences in early growth could be observed between stubble treatments. Biomass in mid-August was lower with standing stubble than after burning at three sites (Weethalle, Tottenham and Tullamore) but not at Wirrinya and Euabalong.
- Variety rankings were not significantly affected by stubble treatments. The best option in terms of yield was to simply grow the variety with the highest yield potential for the sowing window.

Background

Stubble retention during fallows within cropping systems in CWFS districts is a common practice. The 2013 CWFS farmer survey (representing 47 producers managing 207000 ha) highlighted that 70 % of producers regularly maintained stubble cover over summer whilst 20% regularly maintained fallows by

cultivation alone. No simple relationship between farm size and stubble management practice could be determined. Anecdotally, the reliance on herbicide for weed control in stubble retained systems, and the increasing threat to system profitability posed by herbicide resistant and hard to kill summer weeds, have seen the adoption of more integrated weed management programs including a reversion to stubble burning and cultivation. CWFS members are asking about short and longer term impacts of using chemical fallows, cultivation and burning in more seasonally specific dynamic combinations to resolve agronomic problems such as weeds, pests, disease or crop nutrition issues with the aim of increasing profitability.

Trial design

During 2013 CWFS conducted a trial at 6 locations Tottenham, Euabalong, Weethalle, Rankins Springs, Wirrinya, and Tullamore to investigate;

- the impact of different stubble treatments imposed towards the end of the fallow have on the yield of wheat, barley and oats
- evaluate any varietal responses within crop species to the impact of the different stubble treatments.

The trial was 9 ranges and 18 rows, and consisted of 3 replicates. Each replicate was 3 ranges and 18 rows. The trial was a split plot with varieties nested in (stubble x crop) nested in replicates. There were 3 stubble treatments; standing, burnt and cultivated. There were 3 crop species; wheat, barley and oats. For each of the three crop species there were 6 varieties tested listed in Table 1, trial layout is shown in Figure 1.

Wheat	Barley	Oats
1. Gregory	1. Hindmarsh	1. Yallara
2. Suntop	2. Bass	2. Nile
3. Livingston	3. Buloke	3. Yarran
4. Emu Rock	4. Commander	4. Coolibah
5. Spitfire	5. Schooner	5. Yiddah
6. Dart	6. Skipper	6. Mitika

Table 1: Varieties of wheat, barley and oats included in 2013 trial. Number identifies variety position on trial plan (Figure 1)



List of Treatments

Wheat

Barley

Oats

Buffer

Figure 1: 2013 trial plan. Numbers refer to variety in table 1

Tottenham

Co-operator

Paul Adam

Paddock History

Full stubble retention 2003-2005 wheat, 2006 Barley, 2007-2010 wheat, 2011 lupins, 2012 wheat

Soil Type

Red sandy loam

Stubble treatments imposed

4 April 2013

Sowing Date

28 May 2013 Seeding rate 40 kg/ha, 63 kg/ha MAP fertiliser into moist seedbed

Harvest date

13 November 2013

Special notes

Cultivation treatment imposed with off set discs

Nile oats was heavily grazed by kangaroos as it was the last remaining green pick in the trial and surrounding paddock. Likely effect on final yield

Mitika oats was generally flattened by kangaroos resting following grazing of Nile oats. The short stems of Mitika surrounded by the higher growing varieties provide comfortable secluded resting space. Likely effect on final yield

Euabalong

Co-operator

Kemp family, "Derrida"

Paddock History

2011, 2012 wheat fallow heavily grazed with cross bred lambs between crops due to dry summers

Soil Type

Light red sandy loam

Stubble treatments imposed

25 March 2013, Burning treatments could not be imposed due to lack of ground cover

Sowing Date

15 May 2013 Seeding rate 40 kg/ha, 63 kg/ha MAP fertiliser into moist seedbed following first sowing rain for the season on 12 13 May

Harvest date

7 November 2013

Special notes

Cultivation treatment imposed with off set discs

There was no burnt treatment at this site. No soil tests were conducted but it is suspected that the site was very low in Nitrogen.

Suspected trifluian damage to wheat and barley following heavy rain post sowing but pre-crop emergence.

60kg/ha urea topdressed 22 July 2013-12-04

Oats were mown out and removed early October to simulate cutting for hay due to severe black oats infestation.

Weethalle

Co-operator

The Luelf family, "Malonga Park"

Paddock History

2007- wheat; 2008 - barley; 2009 - barley; 2010 - barley; 2011 - canola; 2012 - wheat

Soil Type

Red sandy loam

Stubble treatments imposed

5 April 2013

Sowing Date

27 May 2013 Seeding rate 40 kg/ha, 63 kg/ha MAP fertiliser into moist seedbed with good soil moisture

Harvest date

18 November 2013

Special notes

Cultivation treatment imposed with off set discs

Rankins Springs

Co-operator

Michael Pfitzner, "Hill End". CWFS contracted Agrow Agronomy and Research to sow, manage and harvest this trial

Paddock History

20 year no till continuous cropping paddock with a general rotation of wheat/Barley/legume. 2012 the paddock was sown with wheat

Soil Type

Mallee sand

Stubble treatments imposed

31 March 2013

Sowing Date

3 May 2013 Seeding rate 40 kg/ha, 63 kg/ha MAP fertiliser into moist seedbed with good subsoil moisture

Harvest date

15 November 2013

Special notes

The cultivated treatment was burnt and then cultivated with tynes

Axial herbicide damage to some oats plots

70kg/ha urea topdressed 22 June 2013

Suspected frost damage and yield loss to emu rock and dart wheat varieties

Tullamore

Co-operator

Paul Bell, "Gwandalan"

Paddock History

No till cropping and grazing paddock which had been heavily grazed over the summer. Hard to kill summer grass were established in the paddock. 2012 the paddock was sown with wheat

Soil Type

Clay loam

Stubble treatments imposed

8 April 2013

Sowing Date

21 May 2013 Seeding rate 40 kg/ha, kg/ha MAP fertiliser into moist hard seedbed with marginal subsoil moisture

Harvest date

4 November 2013

Special notes

Cultivation treatment imposed with off-set discs

Trial management for this site and a nearby canola trial was a co-operation between CWFS and Grains Orana Alliance.

Wirrinya

Co-operator

Angus & Kim Maslin, "Bergen Park"

Paddock History

No till continuous cropping irrigation paddock with a general rotation of wheat/barley or wheat/canola. 2012 the paddock was sown with canola.

Soil Type

Heavy black flood plain soil

Stubble treatments imposed

5 April 2013

Sowing Date

26 May 2013 Seeding rate 90 kg/ha, 105 kg/ha MAP fertiliser into moist seedbed with good subsoil moisture. Trial was established with the intention of irrigating if required. Due to rainfall no irrigation was undertaken. It is believed the crop would have responded to irrigation during grain filling.

Harvest date

14 November 2013

Special notes

Cultivation treatment imposed with off set discs

Results

Tottenham

There was no effect of stubble treatment on crop yield at this site. The quickest wheat varieties, Dart and Spitfire, performed well. The rankings were generally similar to the NVT trial at Condobolin except for Suntop. The two sites were sown within 3 days of each other but Tottenham experienced a much drier finish. Hindmarsh was the standout barley, again reflecting the short spring and tight finish. Mitika and Nile oats suffered from kangaroo damage at this site.

Wheat	Yield (t/ha)	Barley	Yield (t/ha)	Oats	Yield (t/ha)
Dart	2	Hindmarsh	1.8	Coolabah	1.7
Spitfire	1.8	Bass	1.5	Yarran	1.6
Emu rock	1.7	Commander	1.5	Mitika	1.5
Livingston	1.7	Schooner	1.4	Yallara	1.5
Gregory	1.6	Skipper	1.4	Yiddah	1.4
Suntop	1.6	Buloke	1.3	Nile	1.2
<i>Isd</i>	<i>0.29</i>	<i>Isd</i>	<i>0.28</i>	<i>Isd</i>	<i>0.28</i>

Euabalong

There was also no effect of stubble treatment on crop yield at this site. Gregory and Spitfire were the highest yielding wheat varieties, despite differing in flowering time. Both varieties performed better than rankings in the Condobolin NVT in 2013. Some of this may be due to the site being sown 14 days earlier than Condobolin. Bass was the best of the barleys, perhaps also aided by the earlier sowing.

Wheat	Yield (t/ha)	Barley	Yield (t/ha)
Gregory	1.7	Bass	2
Spitfire	1.7	Commander	1.7
Emu rock	1.5	Hindmarsh	1.7
Suntop	1.5	Schooner	1.6
Dart	1.4	Skipper	1.6
Livingston	1.4	Buloke	1.5
<i>Isd</i>	<i>0.2</i>	<i>Isd</i>	<i>0.22</i>

Weethalle

The cultivated treatment was lower yielding than the burnt or standing stubble at this site, although the difference was small. The quickest varieties (Dart and Spitfire wheat, Hindmarsh barley) performed well and the rankings were generally in line with NVT results.

Stubble	Yield (t/ha)
Burnt	1.8
Cultivated	1.7
Standing	1.8
<i>Lsd</i>	<i>0.12</i>

Wheat	Yield (t/ha)
Dart	1.9
Spitfire	1.9
Emu rock	1.8
Suntop	1.8
Gregory	1.7
Livingston	1.7
<i>Lsd</i>	<i>0.14</i>

Barley	Yield (t/ha)
Hindmarsh	2.1
Buloke	1.8
Commander	1.8
Skipper	1.8
Schooner	1.7
Bass	1.5
<i>Lsd</i>	<i>0.17</i>

Oats	Yield (t/ha)
Mitika	2
Yallara	1.9
Yarran	1.9
Coolabah	1.8
Nile	1.7
Yiddah	1.4
<i>Lsd</i>	<i>0.17</i>

Wirrinya

The burnt treatment was the highest yielding at Wirrinya followed by standing stubble and cultivation, although the differences were relatively small (0.1 t/ha). Crop maturity wasn't related to yield at this site with both quick and slower wheat (Dart, Gregory) and barley (Hindmarsh, Bass) performing well. The Dart and Bass performance was better than in long term NVT results although not too different to other sites in 2013.

Stubble	Yield (t/ha)
Burnt	3.8
Cultivated	3.6
Standing	3.7
<i>Lsd</i>	<i>0.09</i>

Wheat	Yield (t/ha)
Dart	4
Gregory	4
Emu rock	3.7
Livingston	3.7
Spitfire	3.7
Suntop	3.6

Barley	Yield (t/ha)
Bass	4.3
Hindmarsh	4.2
Commander	3.8
Buloke	3.7
Skipper	3
Schooner	3

Oats	Yield (t/ha)
Mitika	4.5
Yallara	4.2
Yarran	3.9
Nile	3.5
Coolabah	3.4
Yiddah	2.5

Tullamore

Standing stubble was significantly lower yielding than the other two treatments at Tullamore. It also had lower biomass in August despite equivalent plant numbers established. This treatment appeared to have higher numbers of windmill grass plants which may have competed for water and nitrogen. At this site also crop maturity wasn't related to yield with both quick and slower wheat varieties (Dart, Gregory) performing well. In fact, there was little difference among varieties, with only Livingston being significantly lower yielding. Of the barleys, Commander, Bass and Hindmarsh performed well. Schooner was poor at this and most other sites.

Stubble	Yield (t/ha)
Burnt	2.1
Cultivated	2.1
Standing	1.7
<i>Lsd</i>	0.24

Wheat	Yield (t/ha)
Gregory	2.2
Dart	2.1
Emu rock	2.1
Spitfire	2
Suntop	2
Livingston	1.9
<i>Lsd</i>	0.23

Barley	Yield (t/ha)
Commander	2.2
Bass	2.1
Hindmarsh	2.1
Skipper	1.9
Buloke	1.8
Schooner	1.8
<i>Lsd</i>	0.18

Oats	Yield (t/ha)
Mitika	2.4
Yallara	2.2
Yarran	2.1
Coolabah	1.9
Nile	1.8
Yiddah	1.5
<i>Lsd</i>	0.18

Rankins Springs

Stubble treatments were significantly different here, with the cultivated treatment (slashed and then worked with a tined implement) yielding 0.2 t/ha more than the other treatments. Wheat yields were generally similar across varieties except for Dart and Emu Rock which appeared to suffer frost damage, perhaps a result of the early sowing date (3 May). Rankings were generally similar to the Merriwagga NVT trial which was sown on 14 May, except for Emu Rock. In the barleys, Bass and Commander performed well, helped perhaps by the early May sowing, with yields similar to Hindmarsh. Schooner yielding poorly.

	Yield (t/ha)
Burnt	3.3
Cultivated	3.5
Standing	3.3
<i>Lsd</i>	0.14

Wheat	Yield (t/ha)	Barley	Yield (t/ha)	Oats	Yield (t/ha)
Spitfire	3.5	Bass	4.4	Mitika	3.3
Suntop	3.5	Commander	4.3	Yallara	3.3
Gregory	3.4	Hindmarsh	4.2	Nile	2.9
Livingston	3.3	Buloke	3.8	Yiddah	2.9
Emu					
Rock	3.1	Skipper	3.6	Coolabah	2.7
Dart	2.8	Schooner	3.3	Yarran	2.7
<i>Isd</i>	<i>0.28</i>	<i>Isd</i>	<i>0.24</i>	<i>Isd</i>	<i>0.38</i>

Discussion

There is no evidence from the 2013 trials that species or variety yield ranking changed with stubble or tillage treatment. Seasonal issues this year did not bring short term agronomic benefits or risks associated with stubble conservation, burning or cultivation into play. For example, the autumn break was late and all trial sites were sown with good seed bed moisture. Therefore, the potential benefit of retained stubble providing a more favourable seedbed for early sowing was not observed. Similarly the dry spring conditions did not promote foliar disease pressures that may have resulted in widely accepted short term disease advantages for the burnt treatments. For this season the best option in terms of yield was to simply grow the variety with the highest yield potential for the sowing window.

Overall site performance appears to be inline with nearby National Variety Trials. It is worth noting differences at each site so as not to unintentionally bias varietal performance. It is critical to remember that this report only represents data from the 2013 season and growers should rely on a range of data sources and experience in assessing varieties for their farming system.

Visual differences could be observed in the same varieties across stubble treatments during the trial. Generally the burnt treatments appealed to the eye as being even in colour and ahead in terms of ground cover whilst the cultivated treatment being ahead in terms of height. As all trials progressed the observed differences became less as the plots matured and resulted in no significant effects on yield at harvest. Photographs of Gregory wheat at Tullamore late August highlight these observations.



Photograph 1; Tullamore, Gregory wheat, burnt treatment, 22/8/2013



Photograph 2; Tullamore, Gregory wheat, cultivated treatment, 22/8/2013



Photograph 3; Tullamore, Gregory wheat, standing stubble treatment, 22/8/2013

Acknowledgments

CWFS would like to acknowledge the support provided by the co-operating farmers, without their in-kind support the trials would never have happened. The support provided by AgGrow Agronomy and Research at Rankins Springs site was well beyond any simple contractual arrangement between themselves and CWFS. Matt McRae, Walkers Ag N Vet, Forbes and Scott Boyd, GOA, Dubbo is also acknowledged. The author also thanks Neil Fettell for his support in compiling this report.