Local Research and Development Results

February 2012

2012

LiEBE GROUP

Working together in Agriculture

Dear Liebe Group Members and Supporters,

It is with great pleasure that we present to you the Liebe Group Local Research and Development results book for 2012. This book contains results from research and development conducted in the Coorow, Dalwallinu, Perenjori and Wongan-Ballidu shires from the 2011 season. The book also outlines current Liebe Group projects to keep you updated with the interesting work that is going on in the district. Due to unavoidable circumstances, there are some results that are not available at the time of printing; these will be published in subsequent Liebe Group newsletters.

Many thanks must go to the researchers, agribusiness organisations and growers who have cooperated to conduct valuable local research and development. We thank you for the opportunity to present these results in our 2012 book.

Also we would like to remind you that many trial results will be reviewed at the **2012 Trials Review Day on the 13th February** at the Buntine Hall and the **2012 Liebe Group Crop Updates on the 7th March** at the Dalwallinu Hall and Discovery Centre**.** We invite you to bring this book along to these days so you can follow the trials and ask questions regarding any results you may have found interesting.

Please interpret the results in this book carefully. Decisions should not be based on one season's data and please contact the Liebe office if you have any further queries.

Throughout the book our major financial sponsors are promoted. All of our sponsors and supporters play a vital role in ensuring the continued success of the Liebe Group. We acknowledge the invaluable support we receive from the Grains Research and Development Corporation (GRDC), the Department of Agriculture and Food WA (DAFWA), the Department of Agriculture, Fisheries and Forestry (DAFF), Rabobank, CSBP, COGGO, RSM Bird Cameron, the Farm Weekly, the Grower Group Alliance and many others.

All the best for the 2012 season and let's hope it brings plenty of rain!

Kind regards,

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LIEBE GROUP SUPPORTERS

The Liebe Group would like to thank the following organisations for their invaluable support:

- Grains Research and Development Corporation (GRDC)
- Department of Agriculture and Food WA
- Department of Agriculture, Fisheries and Forestry – Caring for Our Country
- Department of Agriculture, Fisheries and Forestry – FarmReady
- University of Western Australia
- CSIRO
- Farm Weekly
- Shire of Dalwallinu
- Future Farm Industries CRC
- Grower Group Alliance
- Northern Agricultural Catchments Council

LONG TERM RESEARCH SITE SUPPORTERS

The Liebe Group would like to acknowledge and thank all the sponsors and contributors to the Long Term Research site for 2011. Without the generous support and assistance from supporters and contributors the management of this unique site would not be possible.

The following is a list of people/organisations the Liebe Group would like to thank:

- **Grains Research and Development Corporation (GRDC)**
- **DAFWA** - Technical advice throughout the year, seeding and harvesting of the trials.
- **The University of Western Australia** - For technical assistance and collaboration opportunities.
- **CBH Group** - Grain sampling and analysis.
- **CSBP** - Analysing soil samples.
- **Scholz Rural Supplies** - Agronomic advice throughout the season.
- **CSIRO** - For providing and maintaining the weather station, classifying soils and technical advice and collaboration opportunities.
- **Stuart McAlpine and staff** - For seeding and harvesting the site and also agronomic assistance and monitoring the site throughout the season.
- **Michael Dodd and staff** - For use of his machinery and agronomic assistance throughout the season.
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- **Bayer** - Chemical donations for the 63ha site.
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- **Wesfarmers Federation Insurance** – Donation of crop insurance.

LIEBE GROUP COMMITTEES

The Liebe Group would like to recognise the support and contribution of the Liebe Group Management and Research & Development committees to the work outlined in this publication.

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New varieties from Seedmark show promise for WA

Three new pulse varieties have been unveiled for the Australian market, with the first expected to have a limited release this year.

Seedmark has won a tender to distribute the new Albus lupin, WALAB 2014, in Western Australia, possibly from 2012, and two Desi chickpeas, WACPE2136 and WACPE2155 for southern Australia from 2013.

Seedmark plans to build on its ongoing marketing plans for both the Albus lupin and its two Desi chickpea varieties and expects growers to see significant benefits from both.

The company is continuing the commercialisation work of PlantTech, which it acquired in 2009.

The Perth-based Council of Grain Grower Organisations provided the financial backing for Albus lupin with Anthracnose resistance research work which was undertaken by the Western Australian Department of Agriculture and Food.

The desi chickpea breeding program was carried out by four partner organisations – COGGO, the WA Department of Agriculture and Food, University of Western Australia and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), based in Andhra Pradesh, India.

COGGO chief executive officer Mark Tucek says Western Australia developed a small, but valuable, industry in the 1980s and '90s based on the Albus lupin selling for human consumption to the Middle East.

"However, the arrival of the fungal disease lupin anthracnose in 1996 led to the collapse of the industry when the only variety – Kiev Mutant – was found to be highly susceptible to the disease," Mr. Tucek says.

"Since 2002, COGGO and DAFWA have collaborated in an effort to breed anthracnose-resistant varieties of Albus lupin, with the objective of seeing the industry re-established across the WA wheat belt.

"The project concluded in 2009 with its major achievement the development and release of WALAB2014, with improved yield and anthracnose resistance and the ability to thrive in a wide range of wheat belt environments."

Seedmark Research and Development Manager Richard Prusa says the new Albus lupin will revive the industry in WA

"This new Albus variety has better anthracnose resistance than Andromeda and provides a lower risk to growers. WALAB2014 will only be marketed in Western Australia."

Steve Rowe farms 4000ha at Mullewa, east of Geraldton, producing mainly wheat, but also cropping canola, lupins, chickpeas and barley. He grew 24 ha of WALAB 2014 in 2011.

"We were on the lookout for a pulse crop we could grow a bit taller – much easier to harvest than chickpeas, which sits closer to the ground. "The Albus has fitted in well with our overall cropping program and we can treat it similarly to narrow leaf lupin. "It's been a bad year for anthracnose here, and I've sprayed once with a fungicide, but the Albus seems to be a lot more tolerant of anthracnose than others," he says.

WALAB2014 Characteristics and Fit

- Shorter season variety than Andromeda
- Flowers at a similar time to Kiev Mutant
- Matures about 7 days later than Kiev Mutant
- Anthracnose rating of MR/MS, better than Andromeda (MS/S) but less than Mandelup (MR)
- Drought has impacted on trial results in recent years. The 2010 NVT trial at Arrino supports previous observations regarding the relative yield improvement of WALAB 2014. As a single trial result it must be treated with caution.

State	WA	
Region	Agzone2	
Nearest Town	Arrino	
Variety Name	**Yield t/ha**	**% of control**
Andromeda	1.79	93
Kiev Mutant	2.03	105
Mandelup	1.91	99
WALAB2014	**2.26**	**117**
Site Mean (t/ha)	1.93	
CV (%)	6.64	
Probability	0.013	
LSD (t/ha)	0.2	11

WACPE 2136 is early-flowering, relatively short and bushy. In 2009 it was top yielding in some of the NVT trials in the eastern States. It yields particularly well in potentially high yielding situations. Seed size is smaller in comparison to other promising germplasm.

WACPE2155 is a mid-flowering line with good height and is the most outstanding yielder so far. It was the highest yielding of all the CVT and NVT entries in the WA trials of 2009. In South Australia and Victoria, it was the top yielding line in 5 out of the 7 trials. Its seed quality is good; similar to Genesis836. It is hoped that this line will commercialized in 2012-13.

Both lines have good seed quality and are rated **R**esistant to ascochyta blight resistance, similar to PBA Slasher.

WALAB2014 will be available for general release in 2013 with limited commercial seed available in autumn 2012. WACPE2136 and WACPE2155 will be available for general release from 2014 with limited commercial seed available in autumn 2013.

For more information on these varieties, please contact Tim O'Dea from Seedmark on 0429 203 505 or t.odea@seedmark.com.au

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Understanding Trial Results and Statistics

We have tried to present all trial results in one format throughout this results book. However, due to differences in trial designs, this isn't always possible. The following explanations and definitions should provide you with sufficient statistical understanding to get the most from the trial results.

Mean

The results of replicated trials are often presented as the average (or mean) of all replicates for each treatment. Statistics are used to determine if the difference between means is a result of treatment (i.e. different chemicals) or natural variability (i.e. soil type).

Significant Difference

In nearly all trial work there will be some difference between treatments, i.e. one rate of fertiliser will result in a higher yield than another. Statistics are used to determine if the difference is a result of treatment or some other factor (i.e. soil type). If there is a significant difference then there is a very strong chance the difference in yield is due to treatments, not some other factor. The level of significance can also play a role. If it says P<0.05% there is a greater than 95% guarantee that a difference is a result of treatment and not some other factor.

The LSD test

To determine if there is a significant difference between two or more treatments a least significant difference (LSD) is often used. If there is a significant difference between two treatments their difference will be greater than the LSD. For example when comparing the yield of five wheat varieties (Table 1), the difference in yield between variety 4 and 5 is greater than 0.6 t/ha (LSD), therefore it can be said there is a significant difference. This means it is 95% (P=0.05) certain that the difference in yield is a result of variety not soil type or some other factor. Whilst there is a difference in yield between variety 1 and 2, it is less than 0.6, therefore it is unsure if the difference is a result of variety; it may be due to subtle soil type change or other external factors. Letters are often used to indicate which varieties are significantly different, using the LSD value (Table 1), so in this example, there is no significant difference between varieties 1, 2 and 3, whereas varieties 4 and 5 are significantly different to each other and the rest of the varieties. Where the LSD result reads as 'NS' this represents that the values are not significantly different from each other.

Table 1: Yield of five wheat varieties.

Treatment	Yield (t/ha)
Variety1	2.1 a
Variety2	2.4 a
Variety3	2.3 a
Variety4	2.9 b
Variety5	1.3 c
LSD (P=0.05)	0.6

The Coefficient of Variation (CV %)

The CV measures the amount of variation in the data. A low CV means less variation. Generally a CV less than 6% is considered good.

Having less variation means there is more confidence in the trial results. Having high variation could mean that factors other than the one being tested are influencing the result (i.e. soil type), and if the same trial was repeated at your place, results may be different.

Non-replicated Demonstrations

This book presents the results from a range of non-replicated demonstrations. In this case we cannot say for certain if a difference is the result of treatment or some other factor. Whilst the results from demonstrations are important, they need to be interpreted carefully as they are not statistical.

Wheat National Variety Trial – East Coorow

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sandy loam
Soil pH ($CaCl_2$)	4.9
EC	0.032 dS/m
Paddock rotation	2009 wheat, 2010 lupins
Seeding date	25/5/11
Seeding rate	75 kg/ha
Fertiliser	25/5/11: 100 kg/ha Urea, 100 kg/ha Gusto Gold 26/7/11: 70 kg/ha Urea
Herbicides	25/5/11: 2 L/ha Paraquad Diquart, 1.6 L/ha Trifluralin, 1 L/ha Chlorpyrifos 13/7/11: 1 L/ha Velocity, 500 mL/ha MCPA LVE, 1% v/v Hasten
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of wheat varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Scout	2.83	79	79.00	10.0	3.12
Estoc	3.06	86	78.60	10.7	3.66
Envoy	3.10	87	79.40	11.1	2.20
Justica CL Plus	3.16	89	74.60	10.6	2.42
Clearfield Stl	3.20	90	76.00	10.3	2.83
Zippy	3.23	91	75.80	11.3	2.07
Calingiri	3.37	95	79.80	10.1	1.00
Impose CL Plus	3.37	95	79.80	11.4	0.60
Wedin	3.39	95	75.00	10.1	3.76
EGA Bonnie Rock	3.43	96	79.20	10.7	1.27
LongReach Impala	3.44	97	79.20	9.5	1.71
King Rock	3.52	99	79.40	11.2	0.71
Kord CL Plus	3.53	99	78.80	11.0	3.00
Espada	3.54	99	75.40	10.5	1.21
Carnamah	3.57	100	77.60	9.6	2.31
Sabel CL Plus	3.60	101	78.00	10.2	1.47
AGT Katana	3.61	101	78.40	10.6	4.37
Fortune	3.62	102	77.20	10.5	0.74
Westonia	3.70	104	78.00	9.9	0.92
Wyalkatchem	3.70	104	78.20	10.5	0.79
Emu Rock	3.72	104	78.40	11.0	2.03

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Yandanooka	3.74	105	77.80	10.4	1.54
Mace	3.76	106	78.60	9.5	2.04
Arrino	3.78	106	78.80	10.0	0.38
Kunjin	3.86	108	77.40	9.6	1.94
Magenta	3.93	110	79.00	10.0	2.87
Corack	3.99	112	79.80	10.1	0.36
LongReach Cobra	4.01	113	76.80	10.0	1.23
Site Mean (t/ha)	3.56				
CV (%)	4.6				
Probability	<.001				
LSD (t/ha)	0.28	8			

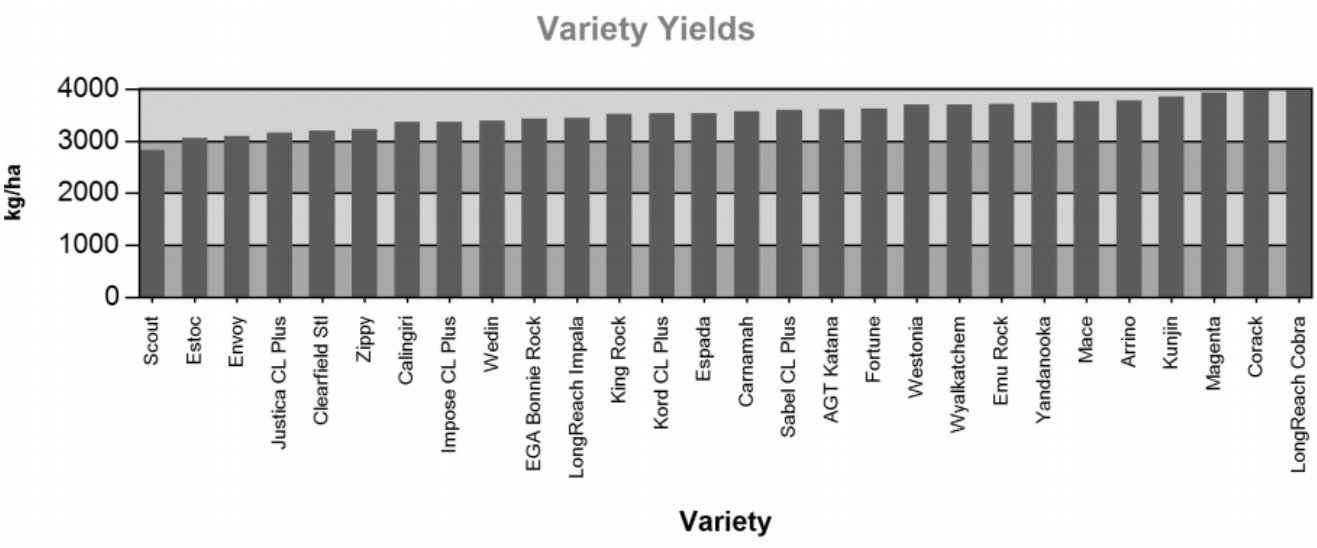

Figure 1: Yield comparison of wheat varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial - Calingiri

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Julian McGill, Calingiri
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sandy loam / loam
Soil pH ($CaCl_2$)	5.1
EC	0.154 dS/m
Paddock rotation	2010 canola
Seeding date	21/5/11
Seeding rate	75 kg/ha
Fertiliser	18/5/11: 100 kg/ha Urea, 100 kg/ha Vigour Atlas
Herbicides	24/6/11: 1 L/ha Velocity, 300 mL/ha Axial, 120 g/ha Lontrel, 0.5% v/v Adigor
Growing Season Rainfall	394mm

Results

Table 1: Yield and quality of wheat varieties sown at Calingiri.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Zippy	2.00	84	71.60	10.1	3.45
Impose CL Plus	2.07	87	72.20	10.0	3.10
Calingiri	2.08	87	73.20	8.8	3.73
Emu Rock	2.11	88	69.20	10.5	9.18
Kord CL Plus	2.15	90	73.20	9.5	3.25
Corack	2.19	92	73.20	9.2	3.07
AGT Katana	2.20	92	74.00	9.6	4.04
Yandanooka	2.22	93	73.00	9.3	3.62
Mace	2.25	94	72.00	8.7	2.42
LongReach Impala	2.28	95	74.60	8.4	2.83
Justica CL Plus	2.30	96	72.80	9.4	1.49
Sabel CL Plus	2.34	98	74.40	9.0	1.40
Wyalkatchem	2.40	100	74.20	9.3	2.57
Estoc	2.41	101	74.20	9.2	3.02
Arrino	2.45	103	72.80	9.4	3.71
Envoy	2.46	103	76.60	9.1	6.16
King Rock	2.46	103	74.80	9.3	2.92
Espada	2.47	103	72.60	9.4	2.70
Wedin	2.49	104	73.00	8.5	2.58
Fortune	2.50	105	74.00	8.9	2.55
Westonia	2.50	105	69.00	8.9	3.71
Kunjin	2.51	105	72.40	8.3	4.44
EGA Bonnie Rock	2.54	106	74.60	9.3	3.23

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Carnamah	2.56	107	74.20	8.9	2.64
Magenta	2.60	109	74.40	8.6	1.62
Scout	2.60	109	75.60	8.7	2.96
LongReach Cobra	2.63	110	72.60	8.6	2.84
Clearfield Stl	2.91	122	75.80	8.2	3.44
Site Mean (t/ha)	2.39				
CV (%)	6.9				
Probability	<.001				
LSD (t/ha)	0.28	12			

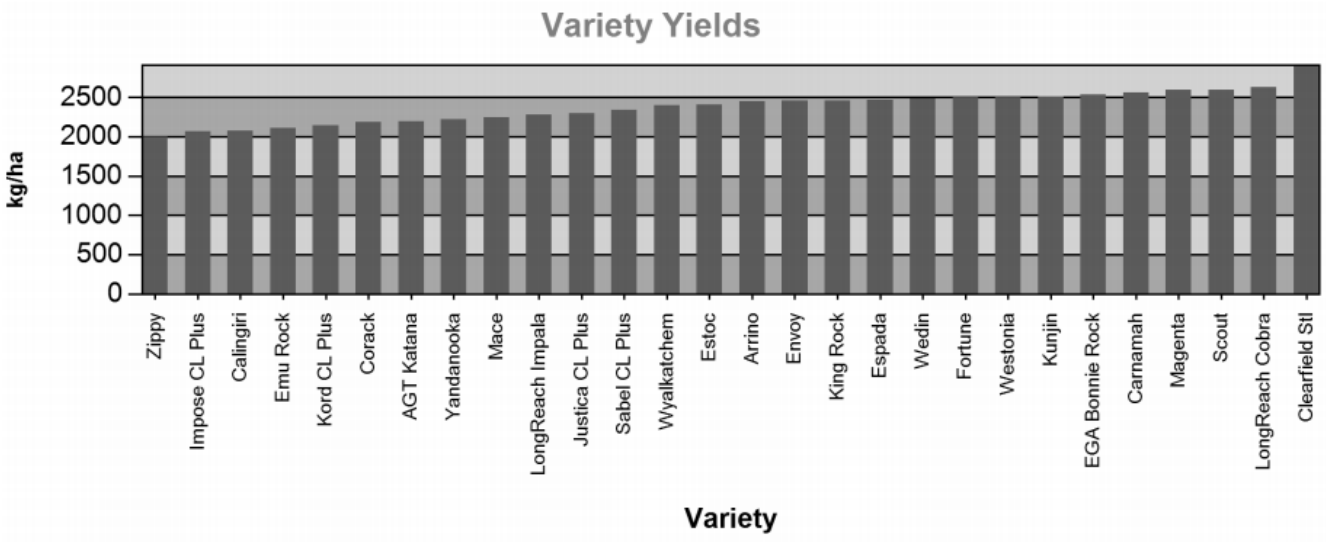

Figure 1: Yield comparison of wheat varieties sown at Calingiri.

Comments

24/6/11: Glyphosate drifted over part of trial. First 3 rows affected and range 1 cut back to 8m.

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial - Miling

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Wade Pearson, Miling
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sand / sandy loam
Soil pH ($CaCl_2$)	4.9
EC	0.162 dS/m
Paddock rotation	2009 wheat, 2010 pasture
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	22/5/11: 100 kg/ha Urea, 100 kg/ha Vigour Atlas 26/7/11: 80 kg/ha Urea
Herbicides	20/5/11: 1.5 L/ha Roundup PowerMax, 1.6 L/ha Trifluralin, 1 L/ha Chlorpyrifos 22/5/11: 2.5 L/ha Sprayseed, 0.75 L/ha Trifluralin 5/7/11: 1 L/ha Velocity, 120 g/ha Lontrel, 400 mL/ha Axial, 0.5% v/v Adigor
Growing Season Rainfall	307mm

Results

Table 1: Yield and quality of wheat varieties sown at Miling.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Wedin	2.86	87	71.60	8.9	5.20
Sabel CL Plus	2.96	90	72.80	9.4	4.99
Zippy	2.97	90	74.80	10.2	3.52
Kord CL Plus	2.99	91	72.20	9.7	5.46
Estoc	3.07	93	76.60	9.2	6.45
Fortune	3.07	93	74.80	10.1	1.50
Justica CL Plus	3.12	95	74.40	9.9	1.52
Clearfield Stl	3.20	97	77.40	9.7	3.89
Emu Rock	3.23	98	71.60	10.0	6.53
Calingiri	3.24	98	75.00	9.2	4.18
Wyalkatchem	3.24	98	75.40	9.4	2.22
Espada	3.25	99	73.20	9.3	3.72
Impose CL Plus	3.25	99	77.00	9.5	2.06
AGT Katana	3.28	100	78.60	10.4	3.94
Envoy	3.29	100	81.00	9.7	2.07
Scout	3.30	100	76.20	8.9	4.64
LongReach Impala	3.35	102	75.80	8.8	2.74
Kunjin	3.38	103	76.60	8.8	3.37
Arrino	3.41	104	75.60	9.0	1.57
Yandanooka	3.41	104	76.20	9.3	3.94
Westonia	3.48	106	72.80	9.4	2.15

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Carnamah	3.50	106	73.00	10.2	4.89
King Rock	3.50	106	76.00	10.2	4.05
Mace	3.50	106	76.00	8.6	3.18
Corack	3.52	107	75.40	8.9	3.74
EGA Bonnie Rock	3.62	110	75.00	9.7	3.44
LongReach Cobra	3.62	110	76.00	9.6	2.08
Magenta	3.93	119	78.80	9.0	2.64
Site Mean (t/ha)	3.29				
CV (%)	6.5				
Probability	0.004				
LSD (t/ha)	0.37	11			

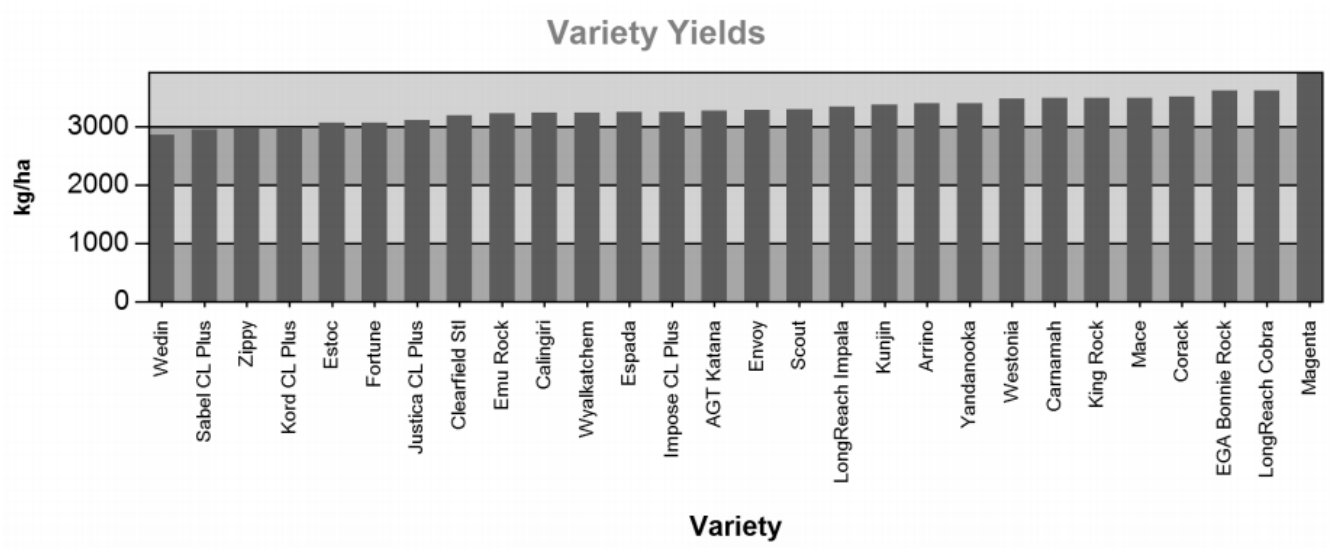

Figure 1: Yield comparison of wheat varieties sown at Miling.

Comments

19/7/11: Grassy weeds in inter row area. Farmers crop also affected.

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial - Pithara

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Gary Butcher, Pithara
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Heavy clay
Soil pH ($CaCl_2$)	6.1
EC	0.2 dS/m
Paddock rotation	2009 wheat, 2010 medic
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	22/5/11: 80 kg/ha Urea, 100 kg/ha Vigour Atlas
Herbicides	21/5/11: 1.5 L/ha Roundup PowerMax, 1 L/ha Trifluralin, 2.5 L/ha Boxer Gold, 1 L/ha Chlorpyrifos. 22/5/11: 2.5 L/ha Sprayseed. 5/7/11: 25 g/ha Monza, 120 g/ha Lontrel, 1% v/v Bonza. 19/7/11: 1 L/ha Velocity, 300 mL/ha Axial, 120 g/ha Lontrel, 0.5% v/v Adigor
Growing Season Rainfall	272mm

Results

Table 1: Yield and quality of wheat varieties sown at Pithara.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Wedin	1.57	73	7.80	14.9	3.50
Estoc	1.79	84	75.00	16.8	4.00
Clearfield Stl	1.87	87	77.00	16.7	1.15
Justica CL Plus	1.87	87	68.80	16.8	2.47
Kunjin	1.88	88	75.00	13.9	2.36
Carnamah	1.96	92	71.00	15.5	2.15
Magenta	1.99	93	70.40	16.8	2.96
Calingiri	2.00	93	71.80	16.6	2.09
Espada	2.03	95	70.40	16.2	2.70
Kord CL Plus	2.05	96	71.80	17.0	1.99
Sabel CL Plus	2.06	96	73.40	17.0	0.60
AGT Katana	2.09	98	77.60	14.3	1.25
Westonia	2.10	98	71.20	14.6	3.19
Fortune	2.12	99	72.80	16.1	1.06
Scout	2.12	99	73.00	14.6	2.66
King Rock	2.13	100	74.00	14.3	2.86
Wyalkatchem	2.16	101	74.20	14.0	3.40
EGA Bonnie Rock	2.17	101	74.20	14.5	2.79
Emu Rock	2.22	104	70.40	16.3	5.49
LongReach Cobra	2.23	104	73.00	15.0	3.40

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Yandanooka	2.26	106	72.20	15.0	2.49
Impose CL Plus	2.27	106	73.60	15.1	1.06
Envoy	2.33	109	76.80	14.4	0.84
Arrino	2.36	110	71.60	15.7	2.33
Mace	2.37	111	75.00	14.0	2.03
Zippy	2.37	111	73.80	13.6	2.46
Corack	2.44	114	73.60	13.7	2.99
Site Mean (t/ha)	2.14				
CV (%)	6.4				
Probability	<.001				
LSD (t/ha)	0.23	11			

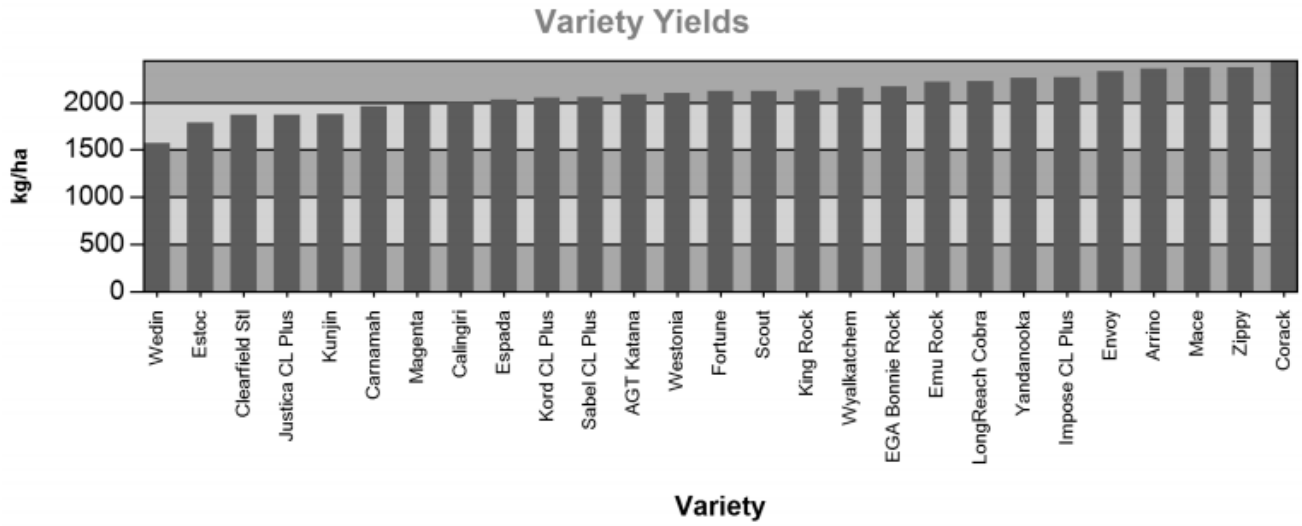

Figure 1: Yield comparison of wheat varieties sown at Pithara.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial – Wubin

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Ron Carlshausen, Wubin
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sandy Loam
Soil pH ($CaCl_2$)	5.2
EC	0.115 dS/m
Paddock rotation	2009 wheat, 2010 fallow
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	22/5/11: 80 kg/ha Urea, 100 kg/ha Vigour Atlas. 27/7/11: 50 kg/ha Urea
Herbicides	22/5/11: 1 L/ha Paraquat, 1.5 L/ha Trifluralin, 350 g/ha Diuron, 1.5 L/ha Tri Allate. 18/8/11: 1 L/ha Velocity, 500 mL/ha MCPA LVE
Growing Season Rainfall	302.5mm

Results

Table 1: Yield and quality of wheat varieties sown at Wubin.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Scout	1.89	75	73.40	10.0	7.09
Zippy	1.93	77	71.60	10.7	5.90
Envoy	2.15	85	77.00	10.5	5.26
Impose CL Plus	2.28	90	75.00	10.6	3.36
Carnamah	2.31	92	74.40	10.2	3.91
Kord CL Plus	2.41	96	73.00	10.3	4.14
Yandanooka	2.41	96	74.80	10.2	3.77
Justica CL Plus	2.44	97	71.60	10.0	2.29
Emu Rock	2.48	98	72.40	10.5	7.16
LongReach Impala	2.48	98	73.60	9.0	3.28
Fortune	2.50	99	73.80	10.5	2.29
Wedin	2.52	100	72.00	10.7	5.00
Estoc	2.54	101	75.60	9.7	5.58
Sabel CL Plus	2.54	101	73.20	9.5	2.20
Kunjin	2.59	103	71.20	10.4	6.72
Espada	2.62	104	70.80	10.2	3.34
AGT Katana	2.67	106	74.20	10.7	7.77
Clearfield Stl	2.68	106	77.20	9.3	2.79
Magenta	2.68	106	76.80	9.5	4.29
Calingiri	2.69	107	75.80	10.0	2.56
Wyalkatchem	2.69	107	73.80	9.8	3.53
Arrino	2.71	108	74.60	9.9	2.00

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
King Rock	2.77	110	75.20	10.5	3.07
Westonia	2.80	111	74.80	9.8	1.98
Corack	2.82	112	75.40	10.1	2.59
Mace	2.83	112	76.80	9.8	2.67
EGA Bonnie Rock	2.91	115	75.60	9.9	2.94
LongReach Cobra	2.92	116	74.80	10.1	2.18
Site Mean (t/ha)	2.52				
CV (%)	6.3				
Probability	<.001				
LSD (t/ha)	0.27	11			

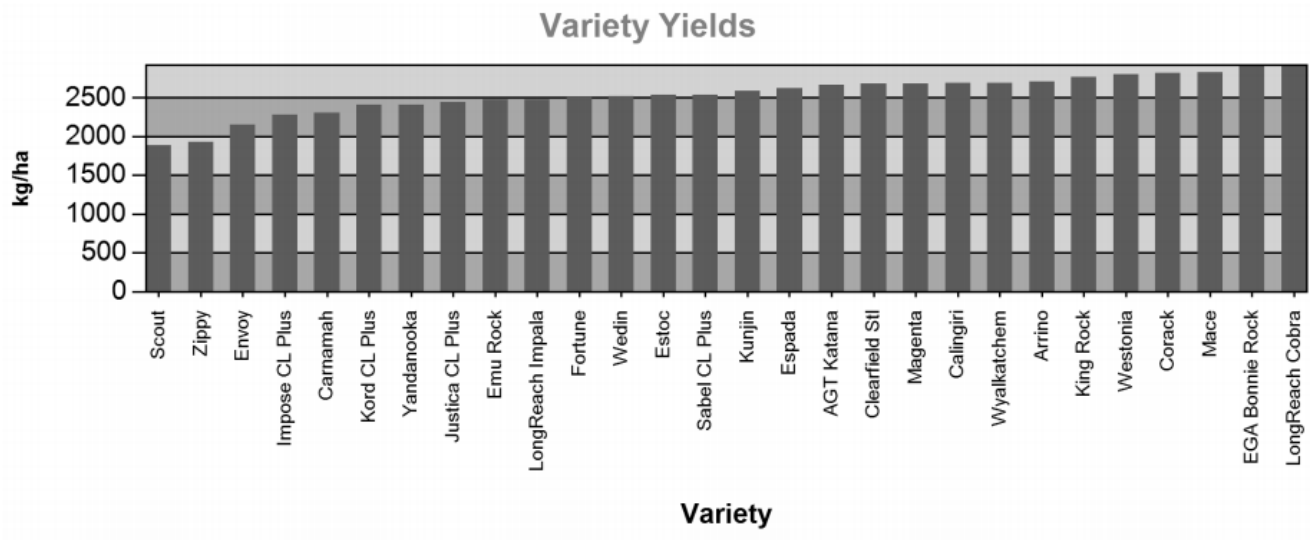

Figure 1: Yield comparison of wheat varieties sown at Wubin.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial - Carnamah

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Scott Walton, Carnamah
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Loam
Soil pH ($CaCl_2$)	5.3
EC	0.163 dS/m
Paddock rotation	2010 canola
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	22/5/11: 100 kg/ha Urea, 100 kg/ha Gusto Gold
Herbicides	22/5/11: 1.5 L/ha Roundup PowerMax, 1.5 L/ha Trifluralin, 1 L/ha Chlorpyrifos. 5/7/11: 1 L/ha Velocity, 500 mL/ha LVE MCPA, 1% v/v Hasten
Growing Season Rainfall	322.6mm

Results

Table 1: Yield and quality of wheat varieties sown at Carnamah.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Sabel CL Plus	2.79	77	61.20	11.8	2.58
Clearfield Stl	3.11	86	75.80	11.8	1.57
Fortune	3.15	87	71.80	11.4	1.93
Yandanooka	3.15	87	70.40	12.3	2.83
Kord CL Plus	3.20	88	66.40	11.7	2.93
Calingiri	3.33	92	74.40	11.0	1.92
Estoc	3.40	94	72.60	11.8	5.32
Carnamah	3.42	94	72.00	12.4	2.32
Justica CL Plus	3.45	96	68.20	11.9	3.21
Scout	3.47	96	62.60	11.0	3.16
Wyalkatchem	3.64	100	70.60	12.0	2.36
Magenta	3.67	101	70.60	11.2	3.90
Impose CL Plus	3.72	102	73.00	11.2	0.84
Espada	3.78	104	67.00	12.1	4.88
AGT Katana	3.79	104	73.20	11.5	5.70
Emu Rock	3.86	106	72.40	11.4	5.20
LongReach Cobra	3.88	107	72.20	11.2	2.50
Mace	3.89	107	68.60	10.7	4.13
Westonia	3.92	108	70.20	11.2	2.76
King Rock	3.96	109	74.80	11.0	1.73
EGA Bonnie Rock	4.04	111	75.40	12.9	2.65
Envoy	4.04	111	76.80	11.1	2.13
Arrino	4.10	113	73.40	11.3	1.65

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Corack	4.21	116	69.60	10.4	3.31
Zippy	4.24	117	73.80	10.9	2.95
Site Mean (t/ha)	3.63				
CV (%)	2.7				
Probability	<.001				
LSD (t/ha)	0.16	4			

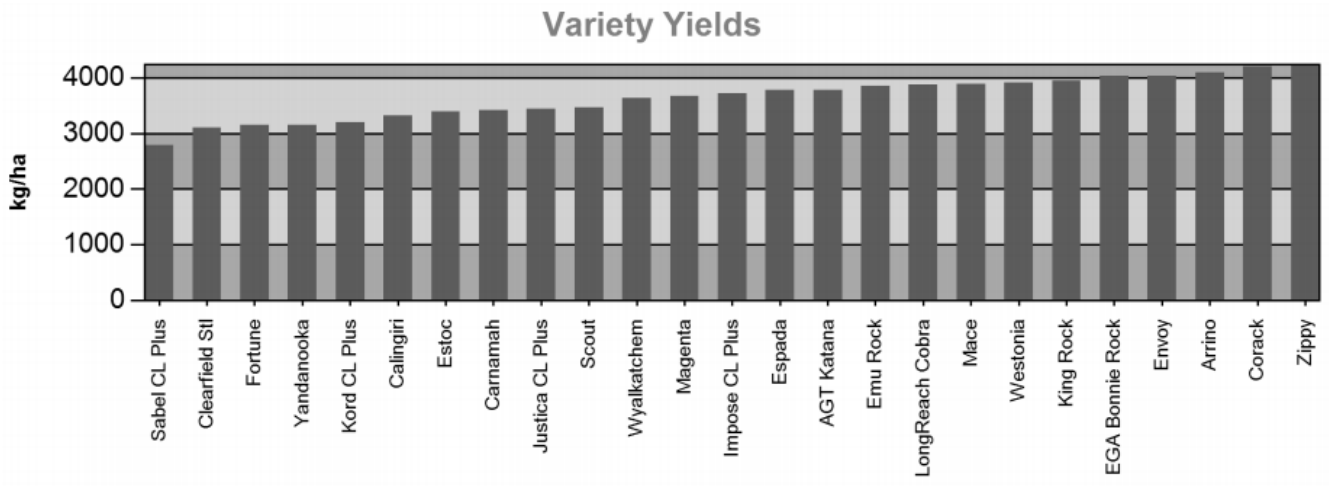

Figure 1: Yield comparison of wheat varieties sown at Carnamah.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial – Wongan Hills

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Jemma Sadler, Wongan Hills
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sand / sandy loam
Soil pH ($CaCl_2$)	5.1
EC	0.069 dS/m
Paddock rotation	2008 pasture, 2009 wheat, 2010 pasture
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	22/5/11: 100 kg/ha Urea, 100 kg/ha Gusto Gold
Herbicides	21/5/11: 1.5 L/ha Roundup PowerMax, 2.5 L/ha Boxer Gold, 1 L/ha Chlorpyrifos 4/7/11: 1 L/ha Velocity, 120 g/ha Lontrel, 400 mL/ha Axial, 0.5% v/v Adigor
Growing Season Rainfall	417mm

Results

Table 1: Yield and quality of wheat varieties sown at Wongan Hills.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Wedin	1.71	79	68.40	13.5	1.84
Kord CL Plus	1.96	90	67.00	14.1	2.44
Justica CL Plus	2.00	92	68.20	13.8	1.55
Sabel CL Plus	2.01	93	66.60	14.3	1.37
Clearfield Stl	2.04	94	73.20	15.4	3.24
Estoc	2.12	98	70.80	14.8	5.58
Yandanooka	2.12	98	70.80	13.7	2.79
Espada	2.13	98	66.00	13.8	2.93
Fortune	2.13	98	69.20	14.0	2.25
Magenta	2.15	99	68.60	14.6	2.61
Emu Rock	2.16	100	63.40	14.0	3.83
LongReach Impala	2.16	100	69.40	12.5	3.42
Scout	2.17	100	67.20	12.5	0.73
AGT Katana	2.17	100	68.40	14.0	3.83
Arrino	2.17	100	66.00	13.0	1.99
Calingiri	2.17	100	71.40	13.0	1.51
Carnamah	2.17	100	66.60	12.8	2.82
Impose CL Plus	2.20	101	68.80	14.0	0.76
Kunjin	2.31	106	68.80	12.6	4.86
Mace	2.33	107	71.20	11.7	2.78
Zippy	2.35	108	68.40	13.2	2.83
LongReach Cobra	2.38	110	66.80	13.4	2.19

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)	Screenings (%)
Westonia	2.38	110	68.80	13.7	2.79
Envoy	2.39	110	73.80	13.2	1.26
Wyalkatchem	2.50	115	70.40	13.7	2.81
Corack	2.52	116	67.60	12.5	1.54
EGA Bonnie Rock	2.58	119	71.00	13.1	3.72
King Rock	2.63	121	70.60	13.5	3.37
Site Mean (t/ha)	2.17				
CV (%)	5.5				
Probability	<.001				
LSD (t/ha)	0.21	10			

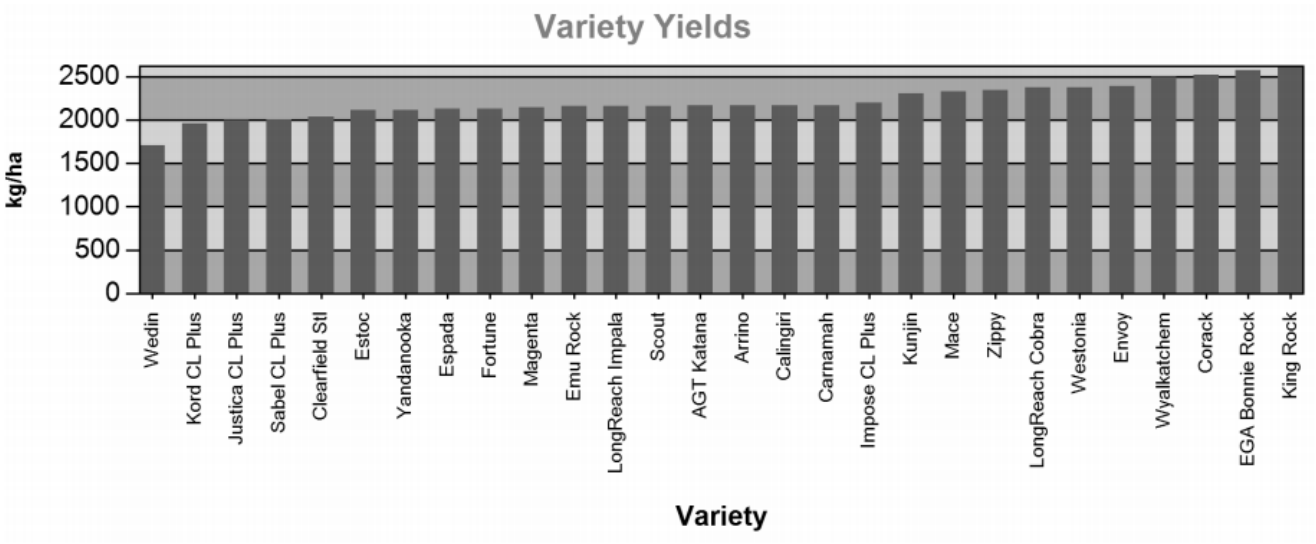

Figure 1: Yield comparison of wheat varieties sown at Wongan Hills.

Comments

20/7/11: Ryegrass problem despite of control previous two weeks. Growth depressions across all rows where ryegrass is thick.

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Wheat National Variety Trial - Eneabba

Australian Crop Accreditation System Limited

Aim

Wheat variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Nick Ashby, Eneabba
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Loam
Soil pH ($CaCl_2$)	4.7
EC	0.081 dS/m
Paddock rotation	2009 wheat, 2010 lupins
Seeding date	31/5/11
Seeding rate	75 kg/ha
Fertiliser	31/5/11: 100 kg/ha Urea, 100 kg/ha Gusto Gold 10/8/11: 160 kg/ha MAXam
Herbicides	31/5/11: 2.5 L/ha Roundup PowerMax, 2 L/ha Trifluralin X, 1.5 L/ha Chlorpyrifos 5/7/11: 1 L/ha Velocity, 500 mL/ha MCPA LVE, 1 %v/v Hasten
Growing Season Rainfall	400mm

Results

Table 1: Yield and quality of wheat varieties sown at Eneabba.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Protein (%)	Screenings
Scout	3.56	83	10.9	3.83
Envoy	3.82	89	12.2	2.88
Wedin	3.83	89	10.5	4.70
Clearfield Stl	3.85	90	11.2	4.87
Justica CL	3.85	90	11.2	1.68
Yandanooka	3.91	91	10.9	2.37
Estoc	3.93	91	11.2	3.68
Zippy	4.01	93	11.9	1.84
Sabel CL Plus	4.02	93	11.6	2.80
AGT Katana	4.12	96	11.4	5.63
LongReach Impala	4.15	97	10.6	1.74
Wyalkatchem	4.16	97	11.4	2.52
Impose CL Plus	4.17	97	12.0	1.49
Arrino	4.18	97	11.0	1.17
Kord CL Plus	4.19	97	11.4	3.77
Fortune	4.29	100	11.6	2.27
Emu Rock	4.33	101	11.3	5.62
Kunjin	4.40	102	10.7	3.36
Espada	4.42	103	11.7	2.51
Calingiri	4.45	103	10.7	2.27
Magenta	4.45	103	10.8	4.09
EGA Bonnie Rock	4.53	105	11.7	2.59

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Protein (%)	Screenings
King Rock	4.53	105	11.9	1.66
Westonia	4.57	106	11.3	1.71
Mace	4.66	108	10.9	3.01
LongReach Cobra	4.70	109	10.5	1.77
Corack	4.82	112	11.1	2.66
Carnamah	4.84	113	10.8	2.05
Site Mean (t/ha)	4.30			
CV (%)	4.7			
Probability	<.001			
LSD (t/ha)	0.35	8		

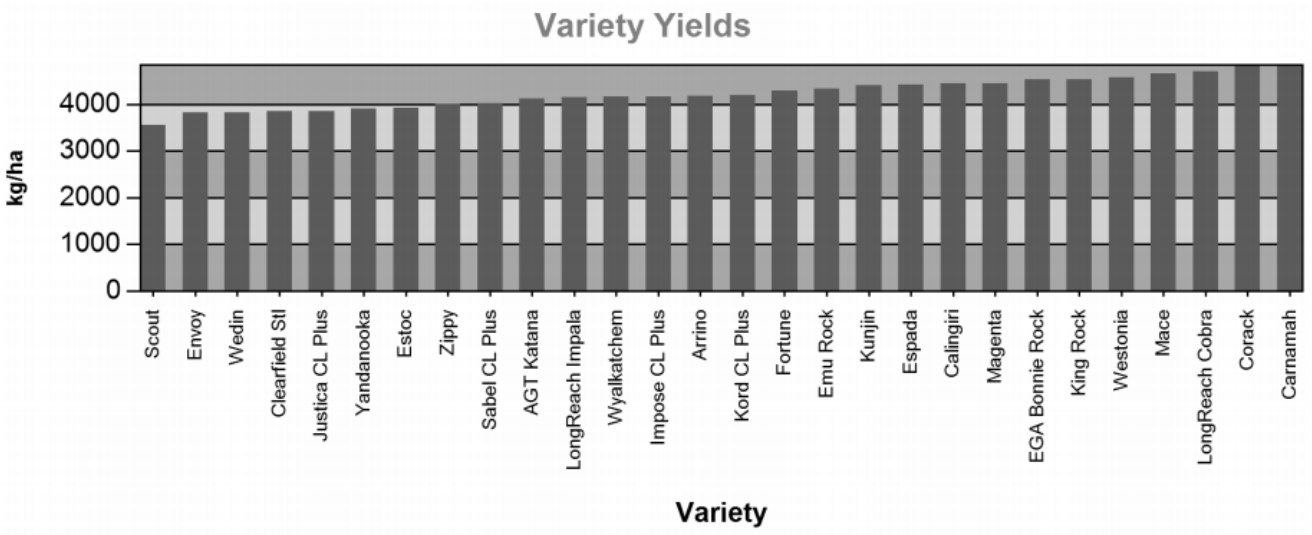

Figure 1: Yield comparison of wheat varieties sown at Eneabba.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Practice for Profit

Clare Johnston, R & D Coordinator, Liebe Group

Aim

To examine the difference in profitability between low and high input cropping practices over an extended period.

Background

This trial has been running since 2001 as a way to determine what input level results give the greatest gross margin. At the beginning of 2011, a review of the Practice for Profit trial was conducted and the results of 9 years of trial work were analysed. In most years, low input treatments gave the best gross margin. However, because the trial moved location every year, it didn't take into account the compounding effect of a continuous low input regime, for both soil nutritional run down and weed burden amongst other factors. After this review the R&D committee decided it was time for this trial to evolve.

In 2011 the trial was set up as a long term rotations trial based on the Mills' property, east of Dalwallinu. This site was chosen as a contrasting soil type to a similar trial already established at the Liebe Long Term Research Site in Buntine and it will also be able to be showcased at the 2012 Liebe Group Spring Field Day.

The trial design will compare the following two scenarios;

Low input treatments are based on a farmer producing grain at the lowest possible cost, regardless of seasonal conditions.

High input treatments simulate a paddock with high yield potential matched with increased inputs to maximize yields and profitability.

Trial Details

Property	Mills Family, Dalwallinu
Plot size & replication	8.8 x 12 x 3 replications
Soil type	Clay loam
Sowing date	25/5/11
Seeding rate	As per protocol
Fertiliser	As per protocol
Paddock rotation	2009 field peas, 2010 wheat
Herbicides	As per protocol
Growing Season Rainfall	321mm, May - October

Treatments

Table 1: Practice for Profit trial, rotation plan.

Treatment	2011	2012	2013	2014	2015	Input Level
1	Field Peas	Wheat	Wheat	Field Peas	Wheat	Low
2	Field Peas	Wheat	Wheat	Field Peas	Wheat	High
3	Wheat	Wheat	Wheat	Wheat	Wheat	Low
4	Wheat	Wheat	Wheat	Wheat	Wheat	High
5	Volunteer Pasture (Spraytopped)	Wheat	Wheat	Volunteer Pasture (Spraytopped)	Wheat	Low
6	Volunteer Pasture (Spraytopped)	Wheat	Wheat	Volunteer Pasture (Spraytopped)	Wheat	High
7	Canola	Wheat	Wheat	Canola	Wheat	Low
8	Canola	Wheat	Wheat	Canola	Wheat	High

Comments

The trial is currently in the first of a five year rotation. Due to this, 2011 results will not be available. Results and economic analysis will be presented in future years.

Contact

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Long, short and mid maturing variety shandy

Chris O'Callaghan, Executive Officer & Clare Johnston, R & D Coordinator
Liebe Group

Aim

To determine the yield and quality value of responding to seasonal conditions through the 'shandying' of several wheat varieties.

Background

With increasing seasonal variability it is important for growers to be able to respond to changing weather conditions. 'Shandying' of two or more varieties with different maturity ranges gives the crop potential to maximize rainfall use in an unpredictable climate as well as mitigate the risk of frost. Katana is a slightly short season variety, Scout has mid to long maturity, and Mace is used as a control with short to mid maturity. All varieties used are APW classified.

Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	2.5m x 50m x 3m
Soil type	Sandy loam
Soil pH	4.9
EC	0.032 dS/m
Paddock rotation	2009 wheat , 2010 lupins
Variety	as per protocol
Seeding date	27/5/11
Seeding rate	80 kg/ha
Fertiliser	27/5/11: 70 kg/ha Mallee, 17/6/11: 46 kg/ha Urea
Herbicides	26/5/11: 2 L/ha Glyphosate, 2.5 L/ha Boxer Gold
Growing Season Rainfall	330mm

Results

The trial conducted showed there was some variation in yield, however, not by a significant amount (Table 1). The shandies of Katana, Scout and Katana, Scout and Mace resulted in a higher average protein than each variety individually. Due to unfavourable late rain all treatments suffered from sprouting of the grain and therefore were graded FED1 pending falling numbers tests.

Table 1: Average yield and quality of wheat varieties and shandies at East Coorow.

Variety	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g/hL)	Sprouted	Grade
Katana	4.02	9.30	2.18	80.55	21	FED1
Scout	4.49	9.17	2.15	80.51	19	FED1
Mace	4.67	9.27	2.36	80.73	15	FED1
Katana & Scout	4.30	9.83	2.29	81.06	24	FED1
Katana, Scout & Mace	4.46	9.85	1.92	80.85	13	FED1
L.S.D.	**NS**	**NS**	**NS**	**NS**		
CV %	**12.8**	**4.7**	**28.9**	**1.7**		

Note: Graded FED1 pending falling numbers test

Comments

No significant differences were observed between treatments. The maturity dates of the varieties chosen for this trial were not different enough for a larger expression of yield differences. Future work on this concept should include varieties with more extreme maturity differences.

Acknowledgements

This demonstration is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under the FarmReady initiative, part of Australia's Farming Future and the Grains Research and Development Corporation.

Thanks to Rod Birch for the use of the land and to Justin Passamani and Nadine Hollamby for their assistance in conducting the trial.

Paper reviewed by: Darshan Sharma, DAFWA

Contact

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Low input wheat variety trial

Chris O'Callaghan, Executive Officer & Clare Johnston, R & D Coordinator, Liebe Group

Aim

To evaluate the performance of four wheat varieties under low input conditions.

Background

Increasing input costs and seasonal variability, as well as rising environmental concerns requires farmers to continually explore strategies to increase nutrient use efficiency. Nitrogen is the single biggest input cost for most farmers. In this trial three commonly grown wheat varieties in the Liebe area, Wyalkatchem, Magenta, and Mace, and one variety that showed promising results in previous National Variety Trials, Katana, are evaluated in terms of providing the best economical return with restricted nitrogen supply.

Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	2.5m x 20m x 3 replications
Soil type	Sandy loam
Soil pH	4.9
EC	0.032 dS/m
Paddock rotation	2009 wheat, 2010 lupins
Variety	as per treatment list
Seeding date	27/5/11
Seeding rate	80 kg/ha
Fertiliser	27/5/11: 70 kg/ha Mallee, 46 kg/ha Urea
Herbicides	26/5/11: 2 L/ha Glyphosate, 2.5 L/ha Boxer Gold 6/7/11: 0.35 L/ha Paragon, 0.5 L/ha BromMA
Rainfall	330mm

Results

Table 1: Yield and quality of wheat varieties.

Variety	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g/hL)	Sprouted	Payment Grade
Wyalkatchem	4.42	9.2	3.70	82.0	13	FED1
Magenta	4.83	9.1	7.37	77.9	29	FED1
Mace	4.84	8.7	8.39	80.6	10	FED1
Katana	4.49	9.6	6.63	80.6	15	FED1
L.S.D.	***NS***	***NS***	***NS***			
CV %	***3.3***	***5.3***	***30.2***			

Note: Due to untimely rainfall, sprouted grain caused all varieties to fall into the FED1 grade pending falling numbers test (Table 1).

Table 2: Economic Analysis ($/ha).

Variety	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin ($/ha)
Wyalkatchem	4.42	750.83	129.39	**621.45**
Magenta	4.83			
Mace	4.84			
Katana	4.49			

Based on FED1 price of $170/t on the 12/12/11. Variable costs based on application rates and costs from Farmanco 1/12/11. Gross Margin completed on Wyalkatchem only as the other varieties are not statistically different from this.

Comments

All varieties yielded well with the lowest being Wyalkatchem at 4.42 t/ha (Table 1). None of the varieties were statistically different. The highest yielding was Mace which as a result had the best gross margin. Due to a wet harvest all varieties were damaged by sprouting and were therefore classified as FED1 pending falling numbers. Protein was quite low across all varieties, due to the limited nitrogen supply. This low input regime may be unsustainable over the longer term, however, it is important to consider the ability of different varieties to perform under different nutrient levels. The NVT's often use high levels of nutrients which in certain conditions can also be just as unfavourable for some varieties.

Paper Reviewed by: Nadine Hollamby, Liebe Group

Acknowledgements

This demonstration is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under the FarmReady initiative, part of Australia's Farming Future.

Thanks to Rod Birch for hosting the trial and to Justin Passamani for his assistance in conducting the trial.

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Yield Prophet – How did it stack up in 2011?

Chris O'Callaghan, Executive Officer, The Liebe Group

Grains Research & Development Corporation
Australian Government
Department of Agriculture, Fisheries and Forestry

Aim

To evaluate the crop modeling tool Yield Prophet.

Background

Yield Prophet is a web based interface for the agricultural production simulation model (APSIM). It uses real-time information from the paddock to simulate how the crop is growing and by using historical rainfall records, probabilities of how it may yield. This provides a forecast of the chance of achieving a certain yield at any point in time during the season. From this we can match inputs to these yield potentials. The accuracy of the forecasts depends highly on the soil type characterization. Many of the sites used in this report have been properly characterized, however there are a couple of sites where the soil type is only an estimate and therefore may not be 100% accurate. The model does have limitations and the information presented is designed to only be used as a guide to help understand soil water and Nitrogen dynamics.

The sites modelled in 2011 are:

Deep Yellow Sand, Rod Birch, East Coorow – Liebe Main Trial Site
Acid Sandy Earth, Liebe Group Long Term Research Site, West Buntine
Loamy Earth, Ian Hyde, Dalwallinu.
Red Loamy Duplex, Keith Carter, East Wubin
Sandy Gravel, Keith Carter, East Wubin

Results

Birch Site

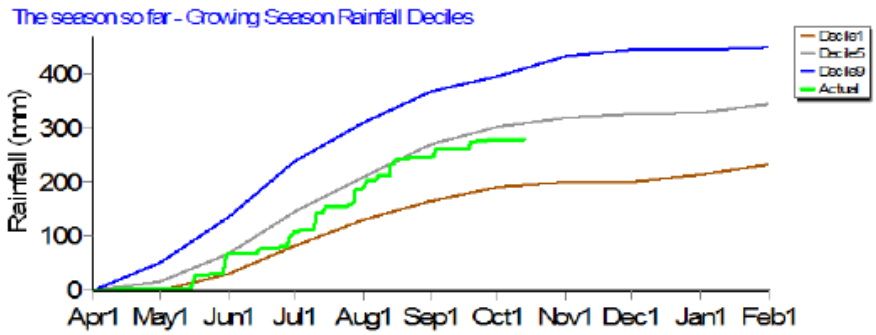

Figure 1: How the season ended up at Birch Site.

The season ended up just below a decile 5.

Table 1: What yield prophet predicted for Mace sown on 27th May.

Date	Season Tracking	Growth Stage	Predicted Potential Yield t/ha
9/5/11	-	Pre-Seeding	3.7
22/6/11	Decile 3	3rd Leaf	2.8
12/7/11	Decile 4	Late tillering	3.6
16/8/11	Decile 5	Mid boot	4.2
8/9/11	Decile 5	Mid flowering	4.2
18/10/11	Decile 4	Maturity	4.2
Actual Yield	**Decile 4**	**Maturity**	**4.6**

Note: the actual yield for this site was taken from Mace sown in a Liebe Group trial at the Main Trial Site and not a header yield monitor.

In this case yield prophet underestimated the final yield, however was reasonably close. One possible suggestion for this is the warmer than usual temperatures pushing the final yield up. It is interesting to note the limitations of the model early in the season. You can see the predicted yield was fluctuated early, and then stabilized at the higher yield potential. It had done this by mid July, so was useful in making N decisions. This site is a very even site and has been characterised.

Long Term Research Site

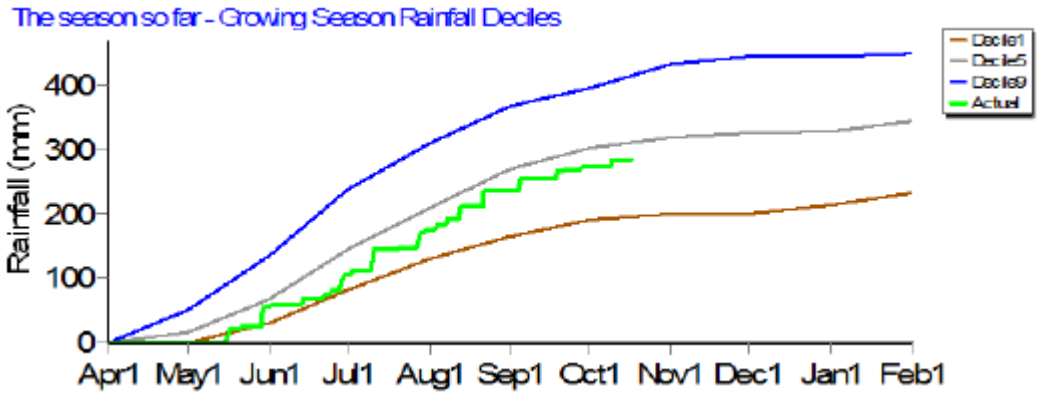

Figure 2: How the season ended up at the Long Term Research Site.

Similar to above, a decile 4.

Table 2: What yield prophet predicted for Wyalkatchem sown 1st June.

Date	Season Tracking	Growth Stage	Predicted Potential Yield t/ha
9/5/11	-	Pre-Seeding	2.2
22/6/11	Decile 3	2nd Leaf	1.8
12/7/11	Decile 3	Mid tillering	2.5
16/8/11	Decile 4	Mid boot	3.8
8/9/11	Decile 5	Mid flowering	4.1
18/10/11	Decile 4	Maturity	4.1
Actual Yield	**Decile 4**	**Maturity**	**3.3**

This crop lost some of its potential late in the season due to disease which is evident in the actual yield compared to its predicted potential yield. In 2010, yield prophet was very accurate on this site.

Hyde Site

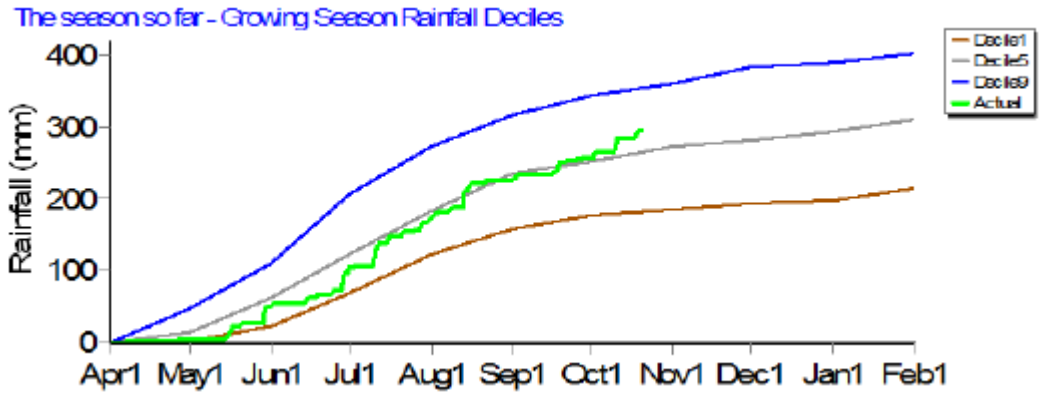

Figure 3: How the season ended up at the Hyde Site.

This site tracked on a decile 5 for most of the season, however with late rain finished up as decile 7.

Table 3: What Yield Prophet predicted for Mace sown 4th June.

Date	**Season Tracking**	**Growth Stage**	**Predicted Potential Yield t/ha**
9/5/11	-	Pre-Seeding	3.3
22/6/11	Decile 2	2nd Leaf	2.1
12/7/11	Decile 5	Mid tillering	5.5
16/8/11	Decile 5	Mid boot	5.2
8/9/11	Decile 5	Mid flowering	5.5
18/10/11	Decile 7	Maturity	5.5
Actual Yield		**Maturity**	**N/A**

Note: Actual yield unavailable at time of writing.

Carter Sites

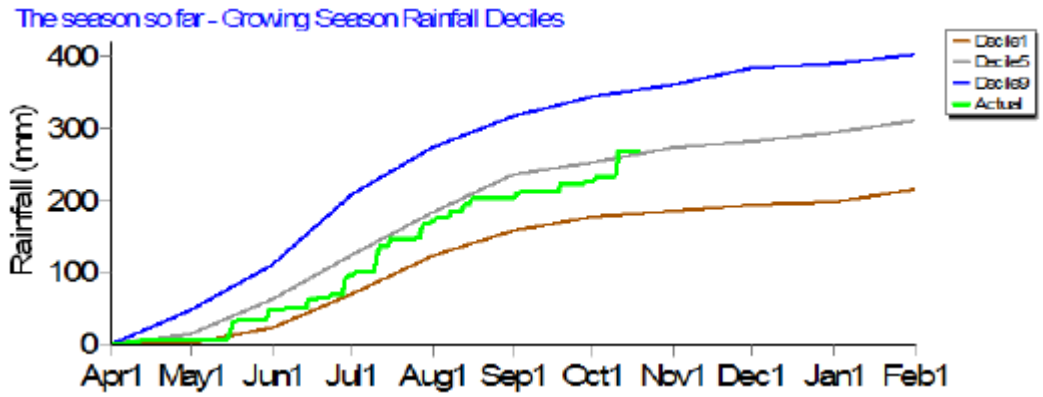

Figure 4: How the season ended up at the Cater Sites.

This site tracked close to a decile 4 before very late rain bumped it up to decile 5.

Light Land Site
What yield prophet predicted for Wyalkatchem sown 30th May.

Date	Season Tracking	Growth Stage	Predicted Potential Yield t/ha
22/6/11	Decile 2	2nd Leaf	2.1
12/7/11	Decile 1	Mid tillering	2.5
16/8/11	Decile 4	Mid boot	3.5
8/9/11	Decile 4	Mid flowering	3.5
18/10/11	Decile 5	Maturity	2.9
Actual Yield	**Decile 5**	**Maturity**	**2.9**

Heavy Land Site
What yield prophet predicted for Mace sown 24th May

Date	Season Tracking	Growth Stage	Predicted Potential Yield t/ha
22/6/11	Decile 2	2nd Leaf	2.0
12/7/11	Decile 1	Mid tillering	2.5
16/8/11	Decile 3	Mid head emerge	3.5
8/9/11	Decile 4	Mid flowering	3.8
18/10/11	Decile 5	Maturity	3.5
Actual Yield	**Decile 5**	**Maturity**	**3.7**

The characterization of the soils on the Carter sites were estimates, however finished up being quite accurate in terms of yields predicted. The model did suggest that the yields were nitrogen limited towards the end of the season, however this is influenced by the inaccuracy of the soil characterization.

Comments
Yield prophet is a tool that simply gives us a probability of how a crop will finish in terms of yield. The model only takes into account soil type, rainfall and nitrogen and assumes there are no other constraints to production. The predicted potential yield results have been drawn from the rainfall decile estimated by the model at that time. For example, if the season was tracking at decile 3 on the 16th of August, the predicted potential yield was taken as a 70% probability of achieving that yield. The 2011 results found the model was reasonably accurate, given the amount of rain that had fallen when the model was run.

Acknowledgements
This project is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under the FarmReady initiative, part of Australia's Farming Future and the Grains Research and Development Corporation.

Paper Reviewed By: David Cameron - Farmanco

Barley National Variety Trial – East Coorow

Australian Crop Accreditation System Limited

Aim

Barley variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rod Birch, East Coorow
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sandy loam
Soil pH ($CaCl_2$)	4.9
EC	0.032 dS/m
Paddock rotation	2009 wheat, 2010 lupins
Seeding date	25/5/11
Seeding rate	75 kg/ha
Fertiliser	25/5/11: 80 kg/ha Urea, 100 kg/ha Gusto Gold 26/7/11: 40 kg/ha Urea
Herbicides	25/5/11: 2 L/ha Paraquat Diquat, 1.6 L/ha Trifluralin, 1 L/ha Chlorpyrifos. 13/7/11: 1 L/ha Velocity, 0.5 L/ha MCPA LVE, 1% v/v Hasten
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of barley varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)
Stirling	2.47	71	63.40	12.3
Baudin	2.57	74	59.60	11.2
Mundah	3.17	91	61.60	11.2
Navigator	3.21	92	61.60	10.1
Bass	3.25	93	65.00	11.2
Fleet	3.32	95	61.60	10.0
Scope	3.33	96	63.40	11.2
Henley	3.34	96	60.60	11.2
Gardiner	3.37	97	63.80	11.2
Roe	3.43	99	64.20	11.2
Fathom	3.50	101	63.00	11.2
Buloke	3.52	101	63.40	11.2
Commander	3.56	102	62.80	11.2
Vlamingh	3.59	103	67.00	11.2
Lockyer	3.63	104	63.60	11.2
Hindmarsh	3.92	113	66.00	10.1
Skipper	3.96	114	65.80	11.2
Site Mean (t/ha)	3.48			
CV (%)	5.7			
Probability	<0.001			
LSD (t/ha)	0.33	9		

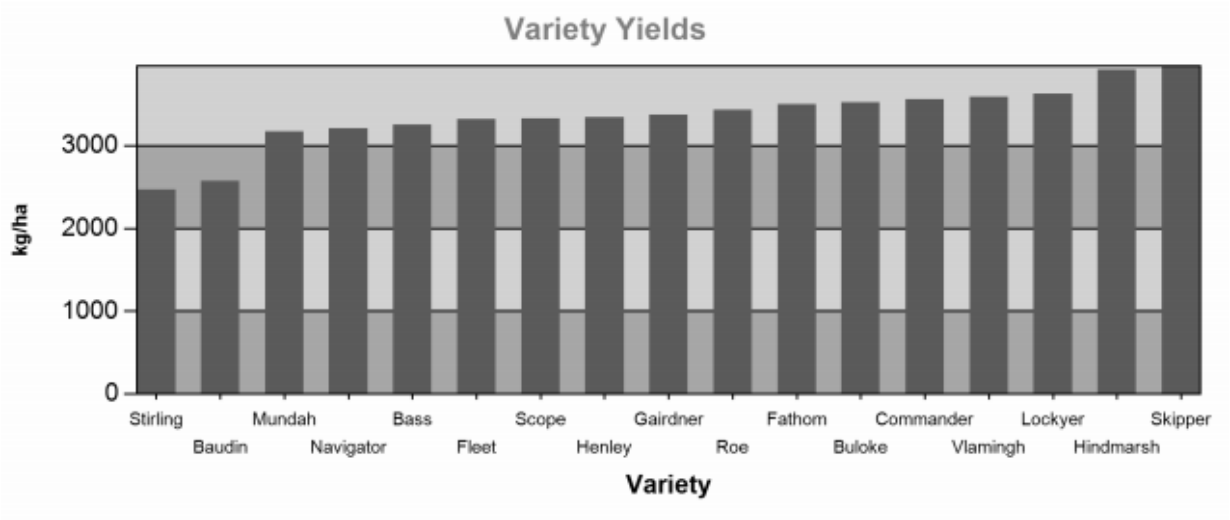

Figure 1: Yield comparison of barley varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au

Barley National Variety Trial – Wongan Hills

Australian Crop Accreditation System Limited

Aim

Barley variety evaluation

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Jemma Sadler, Wongan Hills
Plot size & replication	1.76m x 12m x 3 replications
Soil type	Sand / sandy loam
Soil pH ($CaCl_2$)	5.1
EC	0.069 dS/m
Paddock rotation	2008 pasture, 2009 wheat, 2010 pasture
Seeding date	22/5/11
Seeding rate	75 kg/ha
Fertiliser	3/6/11: 100 kg/ha Urea, 100 kg/ha Gusto Gold. 2/8/11: 80 kg/ha MAXam
Herbicides	21/5/11: 1.5 L/ha Roundup PowerMax, 2.5 L/ha Boxer Gold, 1 L/ha Chlorpyrifos 4/7/11: 1 L/ha Velocity, 120 g/ha Lontrel, 400 mL/ha Axial, 0.5% v/v Adigor
Growing Season Rainfall	417mm

Results

Table 1: Yield and quality of barley varieties sown at Wongan Hills.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Hectolitre Weight	Protein (%)
Molloy	1.83	85	61.00	13.7
Baudin	1.91	89	55.40	13.7
Buloke	1.94	90	59.00	13.7
Mundah	1.95	91	56.40	13.7
Fathom	1.99	93	53.80	14.1
Fleet	2.02	94	52.40	13.6
Stirling	2.03	94	59.00	N/A
Henley	2.04	95	55.40	13.7
Gardiner	2.07	96	58.40	14.8
Scope	2.09	97	59.40	13.7
Bass	2.10	98	59.80	14.8
Skipper	2.24	104	57.20	13.1
Navigator	2.26	105	58.80	14.8
Vlamigh	2.26	105	59.80	14.8
Commander	2.30	107	57.00	13.7
Lockyer	2.33	108	59.80	13.7
Roe	2.49	116	56.20	13.6
Hindmarsh	2.53	118	62.40	13.7
Site Mean (t/ha)	2.15			
CV (%)	6.4			
Probability	<.001			
LSD (t/ha)	0.23	11		

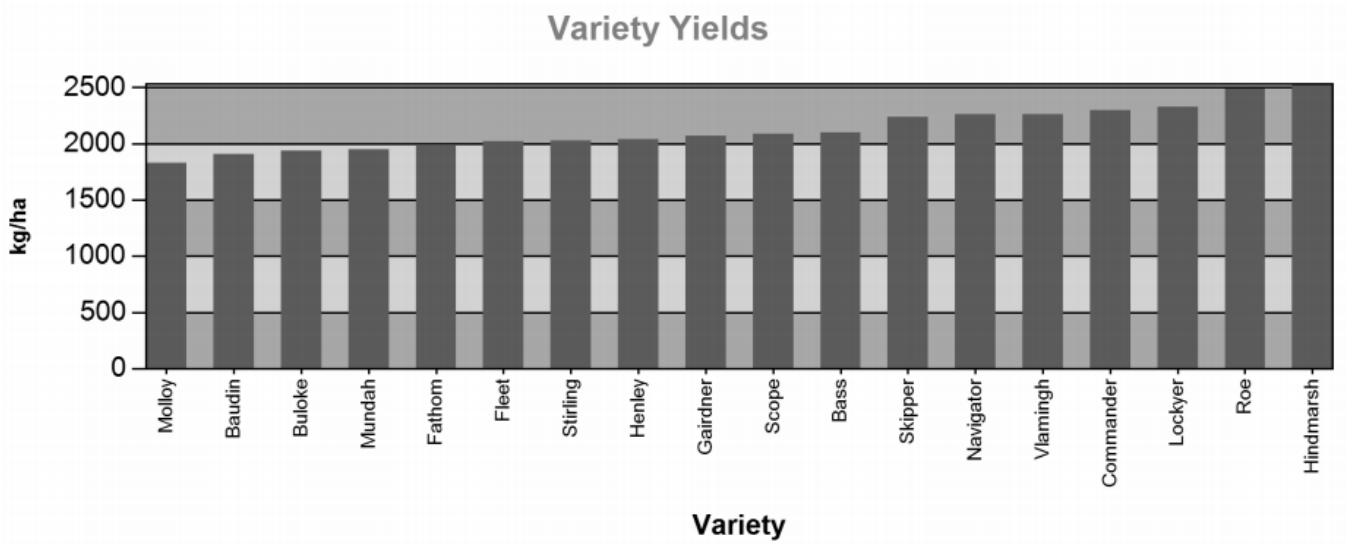

Figure 1: Yield comparison of barley varieties sown at Wongan Hills.

Comments

- For more information please refer to www.nvtonline.com.au

Triticale Variety Demonstration

Clare Johnston, R & D Coordinator, Liebe Group

Aim

To evaluate which varieties of triticale yield well on 'wodjil' soils which have low subsoil pH and aluminum toxicity.

Background

Triticale, a crossbreed of wheat and rye, is designed to be a high yielding feed crop that can grow on acidic soil types in which wheat struggles. Three different varieties were trialled in a farm scale demonstration. These varieties were:

Berkshire: A variety bred for high quality feed grain to supply the pork industry. The yield is equivalent to currently available triticale varieties (Waratah Seeds, 2007).

Speedee: Bred for early vigour and maturity. It is suitable for late sowing, short seasons and low rainfall. Speedee has excellent disease resistance and is easier to harvest than other triticale varieties (Bateman, 2011).

Tahara: Older variety that has good resistance to cereal cyst and root lesion nematodes, however, it is susceptible to stripe rust and yields lower than newer varieties.

Trial Details

Property	Deb and Neil Brown, Perenjori
Plot size & replication	248m x 30m x 1 replication
Soil type	Sandy gravel, light red sandy loam, yellow wodjil
Paddock rotation	2008 triticale, 2009 pasture, 2010 pasture
Seeding date	16/6/11
Seeding rate	70 kg/ha
Fertiliser	16/6/11: 50 kg/ha K-Till Extra
Herbicides & Pesticides	16/6/11: 1.2 L/ha Glyphosate, 1.2 L/ha Trifluralin, 200 g/ha Diuron. 12/7/11: 60 mL/ha Alpha Forte 19/7/11: 60 mL/ha Alpha Forte, 700 mL/ha Jaguar
Growing Season Rainfall	202mm

Trial Design and Layout

Three plots (Berkshire, Speedee and Tahara) were planted 30m wide and 240m long, traversing three soil types – Sandy gravel, light red sandy loam and yellow wodjil sand as shown below in Figure 1.

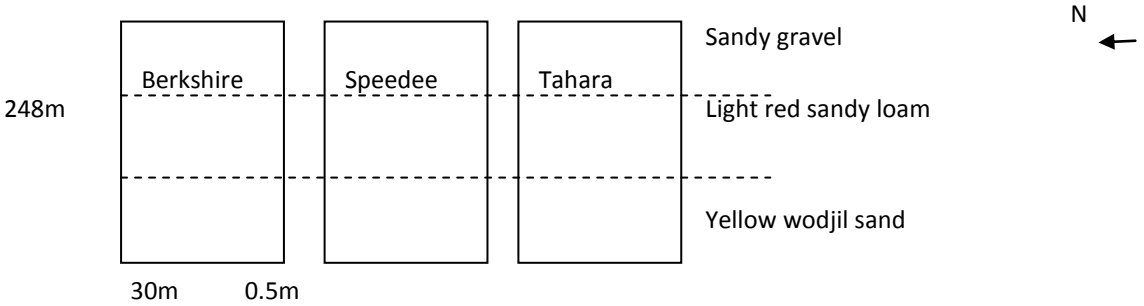

Figure 1: Trial layout.

Results

Table 1: Yield and quality of triticale varieties.

Variety	Yield (t/ha)	Protein (%)
Berkshire	1.14	11.5
Speedee	0.94	11.8
Tahara	0.77	11.8

After being attacked by cutworm 4 weeks after sowing the triticale regenerated quickly. As expected the newer varieties yielded higher than the Tahara.

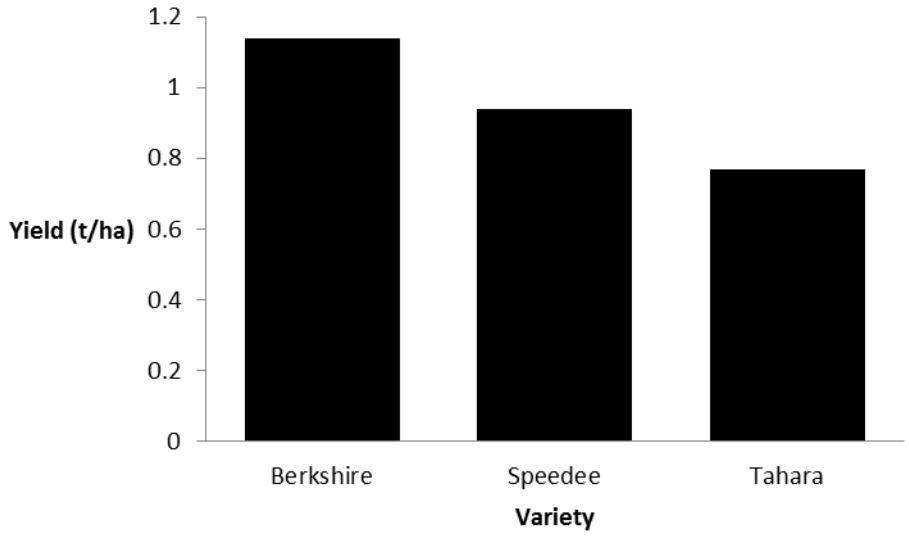

Figure 2: Yield of triticale varieties Berkshire, Speedee, Tahara East of Perenjori 2011.

Comments

- Crop affected by cutworm - count at 40/m^2 (12/7/11), treated with 60 mL/ha Alpha Forte then 1 hour later 40mm rain occurred followed by a week of drizzle, therefore not all cutworm died.
- Berkshire recovered quickly from cutworm damage with more tillers and harvested easily.
- The farmer will not retain Tahara for seed.
- Speedee will be used again by the farmer because it may still perform in a short season – further testing required.
- This is an unreplicated demonstration, please interpret all results carefully.

Acknowledgements

Thank you to Deb and Neil Brown for conducting the trial and sharing their results.

Reference

Bateman, R. 2011. 'Triticale variety sowing guide 2012'. *SARDI Sowing Guide 2012*. pp. 44-46.

Waratah Seeds. 2007. 'Varieties – Triticale'. Received: 4 January 2012, from http://www.waratahseeds.com.au/varieties.html

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TT Canola National Variety Trial – East Coorow

Information from Australian Crop Accreditation System Limited

GRDC Grains Research & Development Corporation

National Variety Trials

Aim

Triazine Tolerant Canola variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	1.32m x 12m x 3 replicates
Soil type	Sandy loam
Soil pH	5.7
EC	0.0 dS/m
Sowing date	6/5/11
Seeding rate	3.5 kg/ha
Fertiliser	6/5/11: 150 kg/ha MAXam, 100 kg/ha Gusto Gold. 23/6/11: 90 kg/ha Urea
Paddock rotation	2009 wheat, 2010 lupin
Herbicides, Insecticides & Fungicides	6/5/11: 1.5 L/ha Glyphosate, 2 L/ha Trifluralin, 1.5 L/ha Chlorpyrifos, 0.2 L/ha Bifenthrin, 0.3 L/ha Alpha-cypermethrin. 11/5/11: 2 L/ha Atrazine. 20/6/11: 2 L/ha Atrazine. 20/7/11: 0.5 L/ha Chlorphrifos, 0.5 L/ha Alpha- cypermethrin, 0.2 L/ha Bifenthrin.
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of TT canola varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Oil (%)	Protein (%)
Hyola 444TT	1.77	86	45.8	20.8
Bonanza TT	1.79	87	46.5	19.9
CB Telfer	1.82	89	46.3	20.7
Monola 605TT	1.89	92	46.8	17.9
Monola 76TT	1.94	95	48.5	18.2
ATR Stingray	1.96	96	47.4	19.9
CB Junee HT	2.01	98	45.8	19.5
CB Mallee HT	2.06	100	44.2	19.1
ATR Cobbler	2.08	101	47.1	18.9
Tawriffic TT	2.08	101	49.1	18.3
Hyola 555TT	2.34	114	45.5	19.7
ATR Snapper	2.46	120	49.9	17.9
Site Mean (t/ha)	2.05			
CV (%)	6.0			
Probability	<.001			
LSD (t/ha)	0.19	9		

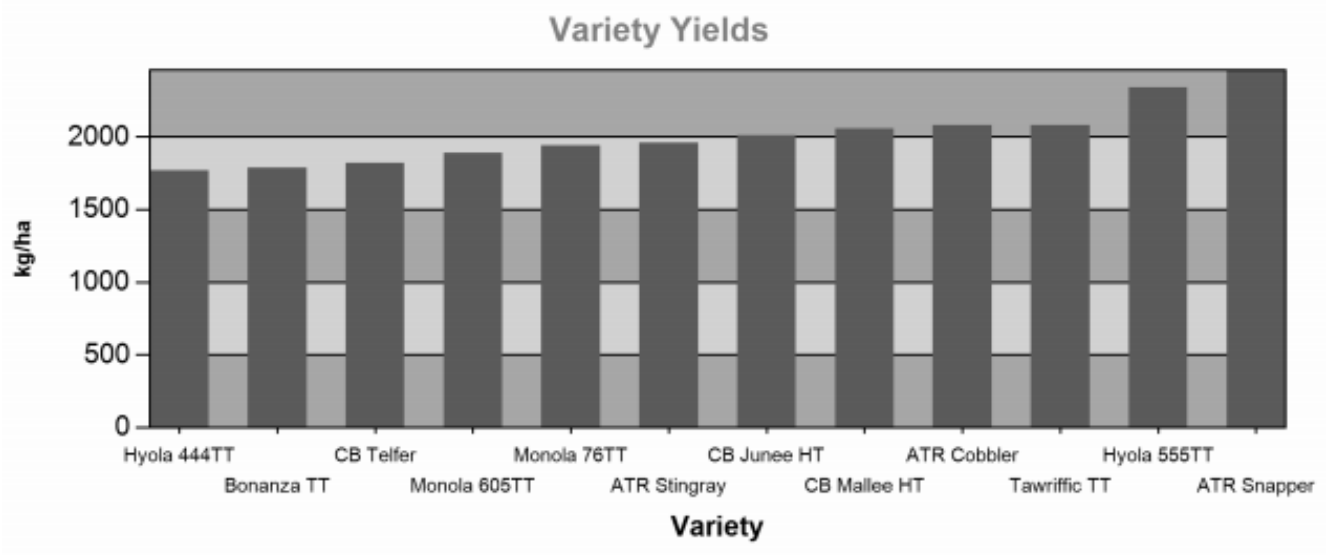

Figure 1: Yield comparison of TT canola varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

RR Canola National Variety Trial – East Coorow

Information from Australian Crop Accreditation System Limited

GRDC Grains Research & Development Corporation

National Variety Trials

Aim

Roundup Ready Canola variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	1.32m x 12m x 3 replicates
Soil type	Sandy loam
Soil pH	5.7
EC	0.0 dS/m
Sowing date	6/5/11
Seeding rate	3.5 kg/ha
Fertiliser	6/5/11: 150 kg/ha MAXam, 100 kg/ha Gusto Gold. 23/6/11: 90 kg/ha Urea
Paddock rotation	2009 wheat, 2010 lupin
Herbicides, Insecticides & Fungicides	6/5/11: 1.5 L/ha Glyphosate, 2 L/ha Trifluralin, 1.5 L/ha Chlorpyrifos, 0.2 L/ha Bifenthrin, 0.3 L/ha Alpha-cypermethrin 20/6/11: 900 g/ha Glyphosate 20/7/11: 0.5 L/ha Chlorpyrifos, 0.2 L/ha Bifenthrin, 0.5 L/ha Alpha-cypermethrin
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of RR canola varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)	Oil (%)	Protein (%)
GT Cougar	2.03	91	46.6	18.1
GT Mustang	2.04	91	49.7	17.6
GT Taipan	2.07	92	46.9	18.5
Pioneer 46Y20	2.08	93	49.2	18.5
GT Scorpion	2.10	94	45.7	19.2
Hyola 505RR	2.13	95	50.3	17.5
GT Viper	2.15	96	48.4	17.6
GT Cobra	2.21	99	48.3	18.2
CB Eclips RR	2.41	108	46.3	18.0
Hyola 404RR	2.53	113	49.0	18.0
Site Mean (t/ha)	2.24			
CV (%)	3.9			
Probability	<.001			
LSD (t/ha)	0.14	8		

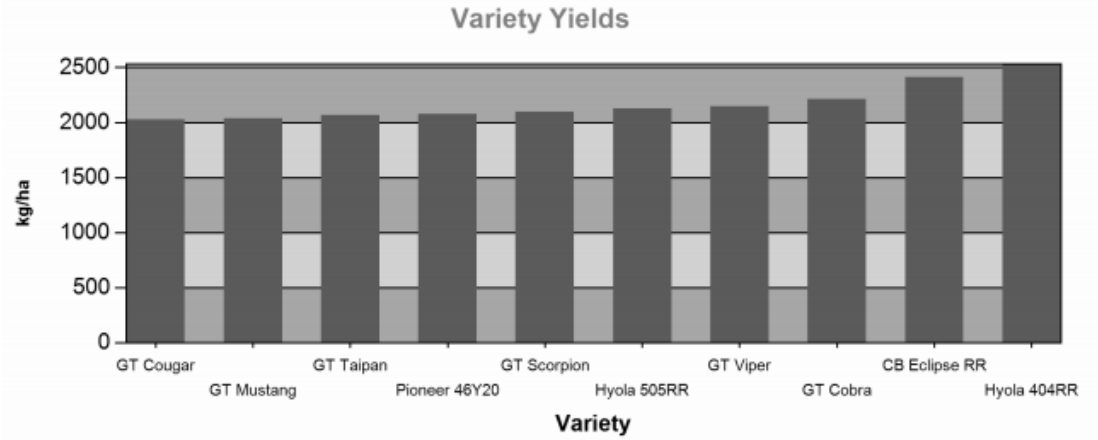

Figure 1: Yield comparison of RR canola varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au
- NVT results will be presented at the Liebe Group Updates on the 7th of March 2012.

Lupin National Variety Trial - Kalannie

Australian Crop Accreditation System Limited

Aim

Lupin variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Rowan McCreery, Kalannie
Sowing date	12/5/11
Fertiliser	12/5/11: 80 kg/ha Big Phos Manganese
Herbicides, Insecticides & Fungicides	12/5/11: 0.1 L/ha Bifenthrin, 1.1 kg/ha Simazine. 27/5/11: 0.15 L/ha Diflufenican 14/7/11: 0.01 L/ha Hasten, 0.5 L/ha Clethodim, 7 g/ha Metosulam
Growing Season Rainfall	283mm

Results

Table 1: Yield and quality of lupin varieties sown at Kalannie.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
Danja	0.88	81
Tanjil	0.88	81
Coromup	1.00	93
Quilinock	1.04	96
PBA Gunyidi	1.08	100
Jenabillup	1.10	102
Mandelup	1.16	107
Site Mean (t/ha)	1.08	
CV (%)	6.7	
Probability	<.001	
LSD (t/ha)	0.12	11

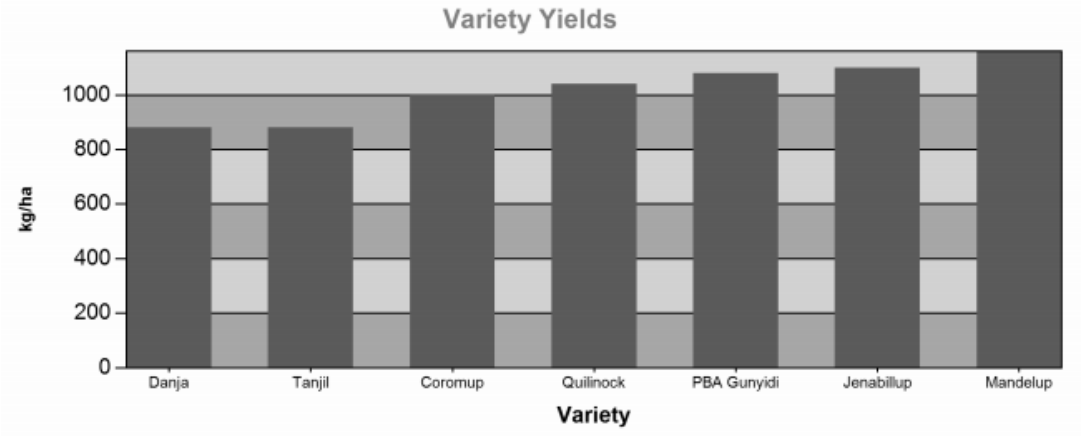

Figure 1: Yield comparison of lupin varieties sown at Kalannie.

Comments

- For more information please refer to www.nvtonline.com.au

Lupin National Variety Trial - East Coorow

Australian Crop Accreditation System Limited

Aim

Lupin variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Soil type	Sandy loam
Sowing date	9/5/11
Paddock rotation	2009 canola, 2010 wheat
Herbicides, Insecticides & Fungicides	9/5/11: 0.2 L/ha Bifenthrin, 0.1 L/ha Alpha-cypermetherin, 1.5 L/ha Trifluralin, 1.5 L/ha Simazine. 20/6/11: 0.01 L/h Hasten, 0.5 L/ha Clethodim. 12/7/11: 0.01 Hasten, 0.5 L/ha Clethodim. 24/8/11: 0.2 L/ha Alpha-cypermetherin. 4/10/11: 0.2 L/ha Alpha-cypermetherin.
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of lupin varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
Danja	2.21	70
Mandelup	2.72	86
Tanjil	2.79	88
Jenabillup	3.19	101
Quilinock	3.40	108
PBA Gunyidi	3.62	115
Coromup	3.65	116
Site Mean (t/ha)	3.16	
CV (%)	8.8	
Probability	<.001	
LSD (t/ha)	0.45	14

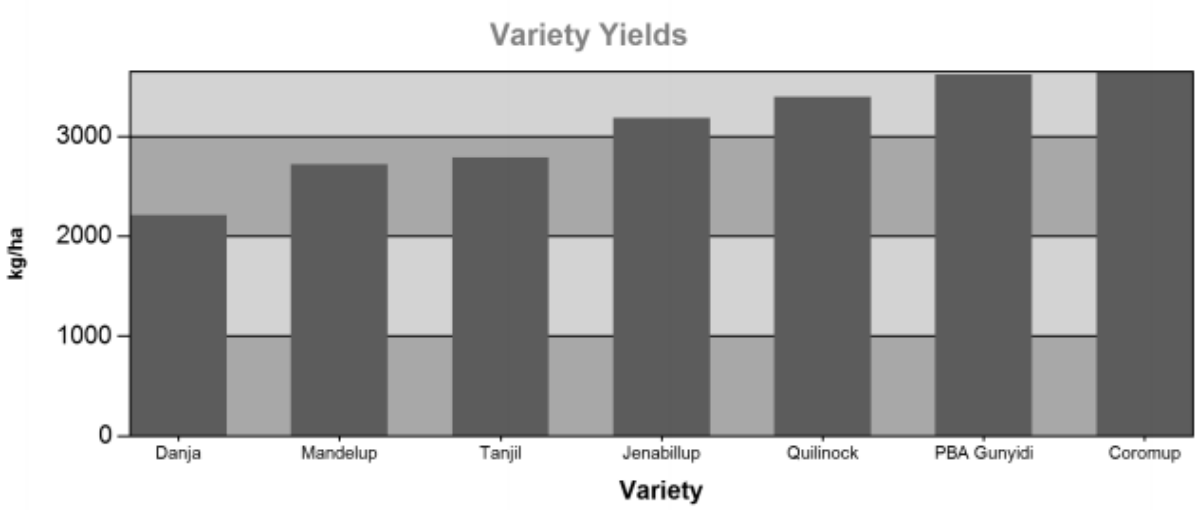

Figure 1: Yield comparison of lupin varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au

Chickpea National Variety Trial – East Coorow

Australian Crop Accreditation System Limited

Aim

Chickpea variety evaluation.

Background

NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Sowing date	19/5/11
Fertiliser	19/5/11: 80 kg/ha DAP
Herbicides, Insecticides & Fungicides	19/5/11: 0.1 kg/ha Isoxaflutole, 2 L/ha Cyanazine, 0.2 L/ha Bifenthrin, 0.1 L/ha Alpha-cypermethrin, 1.5 L/ha Trifluralin, 1.5 L/ha Praquat / Diquat
Growing Season Rainfall	330mm

Results

Table 1: Yield and quality of chickpea varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
Rupali	1.59	76
Genesis 090	1.72	83
Genesis 079	1.81	87
PBA HatTrick	2.07	100
Genesis 510	2.19	105
Genesis 836	2.33	112
PBA Slasher	2.34	113
Sonali	2.42	116
Howzat	2.50	120
Site Mean (t/ha)	2.08	
CV (%)	12.3	
Probability	<.001	
LSD (t/ha)	0.46	22

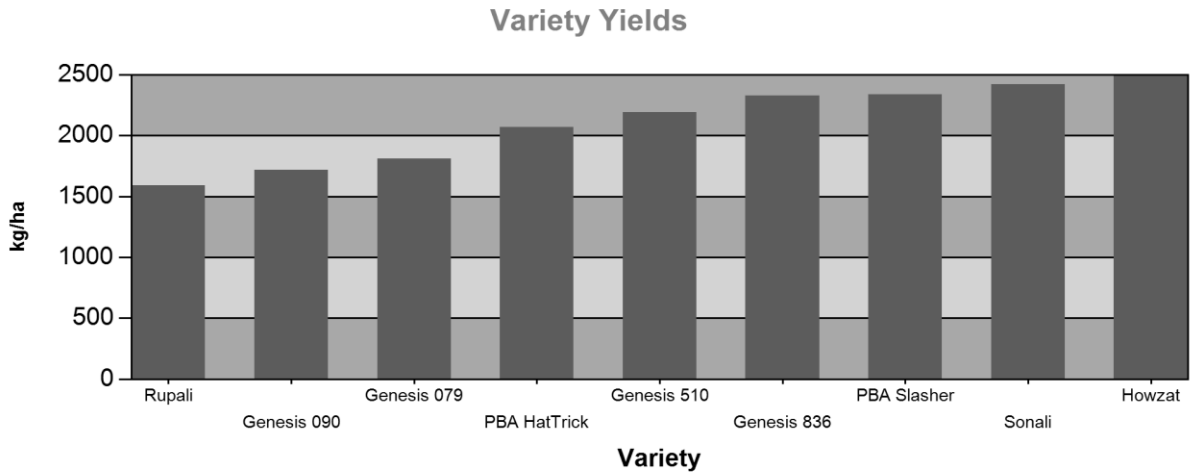

Figure 1: Yield comparison of chickpea varieties sown at East Coorow.

Comments

- For more information please refer to www.nvtonline.com.au

Chickpea agronomy demonstration

Clare Johnston, R & D Coordinator, Liebe Group; David Roach, SA&AM Roach

Aim

To evaluate two chickpea varieties sown at two seeding depths and two seeding rates by two different row spacing's.

Background

This demonstration aims to illustrate some of the agronomic features of chickpeas on a paddock-scale. Two different trials were being tested; the first to discover which variety (Slasher or Genesis 836) grew best under differing seeding depths. The other question to be answered concerned the seeding rate in combination with seeding depth.

Trial Details

Property	Wellparks, SA & AM Roach, East Pithara
Plot size & replication	15.3m x 100m x 3 replicates
Soil type	Red loam
Soil pH	6.5
Paddock rotation	2009 wheat, 2010 wheat
Variety	Genesis 836 and as per protocol
Sowing date	23/5/11
Seeding rate	60 kg/ha and 100 kg/ha
Fertiliser	23/5/11: 50 kg/ha Agflow
Herbicides	1.1 kg/ha Simazine, 0.4 kg/ha Diuron
Growing Season Rainfall	251mm

Trial Design and Layout

There were two separate experiments in this demonstration: (1) two varieties (Slasher and Genesis 836) by two seeding depths (5cm and 10cm) (2) two row spacing's (narrow (30cm) and wide (60cm) with every second tube blocked off) by two seeding rates (100 kg/ha and 60 kg/ha).

Results

Table 1: Chickpea average yield of different seeding depths, rates and varieties.

Treatment	Average Yield (kg/ha)
Row Spacing x Seeding Rate	
30cm, 60 kg/ha	222
30cm, 100 kg/ha	246
60cm, 60 kg/ha	134
60cm, 100 kg/ha	183
L.S.D.	**NS**
Variety x Seeding Depth	
Slasher 5cm	113
Slasher 10cm	192
Genesis 836 5cm	143
Genesis 836 10cm	151
L.S.D.	**NS**

Comments

Grub infestations attacked the pods of the chickpea, resulting in a lack of seed development. As a result a high number of pods are unable to produce seed, significantly reducing crop yield.
Poor Diuron incorporation resulted in weeds in furrow but not on ridges.
There was no significant difference between Slasher and Genesis 836.
Wider row spacing resulted in reduction in chickpea yield, however this was not significantly different.

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Field Pea National Variety Trial – East Coorow

Australian Crop Accreditation System Limited

Aim
Field Pea variety evaluation.

Background
NVT is a national program of comparative crop variety testing with standardised trial management, data generation, collection and dissemination. The program is supported by the Australian Government and growers through the Grains Research and Development Corporation and is managed by the Australian Crop Accreditation System Limited.

Trial Details

Property	Catalina Farms, East Coorow
Soil type	Sandy loam
Sowing date	19/5/11
Herbicides, Insecticides & Fungicides	19/5/11: 0.2 g/ha Imazethapyr, 0.2 L/ha Bifenthrin, 0.1 L/ha Alpha-cypermethrin, 2 L/ha Clopyralid, 1.5 L/ha Trifluralin, 1.5 L/ha Pendimethalin
Growing Season Rainfall	330mm

Results
Table 1: Yield and quality of Field Pea varieties sown at East Coorow.

Variety Name	Yield (t/ha)	Percentage of site mean (%)
PBA Twilight	2.68	88
Parafield	2.73	90
PBA Gunyah	2.90	95
PBA Oura	3.08	101
Kaspa	3.11	102
Yarrum	3.14	103
Site Mean (t/ha)	3.05	
CV (%)	10.6	
Probability	0.037	
LSD (t/ha)	0.57	19

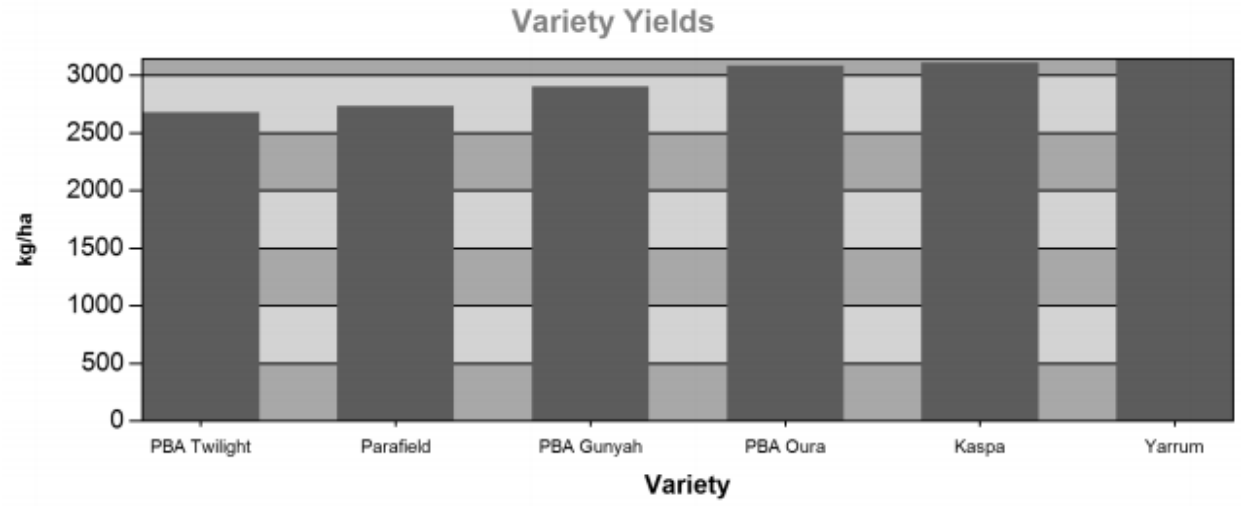

Figure 1: Yield comparison of Field Pea varieties sown at East Coorow.

Comments
- For more information please refer to www.nvtonline.com.au

Summer sowing: alternative technique to introduce legumes into pastures

Angelo Loi & Bradley Nutt, Research Officers,
Department of Agriculture and Food Western Australia

Department of Agriculture and Food

Aim

To compare two methods for the establishment of pasture legumes (i) summer sowing where dormant hard-seed is drill sown into the paddock after the crop is harvested and (ii) traditional sowing where scarified seed is drill sown after the break of the season and knockdown weed control.

Background

Summer sowing is a technique that is being evaluated as a means to introduce legume species into pastures. It is being developed to enable a cost effective and convenient means to improve pasture production and quality using seed produced on the farm with minimal processing and at a low cost. This method firstly utilises legume seed dormancy to prevent undesirable germination and secondly, to have sufficient breakdown of this dormancy to provide adequate seedling establishment density under favourable conditions. Summer sowing requires a sowing operation in late summer or early autumn following crop harvesting and where there is expected to be a low weed burden. The pasture legume will establish as regenerating pasture making full use of the growing season. This technique has the potential to reduce the cost of the pasture legume establishment, particularly for species such as serradella where seed processing to enhance germination is difficult and costly.

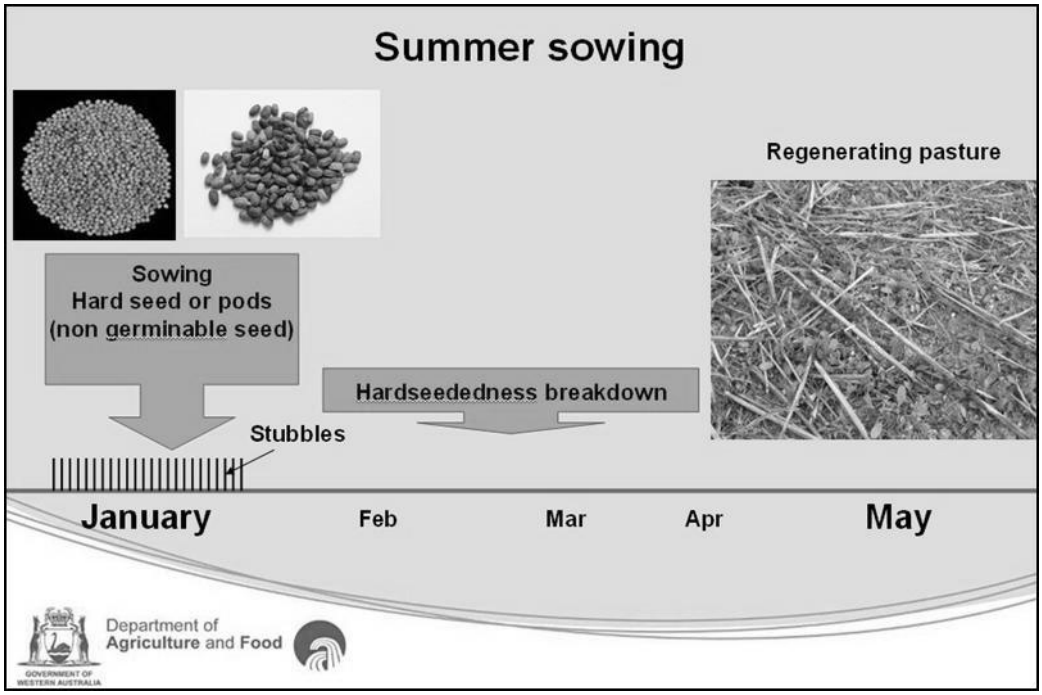

Figure 1: Time line of summer sowing seed breakdown.

Trial Details:

Property	Catalina Farms, Main Trial Site, East Coorow
Plot size & replication	50m x 5m x 3 replicates
Seeding date	3/2/11, 31/5/11
Seeding rate	50 kg/ha of pods (summer sowing) and 10 kg/ha of seed (normal sowing)

Fertiliser	120 kg/ha Super/Potash (3:1)
Inoculation	10 kg/ha ALOSCA S and C
Herbicides	31/5/11: 1 L/ha Kerb as post-sowing/pre-emergence
Growing Season Rainfall	330mm

Treatments:

Table 1: Treatments.

	Species	Sowing Time
1	Unsown	Summer
2	French Serradella Margurita	Autumn
3	Yellow Serradella GEH72.1a	Summer
4	Yellow Serradella GEH72.1a	Autumn
5	French Serradella Margurita	Summer
6	Subclover	Autumn

Results

Table 2: Plant establishment densities at East Coorow after summer sowing of dormant serradella pod and traditional sowing of scarified seed after weed knockdown.

Species	Treatment	Plants/m^2 31/5/11
French serradella Margurita	Normal sowing	220
French serradella Margurita	Summer sowing	1013
Yellow serradella GEH72.1a	Normal sowing	302
Yellow serradella GEH72.1a	Summer sowing	776
Subclover	Normal sowing	213

Table 3: Dry matter production in winter and spring and seed yield (unsprayed and sprayed with glyphosate in spring) of annual pasture legumes sown at different times; at the break of the season (normal) and at the start of summer (summer sowing) at East Coorow.

Cultivar	Treatment	DM t/ha 14/7/11	DM t/ha 5/9/11	Seed Yield (kg/ha) Unsprayed	Seed Yield (kg/ha) Sprayed (Glyphosate Spring)
Margurita	Normal sowing	0	3676	489	62
Margurita	Summer sowing	1478	6124	348	99
GEH72.1a	Normal sowing	0	3111	1128	936
GEH72.1a	Summer sowing	1154	5906	1188	713
Dalkeith	Normal sowing	0	2992	173	195
Unsown		230	746	-	-

Advantages of summer sowing

Traditionally, forage legumes are sown after the main cropping program is completed and require the application of a pre-sowing knockdown herbicide to control established weeds. This treatment seriously reduces early winter pasture production which is then compounded by the slow growth rate of legumes under the cold winter conditions.

Summer sowing offers early winter grazing in a mixed enterprise farm. The technique has the ability to lift the legume component in a pasture which has degraded through a range of factors such as drought and/or intensive cropping. On a farm without grazing animals, summer sowing can be used to produce a green fallow with a high legume content that can be brown manured to provide high nitrogen residues and maximise the organic matter for the benefit of subsequent crops.

Summer sowing reduces establishment cost by firstly, minimising seed processing particularly in the case of serradella where seed extraction is difficult and expensive and secondly, sowing does not require a pre-sowing application of herbicide.

The requirement to sow hard-seeded cultivars in summer or early autumn does lose some of the flexibility to tactically respond to seasonal conditions and this needs to be balanced against the clear productivity advantages demonstrated.

The same trial was conducted at Mingenew. Results are presented below in Table 4.

Table 4: Plant establishment densities at Mingenew 2011 after summer sowing of dormant serradella pod and traditional sowing of scarified seed after weed knockdown.

Species	Treatment	Plants/m^2 31/5/11
French serradella Margurita	Normal sowing	330
French serradella Margurita	Summer sowing	510
Yellow serradella GEH72.1a	Normal sowing	340
Yellow serradella GEH72.1a	Summer sowing	410
Subclover	Normal sowing	210

Table 5: Dry matter production in winter and spring and seed yield (unsprayed and sprayed with glyphosate in spring) of annual pasture legumes sown at different times: at the break of the season (normal) and at the start of summer (summer sowing) at Mingenew in 2011.

Cultivar	Treatment	DM t/ha 14/7/11	DM t/ha 5/9/11	Seed Yield (kg/ha) Unsprayed	Seed Yield (kg/ha) Sprayed (Glyphosate Spring)
Margurita	Normal sowing	0.0	3.7	694	829
Margurita	Summer sowing	1.2	6.1	600	907
GEH72.1a	Normal sowing	0.0	3.1	3287	2933
GEH72.1a	Summer sowing	1.1	5.9	3148	3149
Dalkeith	Normal sowing	0.0	3.0	767	524
Unsown		0.4	0.7	-	-

Paper reviewed by: Dr Ron Yates, DAFWA

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Optimising nitrogen fixation in pasture legumes

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Department of Agriculture and Food

Aim

It is very important that pasture legumes be inoculated with the correct rhizobia strain (or Group) for maximum nitrogen fixation. Native or soil-borne strains of rhizobia are sometimes present, but they are generally poor at fixing nitrogen on pasture legumes compared with specialised commercial strains of rhizobia. This trial compliments last year's trial, in order to gather information on the efficiencies of three commercially available inoculant carriers (peat-slurry, Becker Underwood Nodulator® granules and ALOSCA® granules) to provide commercial strains of rhizobia to three pasture legumes (biserrula, serradella and clover) when summer sown before the break into dry soils or conventional sowing after the break into moist soil. Hence, the aim of this trial is to demonstrate the benefits of inoculating pasture legumes with specialised commercial strains of rhizobia (or Groups) for maximum N fixation. Additionally, it aims to determine the efficiencies of three commercially available inoculant carriers when sown together with seed into dry (summer sowing) and moist soil conditions (conventional sowing).

Background

Pasture legumes form a symbiotic (mutually beneficial) association with specific soil bacteria (rhizobia) to meet their complete nitrogen requirements. Nodules develop on the plant roots and house millions of rhizobia that convert nitrogen from the air into a form the plant can use (in a process known as nitrogen fixation). The association between the host plant and its rhizobia is very specific. It is essential legumes are inoculated with the correct and current commercial rhizobia strain (or Group) for maximum N fixation. Commercial inoculant strains go through an extensive selection process, in which the strains must possess the ability to maintain high N fixation over a broad host range and adapt to the anticipated soil niche of the host legume.

Inoculants come in four different carriers: (a) peat; (b) freeze dried powders; (c) granular; and (d) a pre-coated seed form, with inoculum as part of the pellet. All forms of inoculant carry live cells of rhizobia and must be stored correctly to preserve high numbers. The shelf life of these products varies from several weeks in the case of some pre-coated seeds to three years for the freeze dried powder. The cost of inoculation can vary from $5–25/ha depending on the product. Peat-slurry is the cheapest form of inoculation to purchase but there are additional costs in time and labour to consider. The more expensive options can be easier to use and offer greater flexibility for sowing operations. More information can be found on DAFWA Farmnote 431 "Inoculating pasture legumes".

Therefore the ongoing challenge is to successfully deliver high numbers of the commercial inoculant. If this is not achieved it leads to failed nodulation, or nodulation of the legume with resident soil-borne strains that are usually sub-optimal in N fixation. Notably, before this trial was undertaken the "rule of thumb" on resident soil-borne strains in the WA wheat/sheep belt was that (i) the clover strains were sub-optimal, particularly on the new clover cultivars such as Bartolo, (ii) biserrula had no or very little resident soil-borne strains and (iii) serradella had abundant effective resident soil-borne strains, particularly in the Northern Agricultural region as serradella nodulate and fix N well with the lupin strains. However, summer sowing, a new establishment technique has been designed to cheaply introduce legume species into paddocks at a time when farm labour is not limiting (assisted by strategically harnessing inherent hard-seed breakdown in the legume cultivars) is adding another level of stress to the inoculants. The

technique presents a challenging scenario as the dry soil presents many deleterious factors that kill the bacteria, which are alive, particularly high soil temperatures.

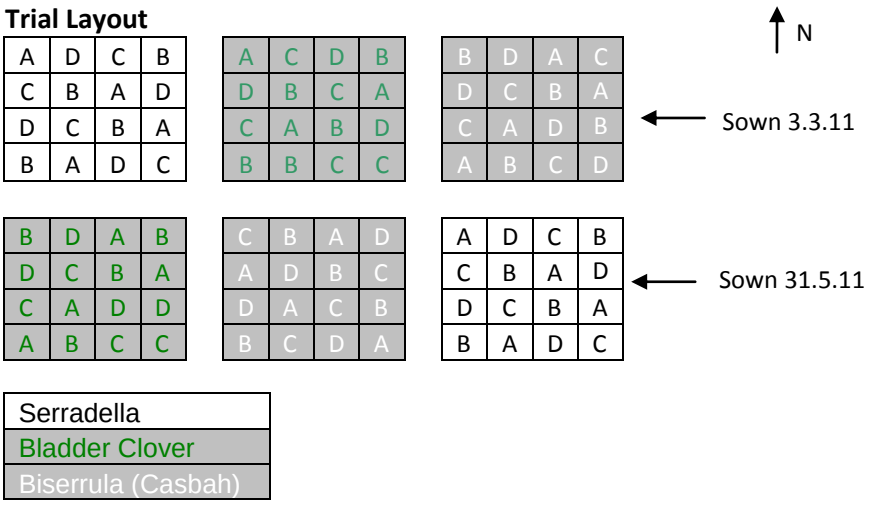
Trial Details

Property	Catalina Farms, East Coorow
Plot size & replication	2m x 0.25m x 4 replicates with 1m buffers
Soil type	Yellow-brown sandy loam
Soil pH ($CaCl_2$)	4.9
EC	0.032 dS/m
Sowing date	Summer sowing - 3/3/11
Seeding rate	50 kg/ha Serradella (Margurita) 30 kg/ha Bladder clover (Bartolo) 30 kg/ha Biserrula (Casbah)
Sowing date	Conventional sowing - 31/5/11
Seeding rate	10 kg/ha Serradella (Margurita), Bladder clover (Bartolo), Biserrula (Casbah)
Fertiliser	120 kg/ha Super/ Potash (3:1) at sowing
Paddock rotation	2010 wheat
Herbicides	3/6/11: (Conventional sowing) 1.5 L/ha Glyphosate, 120 mL/ha Talstar®, 1 L/ha Kerb®
Growing Season Rainfall	330mm

Trial Design

	Treatments	
A	Uninoculated	No inoculant
B	Peat Slurry	250g to 50kg seed (Serradella cv. Margarita) 250g to 25kg seed (Bladder clover cv. Bartolo) 250g to 10kg seed (Biserrula cv. Casbah)
C	Peat Granules	6 kg/ha equivalent
D	Clay Granules	10 kg/ha equivalent

Trial Layout



Results

The summer sown plants were sampled (0.3m of the row) on the 17 July 2011 by removing whole plants and carefully washing the root systems to measure nodulation. Nodulation assessment revealed that the Margurita and Bartolo plants were all nodulated, while the Casbah plants had poor nodulation with very low nodule numbers (Table 1). Assessment of the nodule occupancy from the Bartolo clover plants confirmed that all the inoculated treatments obtained a very high level of the commercial strain (Table 2). In contrast, the uninoculated treatment only achieved 65% of the commercial strain in the nodules (Table 2).

Nodulation assessment on the conventionally sown plants on the 19 September 2011 revealed good nodulation and high nodule numbers throughout the treatments of the cultivars, except for the uninoculated Casbah treatment, in which only 9% of plants nodulated (Table 1). The nodule occupancy data from the Bartolo clover and Margurita serradella plants are still being processed.

Table 1: Percentage of Casbah biserrula plants nodulated and mean number of nodules per plant (in brackets) after being supplied with no, or 3 different methods of inoculant, with two times of sowing, summer (3 March 2011) and conventional (29 May 2011).

Sowing Method	Summer sowing (Casbah)	Conventional sowing (Casbah)
Uninoculated	4% (0.2)	9% (0.2)
Peat Slurry	37% (1.5)	97% (19.1)
Nodulator	17% (0.5)	96% (17.4)
ALOSCA	26% (1.9)	84% (9.5)

Table 2: Percentage of nodules from Bartolo clover plants after being summer sown (3 March 2011) containing the commercial inoculant after being supplied with no, or 3 different methods of inoculant.

Inoculant Method	Summer sowing (Bartolo)
No inoculant	65% (n=37)
Peat Slurry	100% (n=24)
Nodulator	93% (n=28)
ALOSCA	97% (n=31)

The time of sowing resulted in large differences in the dry matter production from the Margurita and Bartolo plants (Table 3). Summer sown Margurita yielded at least 50% more biomass than the conventional sowing, although inoculation treatments did not significantly differ with this method of sowing. However, inoculation did significantly increase production when Margurita was conventionally sown. Summer sown Bartolo produced at least 30% more mean dry matter than the conventional sowing. Inoculation significantly increased production in both times of sowing. The lack of nodulation in the summer sown Casbah biserrula trial, presumably due to the poor survival of the bacteria in the inoculants, was reflected in very low dry matter production. All inoculation methods did significantly increase production when Casbah was conventionally sown.

Table 3: Dry matter production cuts taken on the 21 September 2009 of three pasture cultivars (Margurita, Bartolo and Casbah) after being supplied with no, or 3 different methods of inoculant, with two times of sowing, summer (3 March 2011) and conventional (29 May 2011). General analyses of variance using a 5% least significant difference (LSD) were calculated on the data sets using GenStat 8®.

Sowing Method	Uninoculated	Peat Slurry	Nodulator	ALOSCA	Mean	*LSD*
Summer (Margurita)	5.32	4.45	4.66	5.32	4.94	*1.74*
Conventional (Margurita)	1.8	2.92*	2.62	2.87*	2.55	*1.06*
Summer (Bartolo)	3.32	4.92*	5.29*	4.73	4.57	*1.49*
Conventional (Bartolo)	1.94	4.38*	2.83	3.56*	3.18	*1.61*
Summer (Casbah)	0.13	0.19	0.08	0.12	0.13	*0.12*
Conventional (Casbah)	0.64	3.08*	2.40*	2.28*	2.1	*1.59*

Discussion

It is essential for consistent production and nitrogen fixation from legumes that they are inoculated with the correct and current commercial rhizobia strain (or Group). Commercial inoculant strains undergo an extensive selection process, in which the strains must possess the ability to maintain high N fixation over a broad host range and adapt to the anticipated soil niche of the host legume. However, an ongoing challenge is to successfully deliver high numbers of the commercial inoculant strain to the legume root when it is ready for nodulation. If this is not achieved it leads to failed nodulation, or nodulation of the legume with soil-borne strains that are usually sub-optimal in N fixation. Notably, before this trial was undertaken the "rule of thumb" on soil-borne strains in the WA wheat/sheep belt was that (i) the clover strains were sub-optimal particularly on the new clover cultivars such as Bartolo, (ii) biserrula had no or very little resident (soil-borne) strains and (iii) serradella had abundant effective resident strains, particularly in the Northern Agricultural region. The latter is because serradella nodulates and fixes N well with the lupin strains. This "rule" has been supported by the results of these two experiments; the uninoculated treatments of the Bartolo had lower herbage production than the inoculated treatments and the uninoculated treatments of the Casbah biserrula had very low nodule numbers. The uninoculated summer sown Margurita did fix N in similar amounts to the inoculated treatments, but surprisingly, the conventionally sown Margurita responded to inoculation by producing more herbage.

The dry matter production results from the conventionally sown trial confirmed that the three inoculant formulations; peat slurry, Nodulator and ALOSCA granules were efficient in carrying and providing the commercial strains in sufficient number to the emerging legume seedlings. These results validate the efficacy of these carriers of commercial inoculant under the conditions of the experiments. However, it was outstanding that the commercial clover strain (WSM1325) was identified in the plots that were not inoculated and that the strain had begun to colonise the site. This was a characteristic that WSM1325 was originally selected for. These results are a positive outcome for rhizobiologists developing elite strains for Australian agriculture as it confirms research procedures are working. Since 1982 the selection process for commercial inoculant strains not only involves selecting strains for high nitrogen fixation and acid tolerance, but the ability to persist and colonise (or spread) in WA soils.

The data from the summer sown trial are preliminary results that are presently being gathered to provide best practices for inoculating pasture legumes when they are introduced by "summer sowing" in the Mediterranean climates of southern Australia (i.e. when the soil is hot and dry). This establishment technique has been developed by DAFWA to introduce legume species into paddocks inexpensively at a time when farm labour is not limiting. This is achieved by strategically harnessing inherent hard-seed breakdown in the specific legume cultivars. However, this strategy presents a challenge to keeping the inoculant rhizobia alive until a rainfall event that induces germination, and to identify which carrier (if any) is the most efficient at doing so. Interpretation of the data in this experiment has highlighted that serradella is a great match for summer sowing, particularly in areas that have had recent lupin crops, because if the inoculant fails the species can effectively nodulate with the same rhizobia. Nonetheless, it may be prudent to avoid the risk of sub-optimal nodulation when comparing the relatively low price of inoculation and the gains in N fixation.

It appears all the inoculant carriers worked for the summer sown Bartolo, and the key message with this species is not which carrier to choose, but that the act of introducing the strain (inoculation) is essential. Biserrula is not a pasture legume suited for summer sowing because of

its hard-seed breakdown pattern. However, biserrula was tested in this experiment because the lack of resident soil-borne strains would enable a clear interpretation of the data. Overall, this data has indicated that for the biserrula inoculant, all of the carriers have difficulties in carrying enough live rhizobia numbers to adequately nodulate the legume hosts after 3-4 months of dry, hot soil. If biserrula cultivars are to be developed for summer sowing, then improved inoculant strains or carriers will also need to be developed to make the technology viable. Please take note that this is preliminary data to assist research on summer sowing of pasture legumes, with more information to be gathered and processed before conclusive results are released for recommendations.

Acknowledgements
I would like to thank the Liebe Group, Centre for *Rhizobium* Studies (Murdoch University), GRDC and Pasture Australia for supporting this research.

Paper reviewed by: Prof John Howieson, Murdoch University

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Field evaluation of Tedera (*Bituminaria bituminosa* var. *albomarginata*) for low rainfall areas of southern Australia

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Department of Agriculture and Food Western Australia

Aim

To evaluate the potential of Tedera (*Bituminaria bituminosa* var. *albomarginata*) as a prospective new perennial legume for the cereal / livestock zone of southern Australia

Background and Methods

Tedera is a perennial forage legume native to Lanzarote, Canary Islands, Spain. Lanzarote Island has a Mediterranean climate with an annual rainfall that varies from 150mm to 300mm, and 3 to 5 months with almost no rainfall. This species was sown at the Liebe Group Long Term Research Site in 2006, 2007, 2008 and 2009. The 2006 trial consisted of 225 plants corresponding to 15 plant origins and the main purpose was to explore the adaptation of this novel species to the climate and soil. The 2007 trial evaluated the capacity of the species (9 accessions) to establish from seed and survive the first summer. Both of these trials were funded by the Salinity CRC (now Future Farm Industries CRC). The research program was expanded in 2008. A spaced plant nursery of 1,900 plants was transplanted to select the best individuals for breeding purposes. Another trial sown with seed in 1m rows contrasts the performance of Tedera with several other new perennial legume species. These two trials are funded by the Future Farm Industries CRC. A third trial funded by RIRDC (Rural Industries Research and Development Corporation) has been designed to test the productivity of Tedera and the native forage legume *Cullen australasicum* at five sowing densities (1, 2, 4, 8 or 16 plants /m^2) and four cutting regimes (1, 2, 3 or 4 cuts per year). The set of trials sown in 2008 have also been replicated at Merredin and Newdegate. In 2009, a new spaced plant nursery of 1,000 plants was transplanted, in which we are evaluating 34 accessions of Tedera that includes the latest germplasm collection conducted in the Canary Islands in June 2008.

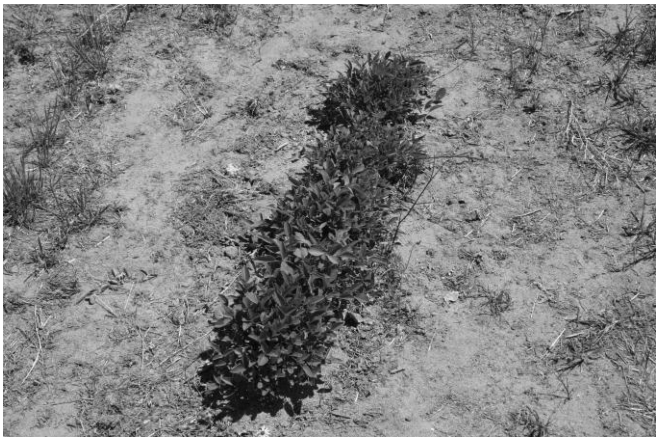
No trials were sown in 2010 or 2011 at this site, however, trials sown since 2006 continue to be evaluated.

Results and Comments

Information from 2011 has been combined together with results from other sites at Newdegate and Mount Barker to select the best parent plants. These have been cloned from the field sites and hand-crossing back in Perth to combine desirable attributes into elite "future" cultivars will occur in 2012. The Buntine site is now being used for grazing trials to study if there are differences in palatability among accessions of Tedera. Grazing is also occurring at Newdegate and Mount Barker that have the same accessions with the aim to find out if sheep are grazing the 3 of them in a similar way, as well as comparing the Tedera palatability to the existing suite of weeds in each site. Grazing will occur in early January and then in April or May. A more comprehensive report will be provided once the grazing data comes through.

(a) During field day (8th October, 2010)

(b) Spaced plant of Tedera



(c) Sown by seed in 2008

Figure 1. Tedera grown at the Liebe Group Long Term Research Site.

Acknowledgements

The author would like to acknowledge the group of researchers involved in these set of trials (DAFWA- Daniel Kidd and Clinton Revell; UWA – Megan Ryan and Lalith Suriyagoda). He would also like to thank the Liebe Group and in particular Stuart McAlpine for the collaboration with this research work and the FFI CRC and RIRDC for research funding.

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Variable Rate Fertiliser Application

Luke Dawson and James Easton, CSBP

Aim

To evaluate the economics of a variable rate approach to fertiliser applications over the 2011 growing season. This trial was also designed as a proof of concept trial for CSBP's Fertlogic Variable Rate Technology (VRT) platform.

Background

Fertiliser is usually the highest cropping input cost, so it makes sense to target applications to increase fertiliser use efficiencies and return on investment.

Fertiliser requirements depend upon nutrient supply and demand. Demand depends upon yield target and constraints. Yield is ultimately dependent upon rainfall, but soil constraints can often be managed.

A paddock was assessed for variability using Fertlogic. Using biomass imagery, the paddock was zoned up into 3 production zones- 'High', 'Medium' and 'Low'. The zone map was discussed with Rod (farmer) and Justin (operations manager) to check whether the biomass imagery was consistent with their knowledge of past paddock performance. Discussions also led to realistic yield potentials being set for each of the zones. Soil samples were conducted in each zone to understand any nutritional factors that could explain the variation across the paddock. Soil testing and realistic yield targeting are two of the more important aspects of variable rate farming. Soil test results were run through NULogic to vary nutrient rates according to our yield targets. Each trial had 4 treatments: Nil fertiliser, Farmer practice (blanket application), NU Logic recommendation, and 'High' fertiliser inputs.

The crop was monitored throughout the season and at stem elongation tiller counts were done in each zone to determine yield potential. It was established that yield potential was much higher than originally targeted. The NULogic plot in the 'High' zone was visually N deficient. Further analysis included running the rainfall figures through the rainfall model to establish yield potential. From these assessments a decision was made to apply another 50 L/ha Flexi-N to the 'High' zone. Additional N was not applied to the 'Medium' zone because there was only 20cm rooting depth over rock. Calculations showed that another 50mm of rain in August was needed to justify the investment in N. As it turned out, the area experienced a magnificent spring and the N would have been highly profitable.

Trial Details

Property:	Catalina Farms, East Coorow
Plot size & replication:	20m x 2.5m x 3 replications
Soil type	Sandy Loam
Sowing date:	19/5/11
Seeding rate:	65 kg/ha Mace
Fertiliser:	As per treatment
Growing Season Rainfall:	330mm

Soil Test Results

Table 1: Low Zone.

	Description	pH	EC	OC	N(Nit)	N(Amm)	P	PBI	K	S	Al
0-10	Sandy Loam	4.9	0.07	0.8	18	5	56	37	85	12	4
10-20		4.6	0.02	0.3	2	2	21	24	44	6	5
20-30cm		5.4	0.02	0.1	1	1	6	15	40	4	1

Table 2: Medium Zone.

	Description	pH	EC	OC	N(Nit)	N(Amm)	P	PBI	K	S	Al
0-10	Sand over clay	5.4	0.08	0.9	16	3	53	30	130	13	1.8
10-20		4.9	0.04	0.4	4	2	9	46	90	11	2
20-30cm		4.7	0.04	0.4	4	2	7	49	100	12	2.1

Table 3: High Zone.

	Description	pH	EC	OC	N(Nit)	N(Amm)	P	PBI	K	S
0-10	Clay loam	6.5	0.07	0.5	15	1	63	23	120	9
10-20		6.8	0.05	0.2	1	1	26	28	64	4
20-30cm		6.6	0.05	0.1	1	1	6	19	75	8

Site Interpretation

Very strong phosphorous (P) levels and adequate potassium (K) in all zones.
Low Zone: pH slightly acid in the sub soil (Aluminum up to 5 mg/kg at 10-20cm) – could be limiting.
Medium Zone: Soil depth limited to 30cm.
Nitrogen (N) appears to be the most likely limiting nutrient across all 3 zones.
Organic Carbon (OC) levels were low across all 3 zones.

Plant Tests (20 July)

Nitrogen is the most limiting nutrient across all zones. Excellent uptake of all other nutrients – can be confident that no other nutrients will limit responses to N top ups.

Results

Table 4: Fertiliser use, yield and grain quality in Low Zone.

Trt		Banded (kg/ha)	Z13/14 (L/ha)	Z30 (L/ha)	N	P	Yield (t/ha)	Protein (%)	Hl Wt (kg/hl)	Scrns. (%)
1	Nil	-	-	-	0	0	1.49	8.8	78	1.9
2	Blanket	70 Agstar	-	88 Flexi-N	47	10	2.88	8.5	79	1.6
3	NUlogic (1.5 t/ha)	50 Agstar	55 Flexi-N	-	28	7	2.52	8.9	78	1.5
4	High (3.5 t/ha)	110 Agstar	100 Flexi-N	80 Flexi-N	92	15	4.36	8.4	79	1.3
						Prob	<0.001	0.22	0.44	0.033
						Lsd	0.17	ns	ns	0.33

Table 5: Fertiliser use, yield and grain quality in Medium Zone.

Trt		Banded (kg/ha)	Z13/14 (L/ha)	Z30 (L/ha)	N	P	Yield (t/ha)	Protein (%)	Hl Wt (kg/hl)	Scrns. (%)
1	Nil	-	-	-	0	0	1.96	9.4	79	1.9
2	Blanket	70 Agstar	-	88 Flex-N	47	10	3.36	9.0	78	1.9
3	NUlogic (2.0 t/ha)	65 Agstar	65 Flexi-N	-	37	9	3.10	8.2	78	1.7
4	High (3.5 t/ha)	110 Agstar	100 Flexi-N	80 Flexi-N	92	15	4.54	9.0	79	1.7
						Prob	<0.001	0.17	0.27	0.16
						Lsd	0.22	ns	ns	ns

Table 6: Fertiliser use, yield and grain quality in High Zone.

Trt		Banded (kg/ha)	Z13/14 (L/ha)	Z30 (L/ha)	N	P	Yield (t/ha)	Protein (%)	Hl Wt (kg/hl)	Scrns. (%)
1	Nil	-	-	-	0	0	2.71a	8.2	78	1.3
2	Blanket	70 Agstar	-	88 Flex-N	47	10	4.21b	8.8	78	1.2
3	NUlogic (2.5 t/ha)	80 Agstar	55 Flexi-N	55 Flexi-N	79	11	4.99c	8.1	79	1.4
4	High (3.5 t/ha)	110 Agstar	100 Flexi-N	80 Flexi-N	92	15	5.49d	8.8	79	1.4
						Prob	<0.001	0.47	0.81	0.46
						Lsd	0.18	ns	ns	ns

Table 7: Economic Analysis.

VRT	Area ha	Yield t/ha	Yield t/Zone	Cost $/ha	Cost $/Zone
Low	36	2.5	91	66	2,367
Med	34	3.1	107	82	2,820
High	36	5.0	182	146	5,339
Total	**107**		**380**	**98**	**10,526**
Total Paddock Return- Wheat @ $180/t	$68,365				

Blanket	Area ha	Yield t/ha	Yield t/Zone	Cost $/ha	Cost $/Zone
	107	3.5	372	98	$10,519
Total Paddock Return- Wheat @ $180/t	$67,025			Difference (Blanket- VRT)	-$6.57 **(A)**

(The average blanket yield of 3.5 t/ha was calculated by averaging the yield from the blanket treatments across all 3 zones).

Difference (VRT - Blanket Return)	$1,340 **(B)**
Comparison (Total Possible Return Difference + Cost Saving of Fertlogic(A+B))	$1,334
Benefit- $/Ha.	**$12.46**

The above table indicates the potential cost savings to be had from using VRT. Even though the total cost of nutrients using VRT was marginally higher ($7 over the paddock) than the 'Blanket' application, the variable rate approach grew another 8t of wheat. This equates to an economic benefit of about $1334 or $12.46/ha.

Comments

There were 3 key messages to be taken from this trial:

- This trial showed that varying fertiliser inputs over different zones of a paddock can provide economic benefits over using a "blanket" application approach. This trial also highlighted the value of zone management using the tools available to us.
- Nitrogen was the major limiting factor in each of the zones. The value of applied nitrogen was really highlighted when other limiting factors such as rainfall were taken out of the equation. In seasons like this, nitrogen is a low risk decision.
- By dividing the paddock into 3 zones it was possible to learn a lot more about different parts of the paddock which served to help better manage the paddock over the 2011 season and will help to make more informed decisions about this paddock going forward.

Acknowledgements
CSBP would like to thank the following people/groups:

- Rod Birch and Justin Passamani for hosting the trial.
- The Liebe Group for organising field walks and the Spring Field Day.
- Ryan Guthrie and Rowan Maddern from CSBP Field Research.

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Nitrogen demonstration

Clare Johnston, R & D Coordinator, Liebe Group

Aim

To evaluate the effects of different nitrogen rates over a two year period on a broadacre scale and to assess if lower N inputs depletes the soil of plant available nitrogen.

Background

It is important to discover the most profitable amount of nitrogen to apply.

As a result of increasing input pressures from high fertiliser costs, varying nitrogen rates and timing is generally considered a valuable strategy in keeping flexibility in the farming system and managing climate risk. Flexible use of nitrogen allows for the farmer to 'play the season' and only apply nitrogen when confidence in the season increases. While higher nitrogen application results in an increase in yield and quality, the return may not result in the greatest profit above application costs.

In 2010 the same trial was conducted on the same paddock. These results showed no statistically significant yield response, however, this is thought to be due to the low rainfall season in which the plants could not make the most of higher nitrogen availability. Therefore the Parkers decided to repeat the trial in 2011.

This demonstration was part of the Liebe Group's FarmReady project, funded by the Federal Department of Agriculture, Fisheries and Forestry and aims to help industry and primary producers develop skills and strategies to respond to climate change.

Trial Details

		2010	2011
Property	Wade Parker, Waddy Forest		
Plot size & replication	30m x 500m, non-replicated		
Soil type	Sandy loam over gravel		
Soil pH	5.0		
EC	0.04 dS/m		
Paddock rotation	2009 canola, 2010 wheat		
Variety		Wyalkatchem	Wyalkatchem
Seeding date		3/6/10	28/5/11
Seeding rate		70 kg/ha	65 kg/ha
Fertiliser		3/6/10: 80 kg/ha Agras Extra, 1.5 L/ha Cereal Plus, 0.3 L/ha Agriton, 30 L/ha Flexi –N Plus treatments	28/5/11: 70 kg/ha Mallee Plus see treatments under results
Herbicides		Jaguar at 0.7 L/ha Logran at 0.01 kg/ha	28/5/11: 1.5 L/ha Roundup, 1.5 L/ha Treflan, 25 g/ha Logran, 5 g/ha Glean. 18/7/11: 0.5 L/ha Polo, 1 L/ha Jaguar, 20 g/ha Logran
Growing Season Rainfall		155mm	317mm

Results

Table 1: Yield and quality of wheat sown at Waddy Forest in 2011.

Flexi-N rate (L/ha)	Yield t/ha	Protein (%)	Screenings (%)	Grade
0	2.82	10.3	1.47	APW2
10	3.28	10.5	2.08	APW2
20	3.12	10.8	1.06	APW2
30	3.28	10.3	1.70	APW2
40	2.99	10.2	2.05	APW2
60	2.90	10.1	3.03	APW2

Note: Graded APW2 pending falling numbers test.

The addition of 10 L/ha and 30 L/ha of Flexi-N were the highest yielding treatments with an increase of 0.46 t/ha above the zero treatment (not adding any post seeding fertiliser) (Table 1).

As can be seen in Table 1, protein levels were sufficient for APW2. Gross margin calculations in Figure 1 show the most profitable scenario is when Flexi N is applied at 10 L/ha ($770/ha), with 30 L/ha marginally less at $760/ha. The difference may in fact be larger than shown here, as other variable costs such as fuel, machinery maintenance and time were not taken into account for gross margin calculations.

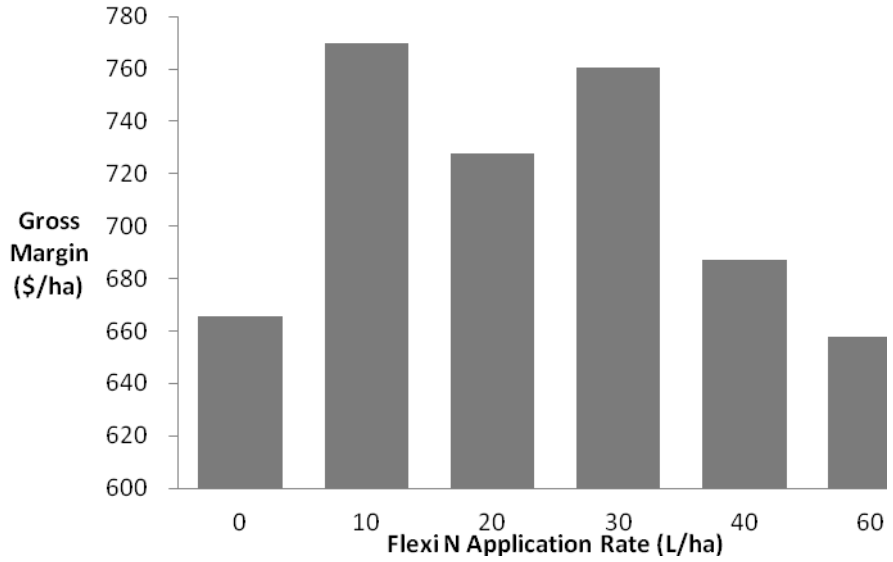

Figure 1: Gross margin calculations ($/ha) of different post seeding nitrogen strategies at Waddi Forest 2011. Grain price $236/t, cost of Flexi-N $464/t.

Comments

Given the good season, the trial results do not follow the expected nitrogen response curve. Plot trials carried out by CSBP in 2012 showed exponential yield improvement as nitrogen application increased up to 100 L/ha. The yield differences here seem to be representative of paddock variation rather than the varied nitrogen rates.

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To evaluate efficacy & crop safety of Sakura® 850WG compared to commercial standards when applied with Lure H_20™ soil wetting agent for the control of brome grass*.

Rick Horbury, Technical Advisor, Bayer CropScience
Dave Scholz, Agronomist, Elders Dalwallinu

Aim

1. To evaluate and compare the weed control of Sakura with pre-emergent herbicides.
2. To evaluate if the application of Lure H_20 will aid in the control of grass weeds with Sakura.
3. To generate return on investment yield data from Sakura compared to other registered pre-emergent herbicides when applied with or without Lure H_20.

Background

Sakura is now registered for use in wheat and triticale for the control of annual ryegrass, barley grass, silver grass, annual phalaris and toad rush.

Brome grass is often difficult to control with pre-emergent herbicides due to its staggered, often late germination. Post emergent herbicides are generally relied upon to control brome grass and in this trial we look to evaluate the best system for efficacy and return on investment (ROI) to the grower.

Sacoa suggest that Lure H_20, a soil wetting product, may aid in crop establishment and vigour to improve crop yields on non-wetting soil types. Will it aid in the early emergence of brome and therefore control from pre-emergent herbicides? Performance of Lure H_20 tends to be better on forest gravels than non-wetting sands as found in this trial site.

Sacoa recommend that to get the best out of Lure H_20 it should be applied 8-10 weeks prior to seeding at 10 L/ha and there should be 2 rainfall events of 15mm during this time.

Trial Details - 10WE04

Property	Catalina Farms, East Coorow
Plot size & replication	5m x 10m, 3 replicates
Lure H_20 Application date:	8/4/11
Water Rate:	65 L/ha
Ground Speed:	15 kph
Pre-em Application date:	27/5/11
Water Rate:	80 L/ha
Ground Speed:	9.2 kph applied by quad bike
Nozzle Type:	DG11002 (Yellow Drift Guard 02's)
Soil type	Sandy loam
Soil pH	5
Paddock rotation	2009 wheat, 2010 lupins
Variety	Mace
Seeding date	27/5/11
Seeding rate	75 kg/ ha
Seed Treatment	15 mL/100 kg Raxil® Pro + 200 mL/100 kg Gaucho® 350
Fertiliser	100 kg/ha Urea top dressed, 100 kg/ha Gusto Gold banded

Herbicides	2 L/ha Roundup® CT with all pre-emergent treatments
Pre-em Application date:	27/7/11
Water Rate:	65 L/ha
Ground Speed:	15 kph
Post-em Herbicides:	Velocity® 800 mL/ha + Hasten® 1% v/v

Site Comments

Lure H_20 treatments were applied on the 8th April to bare soil with a light stubble cover from the 2010 lupin crop of around 20%. The 2011 rainfall pattern fits closely to the recommended use pattern for Lure H2O. 16mm was recorded on 16th May which indicated break of season followed by a further 13mm on the 17th May. This rainfall occurred at optimal timing, in the period between application and seeding.

An earlier knockdown was not applied to the site prior to sowing.
All treatments were applied in tank mixture with Roundup CT to take out some small brome grass and volunteer lupins across the site. There were burnt windrows across the site with at least 1 per plot.

All trial treatments were applied to dry soil on the 26th May and incorporated that day.
On the 31st May 32mm of rainfall was recorded at the trial site to get things underway. The crop established well with no treatment effects observed. The brome grass was staggered in emergence with it germinating from late June into July with a further flush in early August.

Rainfall

A total of 299mm of rainfall was recorded at the Main Trial Site 1km north of the trial from the application of treatments on the 27th May to harvest on the 1st December.
June was dry for the first 2 weeks but with good falls at the end of the month and a more normal winter pattern crop growth was excellent. Good spring rainfall ensured that yield potential was achieved.

Results

Crop Safety

All treatments in the trial were safe to Mace wheat treated with Raxil Pro and Gaucho 350 on the seed.

Control of brome grass

Table 1: Brome grass control ratings 6th September after application of Lure H_20 with various pre-emergent herbicides.

				Application A - Pre sowing		
			Assessment Date	**6/9/11**	**6/9/11**	**6/9/11**
			Days after pre-emergent application	**152 DAS**	**188 DAB**	**188 DAB**
			Rate	**Nil Lure H_20**	**10 L/ha Lure H_20**	**20 L/ha Lure H_20**
Entry/Trt. Description	**Rate/ha**		**Appl. Code**	**% Control**	**% Control**	**% Control**
UNTREATED				0	0	0
SAKURA 850 WG	**118**	**g/ha**	**B**	**75**	**85**	**78**
TRIFLURX	2	L/ha	B	47	48	45
BOXER GOLD	2.5	L/ha	B	40	40	40
			LSD (P=.05)	5.1		
			CV	6.15		

Sakura was the only pre-emergent herbicide to record useful suppression (≥75%) of brome grass in this trial.

The addition of Lure H_20 recorded a minor increase in control with Sakura at both 10 and 20 L/ha although 10 L/ha recorded a higher rating than the 20 L/ha which would indicate there is not a rate response.

Therefore while Lure H_20 may have recorded a minor improvement in brome grass control from this trial further work would need to be done to confirm this.

Reducing carry over seed through the use of an effective pre-emergent herbicide such as Sakura possibly with a post emergent Group B herbicide such as Atlantis® or Monza® or through harvest weed seed management are more cost effective means of driving a paddock's brome seed bank down.

Table 2: Yield t/ha and return on investment (ROI) from Mace wheat (APW2) after application of Lure H_20 with various pre-emergent herbicides.

Assessment Date				1/12/2011				16/11/2011				16/11/2011			
Days after Lure Appl.				174 DAA				174 DAA				174 DAA			
Days after pre-emergent Appl.				126 DAB				126 DAB				126 DAB			
Rate				Nil Lure H_20				10 L/ha Lure H_20				20 L/ha Lure H_20			
Entry/Trt.		Appl.	Cost	YIELD	% of	$ Gross	$ ROI	YIELD	% of	$ Gross	$ ROI	YIELD	% of	$ Gross	$ ROI
Description	Rate/ha	Timing	ha	t/ha	untr	Margin	untr	t/ha	untr	Margin	untr	t/ha	untr	Margin	untr
UNTREATED			$0.00	3.82 d	100	$901.52	$0.00	3.80 d	100	$896.80	-$59.72	3.88 d	102	$915.68	-$90.84
SAKURA 850 WG	118 g/ha	B	$35.40	**4.63 abc**	**121**	**$1,092.68**	**$150.76**	**4.73 ab**	**124**	**$1,116.28**	**$124.36**	**4.81 a**	**126**	**$1,135.16**	**$93.24**
TRIFLURX	2 l/ha	B	$10.20	4.42 abc	116	$1,043.12	$126.40	4.47 abc	117	$1,054.92	$88.20	4.21 bcd	110	$993.56	-$23.16
BOXER GOLD	2.5 l/ha	B	$32.00	4.32 a-d	113	$1,019.52	$81.00	4.56 abc	119	$1,076.16	$87.64	4.13 cd	108	$974.68	-$63.84
Overall Lure H_20 Mean excluding Nil pre-em				**4.46**	**117**	**$1,051.77**	**$119.39**	**4.59**	**120**	**$1,082.45**	**$100.07**	**4.38**	**115**	**$1,034.47**	**$2.08**
LSD (P=.05)				0.05											
CV				6.53											
Application Cost:				$5.00											
Lure H_20 cost per litre:				$5.00											
APW2 16/11/11				$236.00											

Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)

The highest yield in the trial was recorded from Sakura applied onto Lure H_20 at 20 L/ha with 4.81 t/ha recorded.
The best ROI once herbicide and application costs were removed was Sakura applied without Lure H_20 with a yield of 4.46 t/ha significantly (P≥5%) higher than the untreated (3.82 t/ha) and $150.76 return above the untreated if all treatments are considered as APW2.

Note: APW2 has an allowable limit of no more than 50 brome grass seeds in the sample, above this and the grain is downgraded to FED1 ($181.00). Brome grass seeds were not separated from the treatments in this trial although they were in the adjacent trial 10WE02. From 10WE02 the untreated (58 seeds), TriflurX 2 L/ha (75) and Boxer Gold (67) did not meet quality specifications and were downgraded to feed (FED1), while Sakura 118 g/ha (12) was in the allowable limit for APW2. If the same grades were applied in this trial as in 10WE02 then the gross margin for the untreated would have been $691.42 with an ROI from Sakura of $365.86, TriflurX $126.40 and Boxer Gold $81.00. For the other Lure treatments you would therefore add an additional $210.10 to the ROI values in the table above.

Sakura® 850WG, Velocity®, Raxil Pro®, Gaucho® 350 & Atlantis® OD are Registered Trademarks of Bayer.
*At the time of publication Sakura 850WG is not registered for the control of brome grass.
An application for the registration of Sakura 850WG for brome grass control is likely to be made during 2012
Always use Sakura 850WG according to the recommended rates on the most recent label.

Paper Reviewed by: Craig White – Technical advisor southern WA, Bayer CropScience.

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To evaluate the efficacy & crop safety of Sakura® 850WG with Atlantis® OD, Monza® or Crusader® for barley grass control in Mace wheat.

Rick Horbury, Technical Advisor, Bayer CropScience
Sally Edwards, Agronomist, Landmark

Aim

1. To evaluate and compare the pre-emergent weed control of Sakura with currently registered products.
2. To compare the crop safety and yield of Sakura with herbicides registered for use in wheat.
3. To compare the return on investment (ROI) of pre-emergent herbicides vs post emergent herbicides for the control of barley grass.
4. To evaluate the interaction of pre-emergent herbicides with post emergent Group B herbicides for the control of barley grass.

Background

Barley grass can be difficult to control with pre-emergent herbicides and a good knockdown is generally the best measure to reduce numbers. The problem with waiting for an appropriate knockdown is that on the heavier red loams, where it often occurs, delayed sowing results in reduced yields. If a pre-emergent option was available to enable earlier sowing yet still provides good control it would aid profitability of production where barley grass is an issue. Post emergent herbicides have been relied upon to control barley grass historically although their control can be hit and miss depending on conditions.

In this trial we look to evaluate the best system for efficacy and return on investment (ROI) to the grower.

Trial Details - 10WE03

Property	Brad McIlroy, Pithara
Plot size & replication	2.5 x 12m, 3 replicates
Application date:	27/5/11
Water Rate:	80 L/ha
Ground Speed:	9.2 kph applied by quad bike
Nozzle Type:	DG11002 (Yellow Drift Guard 02's)
Soil type	Red clay
Paddock rotation	2010 pasture
Variety	Mace
Seeding date	28/5/11
Seeding rate	35 kg/ha
Fertiliser	100 kg/ha Urea top dressed,
Herbicides	2 L/ha Roundup® CT with pre-emergent treatments
Post-em Application date:	13/7/11
Water Rate:	80 L/ha applied by 10m ute mounted boom
Ground Speed:	5 KPH
Nozzle Type:	AirMix 01's

Site Comments

An earlier knockdown was not applied to the site prior to sowing. The paddock had been tilled with narrow points in early May.

All treatments were applied in tank mixture with Roundup CT to take out some small barley grass and broad leaf weeds. There was a light stubble cover from the 2010 pasture of around 20%.
All trial treatments were applied to dry soil on the 27th May and incorporated the following day. A rainfall event of approximately 35mm fell on the site on the 31st May to get things underway. There was some soil crusting and early emergence issues and despite the low seeding rate of 35 kg/ha the crop established well in most treatments. There were still some large clods present on the site but most of the rows were fine.

Rainfall

A total of 334.2mm of rainfall was recorded at Dalwallinu, 10km north of the site from the start of May to the end of November. June was a little dry for the first 3 weeks but with good falls at the end of the month and a more normal winter pattern, crop growth was excellent with 315mm of rainfall recorded on the site from the application of the treatments to harvest. Good spring rainfall ensured that yield potential was achieved.

Crop Safety

Table 1: Emergence and biomass reduction ratings from Mace wheat (APW2) after application of pre-emergent herbicides.

	Assessment Date			**23/06/2011**	**6/07/2011**
	Appl.-Ass. Interval			**28 DAA**	**41 DAA**
	Rating Data Type			**Rating**	**Rating**
Entry/Trt. Description	**Rate /ha**		**Appl. Code**	**% Emergence**	**Biomass Reduction**
UNTREATED				100	0
SAKURA 850 WG	118	g/ha	A	87	0
SAKURA 850 WG	118	g/ha	A	88	2
DIURON 900 WG	300	g/ha	A		
TRIFLURX®	2	l/ha	A	80	15
TRIFLURX	2	l/ha	A	78	17
DIURON 900 WG	300	g/ha	A		
TRIFLURX	2	l/ha	A	65	20
MONZA	25	g/ha	A		
BOXER GOLD®	2.5	l/ha	A	83	7
			LSD (P=.05)	11.7	4.6
			Standard Deviation	6.6	2.6
			CV	7.93	29.85

Emergence ratings 28 days after application (DAA) or 27 days after seeding, rated Sakura as the safest to crop emergence with TriflurX + Monza having the lowest emergence rating compared to the untreated.
A biomass rating conducted at 41 DAA recorded Sakura (0%) alone and in mixture with Diuron (2%) as the safest to the crop with Boxer Gold (7%) the next safest.
There was biomass reduction recorded from all TriflurX treatments with the Monza tank mixture the most damaging.

Results

Table 2: Yield t/ha and return on investment (ROI) from Mace wheat (APW2) after application of pre and post emergent herbicides.

				Total cost of Post-em = $29.90				Total cost of Post-em = $53.66				Total cost Post-em = $57.40				Total cost Post-em = $53.40			
				Assessment Date: 16/11/2011 Appl.-Ass. Interval 174 DAA Appl.-Ass. Interval 126 DAB				16/11/2011 174 DAA 126 DAB				16/11/2011 174 DAA 126 DAB				16/11/2011 174 DAA 126 DAB			
				Application B - Post-emergent				Nil Herbicide + Velocity 670 mL + Hasten 1%				Atlantis 330 mL + Velocity 670 mL + Hasten 1%				Crusader 500 mL + Velocity 670 mL + Hasten 1%				Monza 25 g + Velocity 600 mL + Hasten 1%			
Entry/Trt. Description	**Rate/ha**	**Appl. Timing**	**Cost ha**	**YIELD t/ha**	**% of untr**	**$ Gross Margin**	**$ ROI untr**	**YIELD t/ha**	**% of untr**	**$ Gross Margin**	**$ ROI untr**	**YIELD t/ha**	**% of untr**	**$ Gross Margin**	**$ ROI untr**	**YIELD t/ha**	**% of untr**	**$ Gross Margin**	**$ ROI untr**
UNTREATED			$0.00	2.07 g	100	$488.52	$458.62	2.61 c-f	126	$615.96	$103.68	2.23 fg	105	$526.28	$10.26	2.38 efg	115	$561.68	$44.66
SAKURA 850 WG	118 g/ha	A	$35.40	**2.85 bc**	**137**	**$672.60**	**$143.68**	**3.28 a**	**158**	**$774.08**	**$226.40**	**2.86 bc**	**117**	**$674.96**	**$123.54**	**3.08 ab**	**149**	**$726.88**	**$174.46**
SAKURA 850 WG DIURON 900 WG	118 g/ha 300 g/ha	A	$38.64	2.76 b-e	133	$651.36	$119.20	3.10 ab	150	$731.60	$180.68	2.77 bcd	119	$653.72	$99.06	2.78 bcd	134	$656.08	$100.42
TRIFLURX	2 l/ha	A	$10.20	2.58 c-f	124	$608.88	$105.16	2.77 bcd	134	$653.72	$131.24	2.54 c-f	118	$599.44	$73.22	2.43 def	118	$573.48	$46.26
TRIFLURX DIURON 900 WG	2 l/ha 300 g/ha	A	$13.44	2.58 c-f	125	$608.88	$101.92	2.85 bc	138	$672.60	$146.88	2.62 c-f	118	$618.32	$88.86	2.45 def	118	$578.20	$47.74
TRIFLURX MONZA	2 l/ha 25 g/ha	A	$33.70	2.51 c-f	121	$592.36	$65.14	2.65 cde	128	$625.40	$79.42	2.50 c-f	118	$590.00	$40.28	2.45 def	118	$578.20	$27.48
BOXER GOLD	2.5 l/ha	A	$32.00	2.60 c-f	126	$613.60	$88.08	3.07 ab	148	$724.52	$180.24	2.55 c-f	112	$601.80	$53.78	2.72 b-e	131	$641.92	$92.90
Overall post emergent Mean excluding Nil pre-em				**2.65**	**128**	**$624.61**	**$103.86**	**2.95**	**143**	**$696.99**	**$157.48**	**2.64**	**117**	**$623.04**	**$79.79**	**2.65**	**128**	**$625.79**	**$81.54**
LSD (P=.05)				0.32															
CV				7.35															
Application Cost:				$5.00															

Yields t/ha followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).

Application cost of $5.00/ha included in post em total cost. All treatments received an application of Velocity 670 mL/ha + Hasten 1% v/v ($24.90) for control of broad leaf weeds.

All pre-emergent only treatments recorded a significant yield increase (P≥5%) to the untreated with Sakura 118 g/ha recording the highest yield of 2.85 t/ha. Sakura yielded 270 kg/ha and an additional $38.52/ha than TriflurX 2 L/ha applied pre-emergent only.

The best pre-emergent followed by post emergent combination was Sakura pre-emergent followed by Atlantis which yielded 3.28 t/ha, this was statistically significant and was 510kg more than when TriflurX 2 L/ha was applied with Atlantis, 740kg more than TriflurX followed by Crusader and 850kg more than TriflurX followed by Monza. Sakura or Sakura + Diuron pre-emergent were the top 2 yielding treatments for all pre-emergent + post emergent combinations.

Atlantis post emergent was the only overall to yield a positive ROI mean across the pre-emergent options applied – the nil untreated.

Control of Barley Grass

Table 3: Barley grass control ratings 6/9/11 and plant counts 12/10/11.

Application B - Post emergent			Nil Herbicide + Velocity 600 mL + Hasten 1%			Atlantis 330 mL + Velocity 600 mL + Hasten 1%			Crusader 500 mL + Velocity 600 mL + Hasten 1%			Monza 25 g + Velocity 600 mL + Hasten 1%		
Assessment Date			6/09/2011	12/10/2011		6/09/2011	12/10/2011		6/09/2011	12/10/2011		6/09/2011	12/10/2011	
Appl.-Ass.Interval			103 DAA	139 DAA		103 DAA	139 DAA		103 DAA	139 DAA		103 DAA	139 DAA	
Days after last Appl.			57 DAB	91 DAB		57 DAB	91 DAB		57 DAB	91 DAB		57 DAB	91 DAB	
Rating Data Type			Rating	Count		Rating	Count		Rating	Count		Rating	Count	
Entry/Trt. Description	Rate /ha	Appl. Code	% Control	panicles per m2	% Control	% Control	panicles per m2	% Control	% Control	panicles per m2	% Control	% Control	panicles per m2	% Control
UNTREATED			0	501 a	0	0			0			10		
SAKURA 850 WG	118 g/ha	A	**90**	**48 cd**	**89**	**93**			**91**			**94**		
SAKURA 850 WG DIURON 900 WG	118 g/ha 300 g/ha	A A	88	23 d	88	88			93			94		
TRIFLURX	2 l/ha	A	50	241 a-d	25	63	187 bcd	45	45	313 abc	12	68	163 bcd	63
TRIFLURX DIURON 900 WG	2 l/ha 300 g/ha	A A	40	357 ab	2	63			63			58		
TRIFLURX MONZA	2 l/ha 25 g/ha	A A	50	218 bcd	46	63			55			68		
BOXER GOLD	2.5 l/ha	A	58	252 a-d	25	61			65			70		
LSD (P=.05)			28.3	238.3	55.1									
Standard Deviation			13.8	138.9	32.1	Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)								
CV			23.09	60.3	82.22									

Sakura applied pre-emergent recorded the best level of control of barley grass in ratings on 6/9/11 and in panicle counts (89%) on the 12/10/11 which was significantly (P≥5%) higher than TriflurX + Diuron (2%).

Sakura pre-emergent followed by Atlantis, Crusader or Monza recorded slight improvements in control from ratings conducted 6/9/11 indicating no antagonism between Sakura and those herbicides.

Sakura applied at pre-emergent only recorded better control than TriflurX applied pre-emergent plus any of the Group B post emergent herbicides.

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To evaluate the efficacy & crop safety of Sakura® 850WG with Atlantis® OD or Intervix® for Brome grass control in Sabel CL wheat.

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Aim

1. To evaluate and compare the pre-emergent brome grass control of Sakura to currently registered products.
2. To compare the crop safety and yield of Sakura with herbicides registered for use in Clearfield wheat.
3. To compare the return on investment (ROI) of pre-emergent herbicides vs post emergent herbicides for the control of brome grass.
4. To evaluate the interaction of pre-emergent herbicides with post emergent Group B herbicides for the control of brome grass in 2-gene Sabel Clearfield wheat.

Background

Sakura is now registered for use in wheat and triticale for the control of annual ryegrass, barley grass, silver grass, annual phalaris and toad rush.

Brome grass is often difficult to control with pre-emergent herbicides due to its staggered often late germination. Post-emergent herbicides are generally relied upon to control brome grass and in this trial we look to evaluate the best system for efficacy and return on investment (ROI) to the grower in a Clearfield wheat system.

Intervix is a Group B herbicide only for use in the imidazalone tolerant Clearfield system.

Trial Details - 10WE02

Property	Catalina Farms, East Coorow
Plot size & replication	2.5 x 12m, 3 replicates
Application date:	27/5/11
Water Rate:	80 L/ha
Ground Speed:	9.2 kph applied by quad bike
Nozzle Type:	DG11002 (Yellow Drift Guard 02's)
Soil type	Sandy loam
Paddock rotation	2009 wheat, 2010 lupins
Variety	Sabel CL
Seeding date	27/5/11
Seeding rate	75 kg/ha
Fertiliser	100 kg/ha Urea top dressed, 100 kg/ha Gusto Gold banded
Herbicides	2 L/ha Roundup® CT with pre-emergent treatments
Post-em Application date:	14/7/11
Water Rate:	80 L/ha
Ground Speed:	5 kph applied by 10m wide ute mounted boom
Nozzle Type:	AirMix 01's

Site Comments

An earlier knockdown was not applied to the site prior to sowing with all treatments applied with a tank mixture with Roundup CT to take out some small brome grass and volunteer lupins across the site. There were burnt windrows across the site with at least 1 per plot.
All trial treatments were applied to dry soil on the 26th May and incorporated that day.
On the 31st May 32mm of rainfall was recorded at the trial site to get things underway. The crop established well with no treatment effects observed. The brome grass was staggered in emergence with it germinating from late June into July with a further flush in early August.
The site had a fairly low brome grass population with only 39 panicles per m^2 in the untreated, so treatment differences in terms of efficacy made less of an impact on yield due to low weed competition with the crop.

Results

Rainfall

A total of 299mm of rainfall was recorded at the main trial site 1km north of the trial from the application of treatments on the 26th to harvest on the 1st December.
June was dry for the first 2 weeks but with good falls at the end of the month and a more normal winter pattern crop growth was excellent. Good spring rainfall ensured that yield potential was achieved.

Crop Safety

All treatments in the trial were safe to Sabel Clearfield wheat.
The crop safety of Monza applied pre-emergent to a Group B tolerant wheat like Sable CL does not indicate it would be safe under conventional wheat such as Mace with biomass reductions recorded in trial 10WE03 also conducted this season (see page 66).

Table 2: Yield t/ha and return on investment (ROI) from Mace wheat (APW2) after application of pre and post emergent herbicides.

				Cost of Post-em = $24.90				Cost of Post-em = $48.66				Cost of Post-em = $69.90			
			Assessment Date	16/11/2011				16/11/2011				16/11/2011			
			Appl.-Ass.Interval	174 DAA				174 DAA				174 DAA			
			Days after last Appl.	126 DAB				126 DAB				126 DAB			
			Application B - Post emergent	Nil Herbicide + Velocity 670 mL + Hasten 1%				Atlantis 330 mL + Velocity 670 mL + Hasten 1%				Intervix 600 mL + Velocity 670 mL + Hasten 1%			
Entry/Trt. Description	Rate/ha	Appl. Timing	Cost $/ha	YIELD t/ha	% of untr	$ Gross Margin	$ ROI untr	YIELD t/ha	% of untr	$ Gross Margin	$ ROI untr	YIELD t/ha	% of untr	$ Gross Margin	$ ROI untr
UNTREATED			$0.00	3.52 -	100	$637.12	$612.22	3.97 -	113	$936.92	$271.04	3.76 -	107	$887.36	$221.48
SAKURA 850 WG	118 g/ha	A	$35.40	3.71 -	105	$875.56	$198.04	4.34 -	123	$1,024.24	$322.96	4.18 -	119	$986.48	$21.40
SAKURA 850 WG AVADEX XTRA	118 g/ha 1.6 g/ha	A	$58.60	3.98 -	113	$939.28	$238.56	4.34 -	123	$1,024.24	$299.76	4.29 -	122	$1,012.44	$70.56
TRIFLURX	2 L/ha	A	$10.20	3.52 -	100	$637.12	-$15.20	4.30 -	122	$1,014.80	$338.72	4.21 -	120	$993.56	$12.72
TRIFLURX AVADEX XTRA	1.5 L/ha 1.6 g/ha	A	$30.85	3.66 -	104	$863.76	$190.79	4.21 -	120	$993.56	$296.83	4.23 -	120	$998.28	$59.33
TRIFLURX MONZA	1.5 L/ha 25 g/ha	A	$31.15	3.93 -	112	$927.48	$254.21	4.45 -	126	$1,050.20	$353.17	4.21 -	120	$993.56	-$1.73
BOXER GOLD	2.5 L/ha	A	$30.00	3.60 -	102	$651.60	-$20.52	4.25 -	121	$1,003.00	$307.12	4.01 -	115	$946.36	-$2.88
Overall post-emergent Mean excluding Nil pre-em				**3.73**	**106**	**$815.80**	**$140.98**	**4.32**	**123**	**$1,018.34**	**$319.76**	**4.19**	**119**	**$988.45**	**$26.57**
			LSD (P=.05)	0.68											
			CV	10.21											

Yields t/ha followed by the same letter do not significantly differ (P= 0.05, Duncan's New MRT).

Application Cost:	$5.00
APW2 16/11/11	$236.00
FED1 16/11/11	$181.00

Application cost of $5.00 /ha included in post em total cost. All treatments received an application of Velocity 670 mL/ha + Hasten 1% v/v ($24.90) for control of broad leaf weeds.

Note: APW2 has an allowable limit of no more than 50 brome grass seeds in the sample above this and the grain is downgraded to FED1.

None of the pre-emergent only treatments recorded a significant yield increase (P≥5%) to the untreated, although Sakura 118 g/ha + Avadex Extra recorded the highest yield of 3.98 t/ha with a positive ROI of $238.56 above the untreated after herbicide and application costs were removed. Sakura 118 g/ha yielded 190 kg/ha more than TriflurX 2 L/ha and 110 kg/ha more than Boxer Gold applied pre-emergent, with Sakura also having a positive ROI compared to a negative for TriflurX & Boxer Gold due to brome seed contamination downgrading them to feed (FED1).

The best pre-emergent followed by post emergent combination was TriflurX + Monza pre-em followed by Atlantis which yielded 4.45 t/ha with a ROI figure of $353.17. The combination of 2 Group B herbicides would have implications for plant back into 2012 so the next best yielding treatment was Sakura followed by Atlantis which yielded 4.34 t/ha with a ROI of $322.96.
Atlantis post emergent averaged across the pre-emergent options applied returned the best mean ROI of $319.76 with the Intervix mean ROI @26.57. The nil post emergent treatments with a pre-emergent only returned a better ROI $140.98 on average than Intervix.

Crop Safety

Table 3: Brome grass control ratings 6/9/11, plant counts 12/10/11 and brome grass seeds/sample 16/11/11.

			Nil Herbicide + Velocity 670 mL + Hasten 1%			Atlantis 330 mL + Velocity 670 mL + Hasten 1%			Intervix 600 mL + Velocity 670 mL + Hasten 1%		
Assessment Date			**6/09/2011**	**12/10/2011**	**16/11/2011**	**6/09/2011**	**12/10/2011**	**16/11/2011**	**6/09/2011**	**12/10/2011**	**16/11/2011**
Appl.-Ass.Interval			**104 DAA**	**139 DAA**	**174 DAA**	**104 DAA**	**139 DAA**	**174 DAA**	**104 DAA**	**139 DAA**	**174 DAA**
Days after last Appl.			**58 DAB**	**91 DAB**	**126 DAB**	**58 DAB**	**91 DAB**	**126 DAB**	**58 DAB**	**91 DAB**	**126 DAB**
Rating Data Type			**Rating**	**Count**	**Count**	**Rating**	**Count**	**Weight**	**Rating**	**Count**	**Weight**
Entry/Trt. Description	**Rate/ha**	**Appl. Code**	**% Control**	**% panicle control**	**Brome grass seeds/ sample**	**% Control**	**% panicle control**	**Brome grass seeds/ sample**	**% Control**	**% panicle control**	**Brome grass seeds/ sample**
UNTREATED			0	39/ m2 a	58 a	67	53 bc	2 b	93	92 cd	0 b
SAKURA 850 WG	118 g/ha	A	**70**	81 cd	12 b	**85**		0 b	**93**		0 b
SAKURA 850 WG	118 g/ha	A	75	82 cd	18 b	85		0 b	95		0 b
AVADEX XTRA	1.6 g/ha	A							93		
TRIFLURX	2 L/ha	A	12	24 ab	75 a	73	55 bc	0 b	93	98 d	0 b
TRIFLURX	1.5 L/ha	A	32	51 bc	8 b	72		0 b	95		0 b
AVADEX XTRA	1.6 g/ha	A									
TRIFLURX	1.5 L/ha	A	65	67 cd	17 b	83		0 b	93		0 b
MONZA	25 g/ha	A									
BOXER GOLD	2.5 L/ha	A	18	15 ab	67 a	18		0 b	18		6 b
LSD (P=.05)			28.3	11.6	22.9						
CV			23.09	10.06	110.8	Means followed by same letter do not significantly differ (P=.05, Duncan's New MRT)					

Based on ratings 6/9/11 the highest level of pre-emergent herbicide control was recorded from Sakura + Avadex (75%) with Sakura 118 g/ha the next best (70%).
Intervix (92%) recorded a higher level of post emergent only control than Atlantis (67%), although Sakura applied pre-emergent recorded comparable control. If Group B resistance was present in this brome grass population then results may not have been so favourable for Intervix or Atlantis.

Plant counts conducted on the 12/10/11 recorded a mean of 39 panicles per m^2 in the untreated. The highest level of pre-emergent control was recorded by Sakura + Avadex (82%) which was significantly different to TriflurX 2 L/ha (24%) and Boxer Gold (15%).
The post emergent application of Atlantis with TriflurX 2 L/ha (55%) resulted in a slight increase in control although Sakura 118 g/ha (81%) recorded superior in control.

Grain samples were taken from the trial treatments and analyzed for brome seed contamination. For APW2 there is an allowable limit of no more than 50 brome grass seeds in the sample. Based on this the untreated (58 seeds), TriflurX 2 L/ha (75) and Boxer Gold (67) did not meet quality specifications and were downgraded to feed (FED1), all other treatments had significantly less brome seed or none detected at all.

Table 4: Plant back periods for Intervix.

Months after Application	Following Crops
0	Canola varieties with CLEARFIELD Technology, Wheat varieties with CLEARFIELD Technology
10	Chickpeas, Faba beans, Field peas, Lucerne, Lupins, Pasture, legumes, vetch, Oats ,
34	Triticale , Barley , Non-CLEARFIELD, Wheat conventional and other herbicide tolerant Canola, All other crops

Comments
With Group B resistance in brome grass on the increase it is important to look at other herbicide group options or a system approach.
Field and laboratory results have indicated that Sakura provides excellent control of surface germinating brome grass although control will be reduced when the seed germinates from depths greater than 1cm in the soil profile.

Sakura® 850WG, Velocity® & Atlantis® OD are Registered Trademarks of Bayer.

*At the time of publication Sakura 850WG is not registered for the control of brome grass.
An application for the registration of Sakura 850WG for the control of brome grass control is likely to be made during 2012.
Always use Sakura 850WG according to the recommended rates on the most recent label.

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IWM, comparing harvest weed management practices with Sakura® and Boxer Gold®

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Dr Michael Walsh, Australian Herbicide Resistance Initiative (AHRI)
Rick Horbury, Bayer CropScience

Aim
Evaluation of the pre-emergent herbicide Sakura 850WG® compared to Boxer Gold® in combination with different IWM tools (chaff cart, Harrington Seed Destructor, narrow windrow burning) during harvest on a broad acre scale.

Background
To evaluate the commercial impact of the Harrington Seed Destructor (HSD) a series of field trials comparing harvest residue management systems have been established at 12 locations across the WA wheat belt during the 2010 harvest, one of which was the Liebe Long Term Research Site, west of Buntine. In each trial the HSD was compared with chaff cart and windrow burning residue management systems for its ability to effectively target weed seeds during harvest.

The collection of weed seeds at harvest is the last opportunity to attack the current seasons in-crop weed populations which have escaped or survived earlier weed management tactics. More importantly though, this is the first opportunity to target next seasons weed populations by intercepting weed seeds before they enter the seed-bank. Collecting and managing the weed seed bearing chaff fraction as it exits the header at harvest restricts seed-bank replenishment, leading to a reduction in next seasons weed populations. The Australian Herbicide Resistance Initiative (AHRI) has invested a significant amount of time assessing different harvest weed seed management techniques one of these being the HSD.

The Harrington Seed Destructor (HSD) is the brainchild of Ray Harrington, an innovative farmer from Darkan, Western Australia. Based on a cage mill crushing unit used in the mining industry, the HSD is a trail-behind unit complete with its own power supply which incorporates chaff and straw delivery systems. The HSD system has been progressively evaluated and developed since 2005 when Ray approached AHRI seeking support for his plans to construct the initial prototype. Subsequently with financial support from the GRDC, three HSD prototypes have been field tested by AHRI researcher Dr Michael Walsh for the efficacy of destroying weed seeds during harvest. Results from three seasons of testing have established that the HSD system can destroy 90-95% of annual ryegrass seed present in the chaff fraction.

As demonstration sites were being set up for the new pre-emergent herbicide Sakura, the Liebe Group took the opportunity to trial the use of this herbicide as well as Boxer Gold in conjunction with the harvest weed seed control options.

Details of these two herbicides are as follows:

- Sakura 850WG containing the new active ingredient pyroxasulfone is a pre-emergent herbicide now registered for use in wheat and triticale for the pre-emergent control of annual ryegrass, barley grass, phalaris, silver grass and toad rush at a use rate of 118 g/ha.
- Sakura 850WG is a Group K herbicide that works through both root and shoot uptake.
- Boxer Gold is registered for use in wheat and barley for the pre-emergent control of annual ryegrass and toad rush with a use rate of 2.5 L/ha.

- Boxer Gold is a Group J & K herbicide that works through both root and shoot uptake.

Trial Details

Property	Long Term Research Site, Buntine
Plot size & replication	11m x 20m. Harvest weed control replicated four times, herbicides replicated twice.
Soil type	Deep yellow sand
Soil pH ($CaCl_2$)	5.6 topsoil, 4.8 subsoil
EC	0.075 dS/m
Sowing date	1/6/11
Seeding rate	50 kg/ha Wyalkatchem
Fertiliser	1/6/11: 60 kg/ha K-Till Extra, 20 L/ha Flexi N 19/8/11: 40 L/ha Flexi N
Paddock rotation	2008 wheat, 2009 canola, 2010 wheat
Herbicides	19/3/11: 0.6 L/ha PowerMax, 0.4 L/ha Ester 680, 0.1 L/ha Garlon 31/5/11: 2 L/ha Glyphosate, pre-emergent as per treatment list 4/7/11: 1 L/ha Jaguar 26/7/11: 0.5 L/ha Precept
Fungicide	19/8/11: 50 mL/ha Emporer
Growing Season Rainfall	293mm

Herbicide Treatments
Sakura: 118 g/ha
Boxer Gold: 2.5 L/ha
Control: No pre-emergent

Harvest weed management treatments
Control: no weed management, chaff fraction spread evenly across plot
Chaff cart: chaff cart towed behind header
Windrow burn: spreaders removed, chaff in narrow row behind header and burnt in March.
HSD: the Harrington Seed Destructor, crushing seeds in the chaff fraction

Results

Table 1: Pre seeding ryegrass plant density as recorded on 23rd of May 2011 after harvest weed control mechanisms.

Treatment	Ryegrass plant density (plants/m^2)	Ryegrass reduction (%)
Control	221.50	
Chaff cart	94.13	57.67
Windrow burn	73.58	66.79
HSD	72.63	67.50

Site Comments

Weed numbers were high throughout the trial with some variability, the western end starting at around 200 plants per m^2 increasing across the site as you headed east with numbers above 600m^2.

Table 2: Average control of annual ryegrass panicles by IWM harvest tools and pre-emergent on 14/9/11.

	Control		Sakura 118 g/ha		Boxer Gold 2.5 L/ha	
Sample	**% Control**	***Std Err***	**% Control**	***Std Err***	**% Control**	***Std Err***
Control	0	0	88	1.2	73	3.0
Chaff Cart	14	5.6	89	1.4	75	3.1
Windrow	7	5.8	89	1.0	73	2.7
HSD	20	3.1	89	1.7	74	2.7

Comments
Assessment was conducted in mid September when the ryegrass panicles had reached maturity above the crop to gauge the most accurate measure of weed seed reduction. Values above are the mean control ratings from 8 replicates of each treatment.

Yield and grain quality
The use of different pre-emergent herbicides made no difference in grain yield or quality. Yield results were collected from plots which had used the Harrington Seed Destructor HSD) the previous harvest.

Table 3: Wheat yield and quality after using pre-emergent herbicides Sakura and Boxer gold, west of Buntine.

	Yield (t/ha)	*Standard error*	Hectolitre weight	Protein (%)	Screenings (%)
Boxer Gold	2.9	*0.39*	77	8.3	2
Sakura	3.0	*0.22*	77	8.3	1
LSD	*NS*		*NS*	*NS*	*NS*

* Yield displayed here are for plots where the Harrington seed destructor was used during the 2010 harvest.

IWM at harvest:
The windrows did not look like they had burned hot enough for sufficient time probably due in part to the row not being concentrated enough. There were patches that saw a reduction in numbers but the rest of the plot looked like the control (nil pre-emergent herbicide).

The chaff cart, also recorded mixed success at this site with numbers reduced in the middle of the plot but the outside edges of the plot had high numbers from ryegrass seed that was not captured.

Incorporating some form of harvest weed seed management (chaff cart, windrow burn or HSD) resulted in a reduction of early germinating weed numbers by over 57% (Table 1). However, due to an existing high weed seed bank, the harvest weed seed management tactics used were only able to control 7-20% of late germinating ryegrass.

Overall the plots where the HSD was used demonstrated the largest reduction in weed seed numbers of around 20%. However, given the high weed seed bank at this site, a harvest weed seed management treatment such as the HSD would be required for several seasons to drive the weed seed bank down.

Pre-emergent herbicides:
Sakura recorded the highest and most consistent level of control compared to Boxer Gold across the site, with little influence of any of the IWM methods recorded. A wet July resulted in high numbers of late germinating annual ryegrass which favoured Sakura's longer period of residual activity compared to Boxer Gold and resulted in an additional ~15% ryegrass control recorded from Sakura in this trial. This however, did not result in a significant yield difference.

Acknowledgements
Thank you to Bayer CropScience and Syngenta for donating chemical.

Paper reviewed by: Neree Martinez, Australian Herbicide Resistance Initiative.

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Apron XL® Seed Dressing Demonstration

Clare Johnston, R & D Coordinator, Liebe Group

Aim

To evaluate whether Apron XL® improves yield in field pea crops.

Background

Apron XL is a fungicidal seed treatment containing 350 g/L Matalaxyl-M. It is registered for the control of damping-off disease caused by *Pythium* and for control of Downy Mildew in peas.

Seed dressings are highly effective means of managing disease during the development stage of a crop. Depending on the season, Apron XL can be expected to protect seedlings against fungal disease for up to five weeks after emergence.

Although Downy Mildew is not a common problem in the Central Wheatbelt, *Pythium* has been found to be widely spread across cropping soils and although it is generally more prevalent in areas with annual rainfall greater than 350mm, it is by no means confined to these areas. In fact, new research has found that high rainfall or cold waterlogged soils are not a prerequisite for *Pythium* infection.[1] High incidences of root rot have been recorded in periods of drought conditions not previously considered conducive to development of *Pythium* diseases. Even in the absence of damping-off (above ground) symptoms, *Pythium* has been found to reduce yield significantly through the damage it causes to the roots. A secondary effect is the increased susceptibility to other root and fungal diseases caused by the overall reduced plant health.

Rob Nankivell trialled Apron XL in 2010 on his peas with success, in what was a below average rainfall year. He decided to trial the product again in 2011 to see if the results could be replicated.

Trial Details

Property	Rob Nankivell, East Maya
Plot size & replication	15m x length of paddock
Soil type	Sandy loam
Soil pH	5.6
Paddock rotation	2008 lupin, 2009 wheat, 2010 wheat
Seeding date	21/5/11
Seeding rate	90 kg/ha Kaspa
Fertiliser	MAP at 65 kg/ha
Herbicides	20/5/11: 1 L/ha Glyphosate, 1 L/ha Metalachlor, 1 L/ha Diuron 21/6/11: 0.1 L/ha Brodal, 0.1 L/ha Metribuzin 750 WP 7/7/11: 0.3 L/ha Clethodim 240EC, 0.075 L/ha Quizalofop-P-Ethyl
Growing Season Rainfall	238mm

Results

Table 1: Average yield (t/ha).

Treatment	Yield (t/ha)	Return on Investment $/ha
Apron applied	1.36	86.70
Control (no seed treatment)	0.96	
LSD	*0.09*	
CV %	*3.6*	

Comments

By applying field peas with Apron XL yield was improved by an average of 0.4 t/ha. This equates to a yield gain of 41%, demonstrating again that the treatment does increase yield. In 2010 a 21% yield increase was achieved.

The farmer observed that the plants treated with Apron XL were brighter green in colour than the control. Another interesting observation was a two week difference in flowering times, with the Apron XL treatment flowering after the control.

Reference

[1] Root Disease Fact Sheet, GRDC, Paul Harvey, CSIRO

Reviewed by: Ian MacDonald, Syngenta

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Liebe Group Soil Biology Trial

Nadine Hollamby, Project coordinator, The Liebe Group

Aim

To investigate the potential of organic matter inputs to increase soil water storage, increase yield and improve soil health.

Background

This long term trial was established in 2003 to investigate how soil biology and carbon affect crop yield and soil health.

The trial site was selected as it had no significant chemical or physical soil constraints, therefore capacity to increase grain production through improved moisture conservation and enhanced soil biota can be demonstrated.

The trial aims to understand how agronomic factors such as yield and grain quality are effected by organic matter (OM) breakdown and cycling. Although the application of 20 t/ha of organic matter is not practical in a commercial farming enterprise this treatment is designed to demonstrate the potential upper level of organic carbon for sandy soils in our environment. After three separate applications (2003, 2006, 2010) of organic matter, totalling 60 t/ha, we assume the soil is near soil organic carbon capacity.

Trial Details

Property	Long Term Research Site, Buntine
Plot size & replication	10.5m x 80m x 3 replicates
Soil type	Deep yellow sand
Sowing date	1/06/11
Seeding rate	50 kg/ha Wyalkatchem
Fertiliser	1/6/11: 60kg/ha K-Till Extra, 20 L/ha Flexi-N 26/7/11: 50L/ha Flexi-N
Paddock rotation	2010 wheat, 2009 lupins, 2008 wheat
Herbicides	19/3/11: 0.6 L/ha PowerMAX, 0.4 L/ha Ester 680, 100 ml/ha Garlon 31/5/11: 2.5 L/ha BoxerGold, 1.5 L/ha PowerMAX 4/7/11: 1 L/ha Jaguar 26/7/11: 0.5 L/ha Precept
Growing Season Rainfall	293mm

2011 Treatment List

1. Control (minimum till with knife points and full stubble retention).
2. Tilled soil using offset disks.
3. Organic matter (Organic matter is applied once every 3 years, last applied 2010 at rate of 20 t/ha).
4. Organic matter run down (plots where organic matter was previously applied in 2003 & 2006 but not in 2010).
5. Burnt (plots last burnt in March 2011).

Trial history

Year	Crop type	Yield range	Treatment notes
2003	Lupin	None recorded	Set up phase: 20 t/ha barley chaff applied, Lupin crop brown manured
2004	Wheat (cv. Wyalkatchem)	2.9-3.5 t/ha	Brown manuring and addition of 20 t/ha organic matter increased yield by 18-22%
2005	Wheat (cv. Wyalkatchem)	2-2.8 t/ha	Burnt plots yielded 25% higher than control.
2006	Lupins	None recorded	Set up phase: 20 t/ha canola chaff applied, brown manure
2007	Wheat – sprayed out	None recorded	
2008	Wheat (cv. Wyalkatchem)	2.4-3.4 t/ha	Addition of organic matter increased yield by 23% compared to control.
2009	Lupin	1.5 t/ha	Set up phase:
2010	Wheat (cv. Magenta)	2.5-1.9 t/ha	20 t/ha chaff applied. No significant yield difference between treatments.
2011	Wheat (cv.Wyalkatchem)	3.3-4.2 t/ha	Addition of organic matter

Results

Table 1: Yield and quality for wheat comparing different tillage and stubble retention methods West of Buntine.

Treatment	Yield (t/ha)	Protein %	Screenings %
Control	3.3	11.20	1.07
Tilled soil	3.4	10.23	1.15
Burnt	3.8	10.73	1.40
Organic matter run down	4.0	10.80	1.19
Organic matter	4.2	12.00	3.02
LSD	*NS*	*NS*	*NS*

Table 2: Soil analysis for 0-10cm of soil sampled May 2011, before seeding.

Treatment	Amm. (mg/kg)	Nitrate N (mg/kg)	Phos. (mg/kg)	Potassium (mg/kg)	Organic carbon (%)
Control	3	19 ab	30ab	48 a	0.7 abc
Tilled soil	4	23 ab	24a	55 a	0.5 a
Burnt	3	16 a	26a	49 a	0.6 ab
Organic matter run down	5.3	39bc	48.7 bc	99 a	1.0 bc
Organic matter	7	47 c	55.7 c	248 b	1.2 c
LSD	*NS*	*21.6*	*19.43*	*79.9*	*0.47*

Note: Results followed by the same letter do not significantly differ from each other. P=0.05.

The treatment's had no statistical effect on yield or grain quality this season (Table 1). Although there is a trend towards higher yields with more organic matter, this is not statistically significantly different to other treatments due to large variation of yields between replicates. Different treatments did show large differences in soil nutrients (Table 2). Organic carbon plots had higher levels of nitrate N, phosphorus and potassium. In the case of potassium, the organic matter plots had 5 times the amount of plant available potassium than the control. Organic matter was significantly lower where plots were tilled or burnt than where organic matter had been added.

Addition of organic matter increased carbon stock in the top 0-10cm of soil but has not changed the soil deeper in the profile (Figure 1). In the top 0-10cm 16 t/ha of carbon was present where organic matter was added and only 10 t/ha of carbon present where plots were burnt or tilled. In the sub soil the amount of carbon is less with 6-8 t/ha in the 10-20cm level and 6-4 t/ha in the 20-30cm level. Treatment did not change subsoil carbon stock. Carbon stock is the amount of carbon

in the soil, it takes into account the soils bulk density and is measured in tonnes per hectare. It is therefore a physical amount which is easier to comprehend than the organic carbon percentage of weight which is often reported.

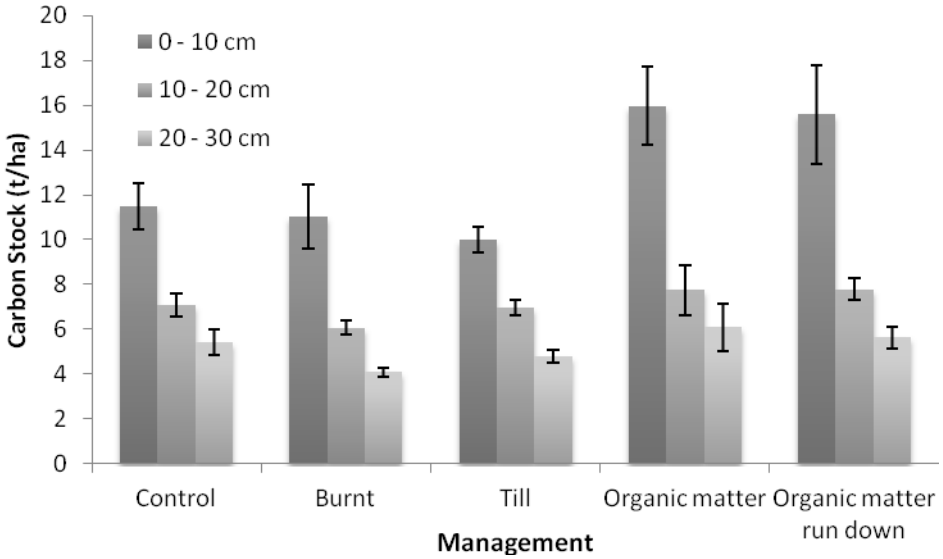

Figure 1: Carbon stock for different stubble management treatments at three soil depths on 2nd May 2011.

Comments

The addition of chaff to the organic matter plots acted as a significant source of potassium and phosphorus. These nutrients were also significantly higher than other plots in 2010, where potassium was 240 mg/kg and phosphorus was 61 mg/kg where organic matter was added.
The increased level of nutrients did not translate into higher yields in the organic matter plots. Organic matter in soil exists with relatively standard ratios of major nutrients. While the addition of organic matter has increased carbon stocks, this has also resulted in an increased amount of nitrogen, phosphorus, potassium and sulphur contained within the soil organic matter. These nutrients are used by the soil microbes for their own structures, and while they are recycled on a constant basis the microbial community is much better at utilising them than growing plants.

This trial will be discussed in more detail at the Liebe Groups Trials Review Day, 13th of February, 2012, at the Buntine Hall.

Acknowledgements

GRDC for funding the work through LLE00006, 'Improved stubble & soil management for sustainable farming systems in the Liebe area'.
Richard Bowles, Daniel Murphy and Andrew Wherrett of UWA for assisting in sampling and interpreting the trial.

Paper reviewed by: Andrew Wherret , The University of Western Australia

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Conserving soil moisture, does stubble or a fallow help on Buntine sandplain?

Nadine Hollamby, Project Coordinator, Liebe Group

Aim

To determine if various farm management techniques improve the storage of out-of-season rainfall and whether this leads to improvements in crop growth and/or yield.

Background

After a decade of variable rainfall, in particular sporadic winter and summer rainfall, Liebe growers wanted a better understanding on how stubble management over the summer affects stored soil water, crop establishment, growth and crop yield. Storing more rainfall in the soils, compared to losing this rainfall to evaporation or weeds, can potentially increase yields by 0.3-0.5 t/ha (Oliver, 2011) and reduce the risk from drought. Therefore it is important to understand how much water your soils can hold (the plant available water capacity - PAWC), how much water can be stored over the summer (summer fallow efficiency) and how it is affected by summer stubble cover and rainfall distribution.

The Liebe Group - GRDC funded project has set-up 3 trials to examine these questions. With the assistance of CSIRO the data will be analysed for the 2011-2012 seasons and extended to other seasons with the use of crop simulation modelling (APSIM).

Trial Details

Property	Liebe Long Term Research Site, West Buntine
Plot size & replication	19m x 4m x 3 replicates
Soil type	Deep yellow sand
Soil pH (cacl)	Topsoil 5.5, Subsoil 4.6
EC	0.04 dS/m
Sowing date	30/5/11
Seeding rate	60Kg/ha Mace
Fertiliser	70 Kg/ha Agstar Extra + 50 Kg/ha Urea topdressed
Paddock rotation	08 wheat, 09 lupin, 10 wheat
Herbicides	30/5/11: 1.5 L/ha Sprayseed, 2.5 L/ha Boxergold pre sowing 4/7/11: 1 L/ha Jaguar 26/7/11: 0.5 L/ha Precept
Fungicide	19/8/11: 50 mL/ha Emporer
Growing Season Rainfall	295mm

Treatments

Treatment	Details	Date imposed
Fallow	Wheat crop sown then sprayed out before anthesis using a knockdown herbicide	August 2010
Burnt	Stubble was raking into a pile and burnt	March 2011
Standing stubble	Stubble harvested at 200mm above ground and spread (normal district practice)	December 2010
Flat stubble	Stubble flattened by dragging a chain dragged across the plot	January 2010

Results

By sacrificing the 2010 crop, yield in 2011 increased by 0.5 t/ha however, this was not significantly different from other treatments. The way in which stubble was managed made no difference to crop yield or protein (Table 1).

Table 1: Wheat yield and quality after stubble was burnt, flattered, left to stand or previous crop was fallowed.

	Yield (t/ha)	Protein (%)
Fallow	3.9	10.2
Burnt	3.4	9.9
Flat	3.3	9.8
Standing	3.1	9.8
LSD	*NS*	*NS*

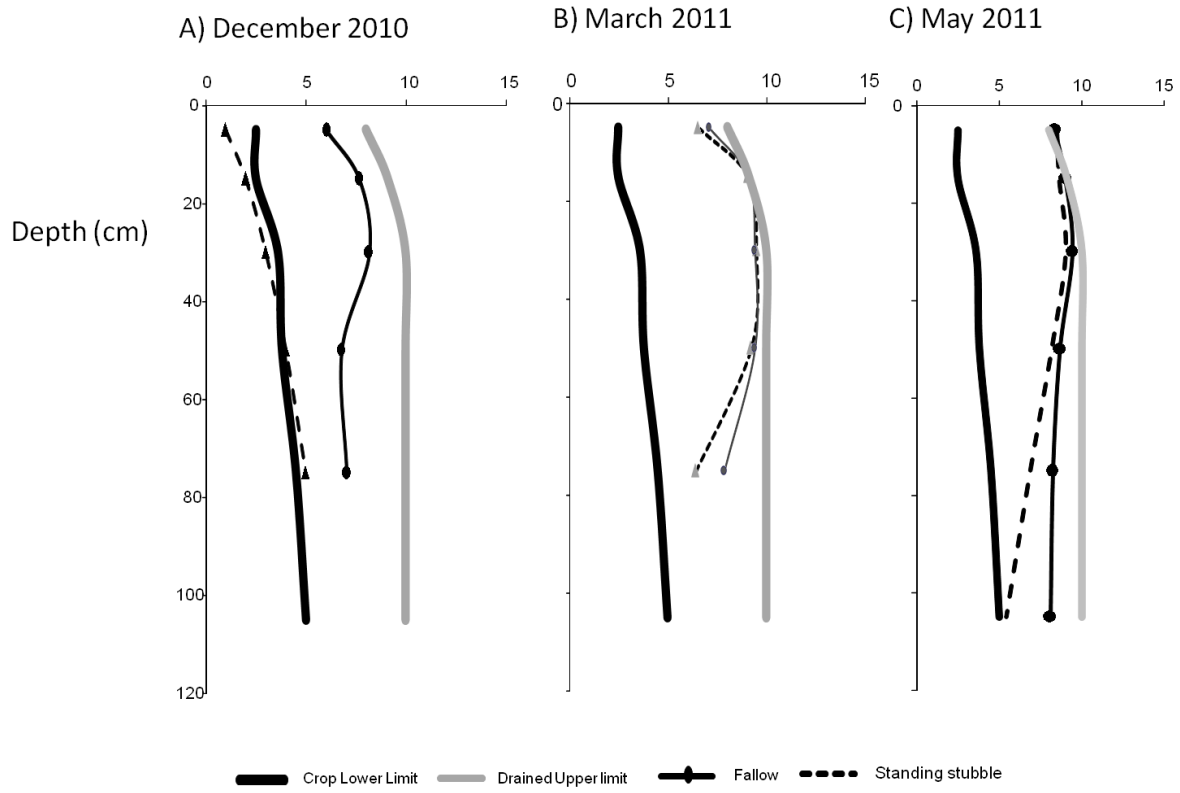

Figure 1: Soil water content at three times during the year under a fallow (crop sprayed out in August) compared to crop grown to maturity which leaves standing stubble, west of Buntine. Note: December and March sampling only conducted to 80cm, May sampling to 100cm.

Figure 1A shows that the fallow treatment has more water in the soil than the standing stubble in December because in a fallow situation this moisture is not being used by the crop and is 'saved' if it is below the evaporation zone. March rainfall wet the top 0-50cm of soil, pushing soil moisture close to the Drained Upper Limit for all treatments (Figure 1B). Due to this rain event the benefit of 'saving' water by using a fallow was not as great as would be expected in a dry summer. However, the fallow did have more water at depth which may have been protected from evaporation (Figure 1B). This extra water deep in the profile was still present in May (Figure 1C).

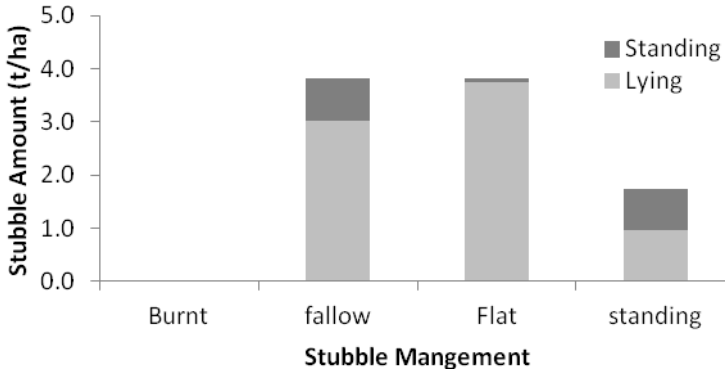

Figure 2: Stubble amounts at seeding in May 2011, west of Buntine.

Table 2: Stored soil water over the summer and just prior to sowing, the rainfall since 1st Dec 2010 and the fallow efficiency of this rainfall on deep yellow sand in Buntine PAWC to 0.9m = 88mm.

Date	Rainfall (1st Dec to date)	Stored soil water (to 0.9m) (mm)			Storage efficiency over period (stored water /rainfall)		
		Burnt	Flat	Standing	Burnt	Flat	Standing
15th December	0	0	0	0			
9th March	56	38	36	39	68%	64%	70%
8th April	64	29	28	22	45%	44%	34%
24th May	93	40	43	39	43%	46%	42%

At the beginning of the summer, after large rainfall events, the standing stubble treatment had 70% of rainfall stored in the soil (Table 2). However, by seeding time the storage efficiency has decreased to 42%. A storage efficiency of between 70-40% is good for this soil type. According to APSIM modelling (Agricultural Production Systems Simulator) over the last 50 years a good sand with good weed control and stubble cover can expect to hold about 40% of the rainfall it receives. The other 60-70% of rainfall is mostly lost to evaporation (which in summer can be as high as 10 mm/day) with some rainfall also lost to runoff or drainage below the root zone when the rain falls in large amounts. The summer storage efficiency varies from year to year depending on the pattern of summer rainfall. In this trial having burnt stubble did not significantly reduce storage efficiency (Table 2). However, computer modelling for the Dalwallinu area shows that stubble cover of 3 t/ha slightly increased stored soil moisture but not in all years. In this trial the orientation of stubble (either lying or standing) doesn't change evaporation, which is consistent with observations in other research and computer modelling.

Comments

While stubble delays evaporation it cannot prevent it. In this trial and season, stubble amount and orientation did not change crop yield or the amount of moisture in the soil. However, past research and grower practice has documented the importance of retaining stubble for a number of other reasons such as wind erosion prevention, water infiltration, nutrient cycling and carbon storage. The implementation of a fallow did enable some extra moisture to be stored deep in the sub soil; however, this did not lead to a significant yield increase in 2011 on this soil type.

Acknowledgements

GRDC for funding the work through LLE00006, 'Improved stubble & soil management for sustainable farming systems in the Liebe area'.

Paper reviewed by: Chris O'Callaghan, Liebe Group

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Conserving soil moisture, does stubble or fallow help on a farm scale?

Dr Yvette Oliver, Research Scientist, CSIRO
Nadine Hollamby, Project Coordinator, Liebe Group

Aim

To determine if various farm management techniques improve the storage of out-of-season rainfall and whether this leads to improvements in crop growth and/or yield.

Background

After a decade of variable rainfall, in particular sporadic winter and summer rainfall, Liebe growers wanted a better understanding on how stubble management over the summer affects stored soil water, crop establishment, growth and crop yield. Storing more rainfall in the soils, compared to losing this rainfall to evaporation or weeds, can potentially increase yields by 0.3-0.5 t/ha (Oliver, 2011) and reduce the risk from drought. Therefore it is important to understand how much water your soils can hold (the Plant Available Water Capacity - PAWC), how much water can be stored over the summer (summer fallow efficiency) and how it is affected by summer stubble cover and rainfall distribution.

The Liebe Group - GRDC funded project has set-up 3 trials to examine these questions. With the assistance of CSIRO the data will be analysed for the 2011-2012 seasons and extended to other seasons with the use of crop simulation modelling (APSIM).

Trial Details - Red loamy duplex

Property	Keith Carter, Jibberding
Plot size & replication	15m x 300m not replicated
Soil type	Red loamy duplex (York gum)
Soil pH ($CaCl_2$)	4.6 surface, 4.8-5.1 at 10-40cm, 6.4-7.8 at 40-100cm
EC (1:5	Non saline (0.15-0.32 dS/m)
Seeding date	24/5/11
Fertiliser	24/5/11: 70 kg/ha Agstar, 36 L/ha Flexi-N 18/7/11: 40 L/ha Flex-N
Paddock rotation	2009 peas, 2010 wheat
Herbicide	18/1/11: 350 mL/ha Sprayseed, 200 mL/ha Ester, 70 mL/ha Garlon 15/3/11: 1.1 L/ha Roundup, 500 mL/ha Ester, 100 mL/ha Garlon, 10 g/ha Metsulfuron 24/5/11: 1.5 L/ha Gladiator, 1.3 L/ha Triflurin, 10 mL/ha AuSu^2, 300 mL/ha Diuron 24/6/11: 200 mL/ha Precept, 400 mL/ha LVE-MCPA
Growing season rainfall	231mm

Trial details – Sand over gravel

Property	Keith Carter, Jibberding
Plot size & replication	15m x 300m not replicated
Soil type	Sand over gravel (Sugar bush)
Soil pH ($CaCl_2$)	5.2 surface, 4.8-5.2 at 10-100cm depth
EC (1:5	Non saline (0.12-0.18 dS/m)
Seeding date	25/5/11
Fertiliser	25/5/11: 70 kg/ha Agstar, 40 L/ha Flexi-N 16/7/11: 40 L/ha Flexi-N 29/8/11: 20 L/ha Flexi-N
Paddock rotation	2009 mixed pasture, 2010 wheat
Herbicide	25/2/11: 600 mL/ha Sprayseed, 400 mL/ha Ester, 100 mL/ha Garlon

	25/3/11: 1.4 L/ha PowerMax, 5 g/ha Metsulfuron 25/5/11: 1.2 L/ha Roundup PowerMax, 1.4 L/ha Triflurin, 0.3 L/ha Diuron, 10 mL/ha li700 30/5/11: 1 L/ha Sprayseed, 0.3 L/ha Gramoxone, , 20 mL/ha Logran
Growing season rainfall	242.7 mm

Treatments

Treatment	Details	Date imposed
Fallow	Wheat crop sown then sprayed out before anthesis using a Glyphosate	August 2010
Bare	Stubble was raking into a pile, piles burnt	March 2011
Standing stubble	Stubble harvested at 200mm and spread (normal district practice)	December 2010
Flat stubble	Stubble flattened by dragging a chain between two vehicles. This practice was once used in district but is now rarely seen	January 2010

Results

Spraying out the 2010 crop in August to create a fallow increased yield of the 2011 crop by 0.7 t/ha on the red loamy duplex and 0.4 t/ha on the sand over gravel (Figure 1). Whether the stubble was standing, flat or removed (bare) made no difference to yield on either soil type.

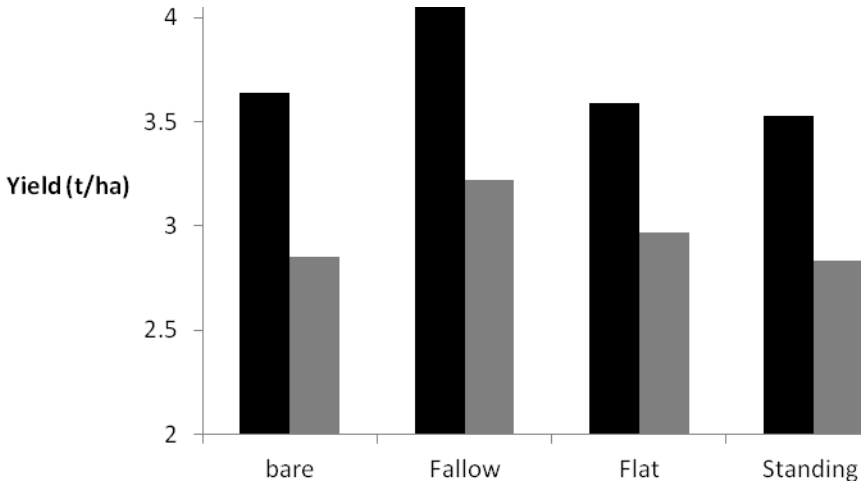

Figure 1: Wheat yield on a red loamy duplex (black) and sand over gravel (grey) after different stubble management practices.

What is PAWC and PAW?

The Plant Available Water Capacity (PAWC) is the amount of water a soil can hold that is available for use by the crops. It is the difference between the soil water measured at Crop Lower Limit (CLL) which the extent to which a particular crop can extract water from a particular soil type. This was the soil water content measured in December 2010 at each site as there has been no large end of season rainfall and is the solid black lines in Figure 2. Drained Upper Limit (DUL) is the amount of water that a soil is able to hold after drainage has ceased, often taken at wettest time of year or from ponding a large amount of water in the profile and allowing drainage to occur. DUL is indicated by the solid grey lines in Figure 2. The Plant Available Water Capacity is affected by the soil type (soil texture), soil constraints and the crop rooting depth. Only data from the light soil is shown in this report because PAWC has not been correctly measured for the red loamy duplex demo trial. The sites had good weed control.

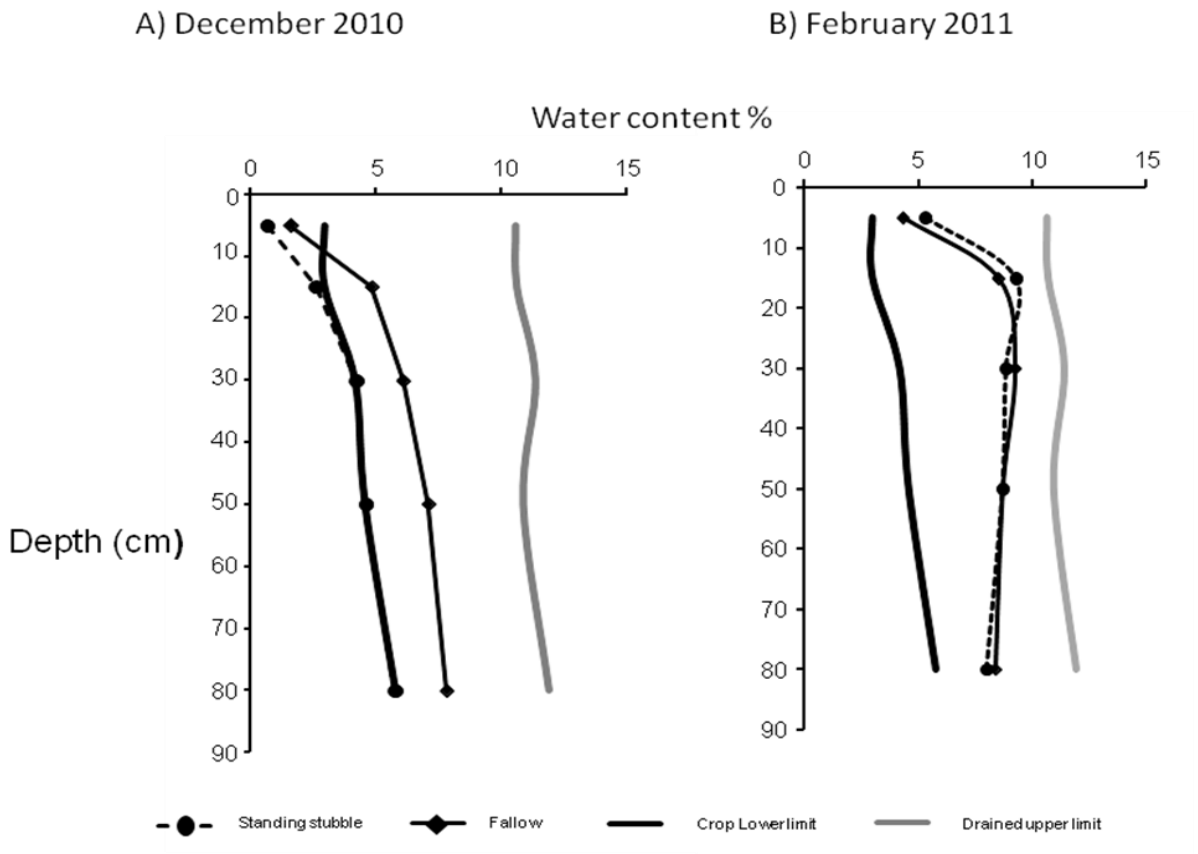

Figure 2: Soil moisture on sand over gravel west of Wubin just after harvest (A) and after a large rainfall event (B).

Imposing a fallow (spraying the 2010 crop in August) resulted in more soil water in the soil after harvest (Figure 2A), however, after a 50mm rainfall event in February the amount of water in the soil increased considerably for both the fallow plot and standing stubble (Figure 2B). Therefore any moisture 'savings' from the fallow were lost as the soil profile fills up with summer rain.

In February the sandy soil had stored 36% of rainfall, however, by May this had decreased to 16% (22mm out of 138 mm of rainfall) probably due to evaporation which can be up to 10 mm/day in summer (Table1). A stored water efficiency of 36% is considered good however, 16% is considered poor. In comparison the APSIM computer model for a good sand in Perenjori with good weed control and high stubble load can store 38% of rainfall. However, if weed control is poor and there is no stubble to protect from, storage was 27%. There are small but not important differences in storage efficiency depending on whether stubble is flat, standing or burnt.

Table 1: Stored soil water over the summer and just prior to sowing, the rainfall since 1st December 2010 and the fallow efficiency of this rainfall on the sand over gravel PAWC to 0.9m = 88mm.

Date	**Rainfall (1st Dec to date)**	**Stored soil water (to 0.9m) (mm)**			**Storage efficiency over period (stored water /rainfall)**		
		Burnt	Flat	Standing	Burnt	Flat	Standing
15th December	1.3						
28th Feb	92.3	30	33	33	33%	36%	36%
12th April	112.8	35	30	31	31%	27%	27%
20th May	138.3	*	28	22		20%	16%

Comments

Imposing a fallow from August onwards increased yield slightly in 2011 (0.7 t/ha in the red duplex soil and 0.4 t/ha in the sand over gravel), Figure 1. As this was not a fully replicated trial it is hard to tell if this yield difference is a significant increase. In a wet year such as 2011 it is unlikely the yield benefit was due to stored soil moisture but rather from difference in nitrogen content in the soil and other agronomic benefits of a fallow. These areas will be further investigated in the coming year.

Acknowledgements

GRDC for funding the GRDC for funding the work through LLE00006, 'Improved stubble & soil management for sustainable farming systems in the Liebe area'.
Keith Carter & Co. for hosting the trial.

Paper reviewed by: Chris O'Callaghan, Liebe Group**.**

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Impact of Biochar on crop yield and nitrogen

Zakaria Solaiman and Daniel Dempster, The University of Western Australia
Nadine Hollamby, Project Coordinator, Liebe Group

Aim

- To determine the impacts of biochar on crop yield
- To determine how biochar influences plant nitrogen uptake and soil nitrogen mineralization
- To compare the effectiveness of different methods of applying biochar to the soil

Background

Biochar is a carbon rich product created when organic matter is heated to temperatures greater than 250°C in low oxygen conditions (Antal and Grønli, 2003). During the conversion of organic matter to biochar, volatile compounds are released. These compounds can be combusted to produce energy; hence it can be considered a carbon negative method of producing energy. Biochar is also very stable in soils. It can remain in soils for many hundreds, or thousands of years, providing a method of carbon sequestration (Ascough et al. 2009).

From an agronomic perspective it is suggested that biochar could improve soil health by improving nutrient retention, particularly in coarsely textured soils (Chan et al. 2008). As most biochar is alkaline, it may also provide a liming effect. From a biological perspective, biochar is also a potential habitat for microbes to avoid predation by nematodes and protozoa. Some biochars can also supply nutrients. The aim of this experiment is to examine the interaction between biochar (made from wheat chaff) and nitrogen. From this we hope to determine whether biochar changes nitrogen fertiliser use efficiency.

In the first year of this trial (2010) addition of biochar did not alter grain yield or protein content, nor did it have any positive effect on nitrogen fertiliser usage. Biochar is considered a long term soil ameliorant and is largely untested in broadacre agriculture; therefore this trial continues to be monitored into the future.

The experiment

If biochar does prove to be a beneficial soil ameliorant, growers will need to consider how to apply the product. In this trial, biochar was either banded or applied on the soil surface at a rate of 4 t/ha using the Department of Agriculture and Food's trial seeder. The biochar was applied in April 2010 and therefore this is the second year that wheat has been grown on the site. To investigate the claim that biochar increases fertiliser efficiency the trial compares 3 nitrogen rates (0, 20 or 40 units of N) applied as urea at seeding. No further nitrogen was applied.

Trial Details

Property	Liebe Long Term Research Site, West Buntine
Plot size & replication	20m x 2m x 4 replications
Soil type	Deep yellow sand
Soil pH (CaCl2)	Topsoil 5.5, Subsoil 4.6
EC	0.04 dS/m
Sowing date	30/5/11
Seeding rate	60 Kg/ha Mace
Fertiliser	As per treatment (N), 50 kg/ha Bigphos + Mn
Paddock rotation	2008 wheat, 2009 canola, 2010 wheat

Herbicides	2 L/ha Roundup PowerMax, 2.5 L/ha BoxerGold
Growing Season Rainfall	295mm

Results

Table 1: Average grain and straw yield, and biomass production for 2011 after biochar was applied on surface and deep banded with 3 rates of nitrogen fertiliser (0, 20, 40 units of N). The least significant difference (LSD) used is for comparing nitrogen and biochar treatments. Percent yield increase was calculated over absolute control (nil nitrogen and nil biochar). NS stands for not statistically significant.

Treatment		Yield	Yield	Post-tillering	Anthesis
Nitrogen (kg N/ha)	Biochar (4 t/ha)	(t/ha)	increase %	biomass (t/ha)	biomass (t/ha)
40	Nil	2.71	42	0.32	5.38
40	Banded	2.76	45	0.38	4.85
40	Spread	2.33	22	0.34	4.93
20	Nil	1.99	4	0.36	3.77
20	Banded	2.31	21	0.28	3.62
20	Spread	2.38	25	0.29	4.04
0	Nil	1.91	-	0.25	4.00
0	Banded	2.00	-	0.23	3.58
0	Spread	2.18	-	0.25	3.16
LSD (Nitrogen)		*0.34*	*-*	*0.03*	*0.70*
LSD (Biochar)		*NS*	*-*	*NS*	*NS*

Table 2: Average grain protein in 2011 after biochar was applied on surface and deep banded with 3 rates of nitrogen fertiliser (0, 20, 40 units of N).

Treatment		Grain Protein
Nitrogen (kg N/ha)	Biochar (4 t/ha)	%
40	Nil	8.95
40	Banded	8.60
40	Spread	8.90
20	Nil	8.85
20	Banded	8.85
20	Spread	8.82
0	Nil	8.55
0	Banded	8.70
0	Spread	9.07
LSD (Nitrogen)		*NS*
LSD (Biochar)		*NS*

Biochar application methods had no effect on wheat biomass and grain yield in 2011 (Table 1). More nitrogen did increase yield but there was no interaction between biochar and nitrogen. Grain protein was also unchanged by biochar application or nitrogen application (Table 2).

Comments

This is the second year in a row in which biochar has had no effect on wheat yield. Trial conditions were not ideal due to a high weed burden and glyphosate damage which has reduced grain yield. Biochar is considered a long term soil ameliorant and once applied it cannot be removed therefore the Liebe Group and the University of Western Australia will continue to conduct biochar research in order to determine its effects on broadacre agriculture.

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Evaluation of Spading x Lime incorporation in low pH, non-wetting sand

Nadine Hollamby, Project Coordinator, Liebe Group
Stephen Davies, Research Officer, DAFWA

Aim

To examine whether deep cultivation by spading can be used to manage water repellence and subsoil acidity on sandplain soil.

Background

This demonstration was established in 2010 to assess the impact of a one-off deep soil cultivation using a rotary spader to dilute water repellent soils and ameliorate subsurface acidity through the burial of lime. In 2010 the spading was successful in diluting the water repellent soil but did not increase the yield of the lupin crop due to poor establishment as a result of being sown too deep and furrow infill.

The trial was spaded in May 2010 to a depth of 30cm. The 'spade' on a rotary spader tynes can carry topsoil down into the subsoil and also bring subsoil up to the surface, mixing to a depth of 25-30cm. It is estimated that the rotary spader buries at least two-thirds of the topsoil with one-third remaining in the topsoil.

Water repellence in soils is caused by waxes from plant residues which coat the sand particles. These waxes are hydrophobic and can cause slow and uneven infiltration of water into the soil. The mixing action of a spader reduces water repellence in sandy soils by diluting the organic matter-rich and repellent topsoil through the top 30cm of the soil profile and by creating subsoil seams in the topsoil that can act as preferred pathways for water movement. As a consequence of the mixing action some of the topsoil can remain slightly water repellent after spading. The fate of the buried water repellent topsoil is not yet known and there is a risk that cultivation of this type may increase the depth of non-wetting. However, it is hoped that over time the buried non-wetting topsoil will become wettable once the waxes causing repellence have been degraded by micro-organisms.

Surface applied lime can take over a decade to significantly increase the subsoil pH below 10cm unless lime is incorporated. Spaders can effectively incorporate surface applied lime into acid subsoils to depths of up to 30-35cm thereby significantly speeding up the amelioration of soil acidity.

Trial Details

Property	Hunt partners, Marchagee
Plot size & replication	22.5m x 1000m
Soil type	Deep yellow sand
Soil pH ($CaCl_2$)	Topsoil pH_{Ca} = 5.7-6.3; Subsurface (10-30cm) pH_{Ca} = 4.3-4.5
EC	0.02 dS/m
Sowing date	10/6/11
Seeding rate	70 kg/ha Wyalkatchem
Fertiliser	10/6/11: 80 kg/ha K-Till Extra, 80 L/ha Flexi-N 22/7/11: 30 L/ha Flexi-N
Paddock rotation	2008 lupins, 2009 wheat, 2010 lupins
Herbicides	10/6/11: 2 L/ha Glyphosate 450, 1 L/ha Paraquat, 1.5 L/ha Treflan

	16/7/11: 1 L/ha Precept, 500 ml/ha MCPA LVE 18/8/11: 600mL/ha Jaguar, 500 ml/ha MCPA LVE
Insecticide	100 mL/ha Alpha Duo
Growing Season Rainfall	308mm

Results

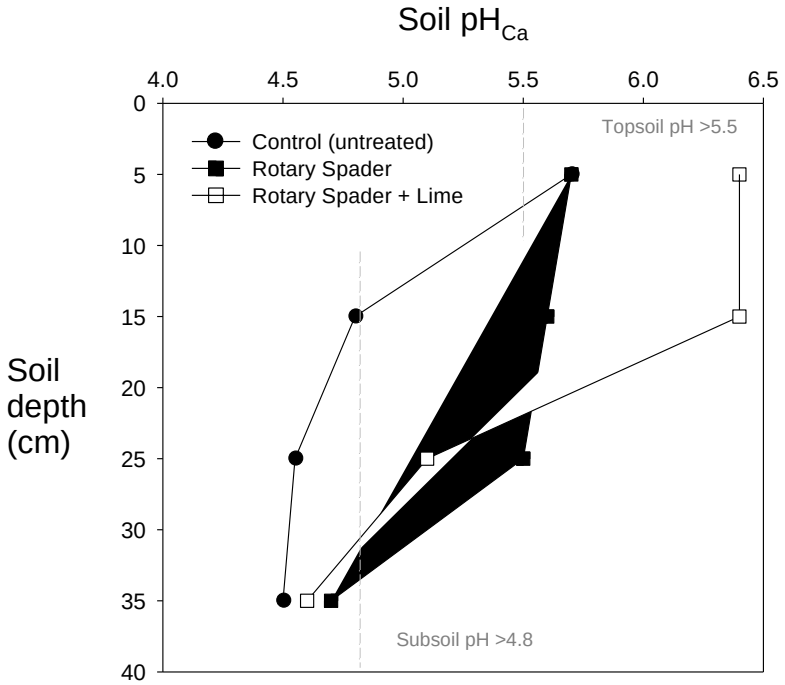

Figure 1: Soil pH ($CaCl_2$) profile changes as a result of spading and incorporating lime and dolomite, measured in 2010.

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Table 1: Wheat yield for 2011 in the second season after using a rotary spader or deep ripper to cultivate soil at Marchagee. Soil was cultivated in April 2010.

Treatment	Yield (t/ha)
Control	1.3
Deep Rip	1.4
Spade	1.5
Spade+ Lime (1 t/ha)+ Dolomite (1 t/ha)	1.7

Comments

Subsoil pH at the site is acidic and with some samples as low as 4.3 with high levels of aluminium so the growth of sensitive crops may be reduced. Soil measurements taken in 2010 had indicated that subsoil pH was improved as a result spading alone due to the incorporation of higher pH topsoil and further improved with addition of lime and dolomite (Figure 1). There was a trend towards higher yield in response to spading alone in 2011 with a grain yield 200 kg/ha higher than the control. In addition there is also some evidence that the improvement in subsoil pH contributed to improved yield with the spading and lime being the highest yielding treatment, 200 kg/ha higher than spading alone. Given the relatively high cost of spading $120-150/ha with additional costs for lime and dolomite further yield increases in subsequent years would be needed to make the soil amelioration efforts worthwhile.

Acknowledgements

Stephen Davies involvement is supported by the 'Delivering Agronomic Strategies for Water Repellent Soils' DAW00204 and 'Putting PA on the ground in WA' CSA00016 GRDC projects.

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Wheat response to rotary spading of water repellent sand at Marchagee

Stephen Davies, Research Officer, DAFWA

Department of Agriculture and Food

Aim

To assess the impact of rotary spading non-wetting sandplain soil on soil properties, crop growth and productivity.

Background

The one-off use of deep cultivation on sandplain soils is being investigated as a method for medium to long-term amelioration of water repellent topsoils. Rotary spaders have deep working spades that lift wettable subsoil seams to the soil surface and these provide numerous pathways for water entry allowing the water repellent soil to wet up more quickly. The mixing action also dilutes some of the water repellent soils and buries some of the topsoil, associated nutrients and organic matter. Other one-off deep cultivation techniques include soil inversion with a mouldboard plough, which buries the water repellent layer and lifts a layer of wettable subsoil to the surface, it also buries the weed seedsw giving excellent weed control. To test these tools Michael (farmer) has conducted several on-farm trials that allow assessment of how the technique fits into the farming system and any associated risks or benefits as well as measures of changes in crop productivity.

Trial Details

Property	Michael O'Callaghan, South Marchagee
Plot size & replication	Farmer trial
Soil type	Pale deep sand
Crop Variety	Mace wheat
Sowing date	5/6/11
Seeding rate	80 kg/ha
Fertiliser	Starter: 120kg/ha Mallee (70%) & MOP (30%); Top-up N: 60 L/ha 40L/ha Flexi-N
Paddock rotation	2010 volunteer pasture; 2011 wheat
Growing Season Rainfall	324mm (May-Oct)

Results

Table 1: Growth and yield response of Mace wheat to rotary spading conducted in 2011 on strongly repellent deep sand at Marchagee in 2011. Data are the average of 4 paired harvest index hand cut samples in an area strongly exhibiting water repellence. Spading cost of $150/ha is an estimate based on contractor rates with no pre-ripping.

Treatment	Shoot DW (t/ha)	Head number (heads/m^2)	Grain Yield (t/ha)	Harvest Index	Kernel weight (mg)	Screenings (%)	Gross Return ($/ha)*	Spading Cost ($/ha)**	Gross Margin ($/ha)
Control	3.47	193	1.49	0.43	35.1	0.9	358	0	358
Spaded 2011	7.74	326	3.28	0.42	35.4	1.3	787	150	637
Difference Spaded-Control	*4.27*	*133*	*1.79*	*-0.01*	*0.3*	*0.4*	*429*	*-150*	*279*

* Based on EPR for APW2 Base Rate $240/tonne; ** Estimate of cost of spading based on contractor rates.

Comments

In the 2011 season more rainfall and some larger rainfall events meant that in general soil water repellence was less of a problem in many areas as the soil had opportunity to wet up. However, in cases of severe water repellence there was still significant reductions and delays in crop establishment. This site was a pale deep sand with severe water repellence. Spading greatly improved crop establishment with early and even germination, while in the control soil

establishment was poor with large delays to the extent that while many of the early germinated wheat plants were in ear, other late-germinating plants were still at early tillering. The hand harvest index cut samples were taken in a strongly repellent part of the paddock where treatment differences were visually large. Spading increased both total shoot dry weight and grain yield by 120%, a grain yield response of nearly 1.8 t/ha. In the 2010 season, rotary spading on a better yellow sand increased wheat grain yield by 0.8 t/ha. The higher wheat yield measured here was a result in a large improvement in plant density (Figure 1), reflected by the fact that the spaded treatment had, on average, 133 more heads per m^2 than the untreated control, a 69% increase in head number (Table 1). It should be noted that the grain yield increases reported here are for hand-cuts which can overestimate yield and they were taken from the most severely water repellent part of the paddock where the responses were greatest. Yield response across the entire paddock is likely to be lower but the results indicate that for this soil type is likely to be profitable in the first year. Minimal or negative yield responses to rotary spading have been measured in some trials, usually this is a result of seeding problems with seed being sown too deep or sandblasting of the crop after is has emerged, but it can occasionally be due to insufficient water at grain filling to finish the spaded crop which has bigger biomass and higher water use. The long term productivity benefits of rotary spading are still unclear and are currently being assessed.

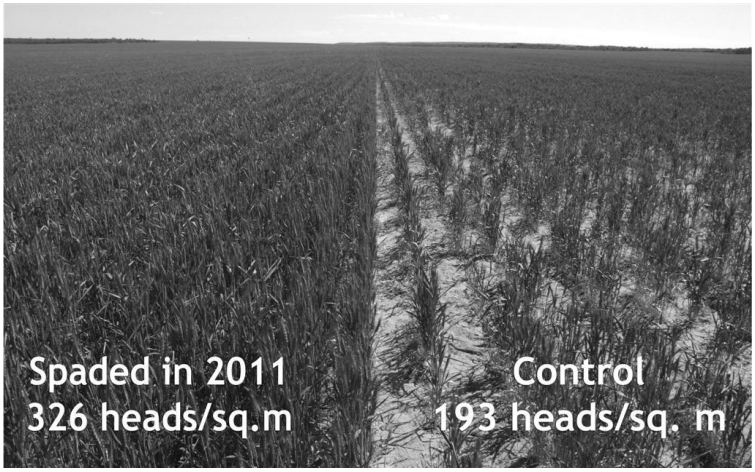

Figure 1: Image showing density of Mace wheat grown in 2011 in response to rotary spading conducted in 2011 compared with an untreated control on severely water repellent pale deep sand. Head numbers are the average of 4 paired harvest index hand cut samples taken at crop maturity.

Acknowledgements
Soil water repellence project 'Delivering agronomic strategies for water repellent soils in WA (DAW00204)' is funded by DAFWA and GRDC. Particular thanks to Michael and Julia O'Callaghan for putting in and allowing access to the trial and Nadine Hollamby (Liebe Group) and Breanne Best (DAFWA) for support and assistance.

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Revisiting Gypsum for improved soil structure

Nadine Hollamby, Project Coordinator, Liebe Group

Aim

To determine the efficacy and rate of gypsum required to improve soil structure on heavy clay soils in a minimum tillage system.

Background

This trial has 3 main aims; (a) to determine whether gypsum improves crop establishment and yield on the selected paddock; (b) to determine if 4 t/ha is more effective than 2 t/ha and; (c) to determine how long the benefits of gypsum application last. The gypsum was applied on 17th April 2010; this is the second year in which the paddock has been monitored. In the 2010 canola crop, applying gypsum had no effect on crop yield. This lack of response in 2010 could have been because lack of rainfall in 2010 limited the ability of the gypsum to dissolve sufficiently or impact on infiltration. In order to account for seasonal variability the trial is being monitored for the next two years.

Gypsum (calcium sulphate) can improve soil structure on heavy dispersive clays by making the soil aggregates more stable (Jarvis R, 2000). Signs that the soil structure of a paddock might need improving include hardsetting or crusting of top soil, patchy germination and slow water infiltration (ponding on the soil surface). Dispersive (sodic) soils can be determined by obtaining a laboratory measure of the exchangeable sodium percentage, a value greater than 6% indicating possible dispersion, or by testing the dispersion of dry soil aggregates in distilled water. The calcium in gypsum helps the clay particles stay bound together when the soil gets wet, reducing the tendency for the particles to disperse (Jarvis R, 2000). The use of gypsum as a soil ameliorant for soil structure has become less popular around the Liebe area with the advent of minimum tillage farming systems, which are less destructive to soil structure than conventional cultivation. However, on the south coast of WA recent work by David Hall (DAFWA) and Nigel Metz (SEPWA) has shown that gypsum can produce yield benefits in a no till system when targeted to the right soil type at the right rate. This trial will investigate whether gypsum still plays a role in a minimum tillage system.

Trial Details

Property	Ian Hyde, Dalwallinu
Plot size & replication	24m x75m x 3 replicates
Soil type	Clay
Sowing date	1/6/11
Seeding rate	60 kg/ha Wyalkatchem
Paddock rotation	2008 wheat, 2009 wheat, 2010 canola
Fertilisers	1/6/11: 70 kg/ha K-Till Extra, 50 kg/ha Urea
Herbicides	1/6/11: 1 L/ha Glyphosate, 0.22 kg/ha Logran, 1.4 L/ha Trifluralin 27/7/11: 600 mL/ha Velocity
Insecticide	1/6/11: 100 mL/ha Alpha Duo
Growing Season Rainfall	323mm

Results

Increasing the rate of gypsum (which was applied in April 2010) had no effect on wheat yield or quality in 2011 (Table 2). Application of gypsum also had no effect on crop establishment (Table 1).

Table 1: Plant germination 1 month after sowing in relation to gyprsum application of 0,2,4 t/ha.

Gypsum applied t/ha	Plant $m/^2$
0	50
2	50
4	45
LSD	*NS*

Table 2: Wheat yield and grain quality two years after gypsum was applied.

Gypsum applied t/ha	Yield (t/ha)	Protein %	Screenings %
0	3.37	10.87	3.87
2	3.66	10.48	3.22
4	3.24	10.37	3.41
L.S.D	*NS*	*NS*	*NS*

Comments

This is the second season in a row in which gypsum has not shown a yield increase or altered crop germination. The jar dispersion test conducted on the site indicated the site is not responsive to gypsum because topsoil did not disperse in water, even after 24 hours. This soil is in fact non sodic and thus gypsum is unlikely in have any impact on soil structure.

It is important to remember that not all heavier-textured soils are responsive to gypsum so it is important to conduct dispersion tests (e.g. jar tests) and soil tests (exchangeable sodium percentage) to gain an indication of the paddocks potential response to gypsum (Jarvis, 2000). In general, soils with an exchangeable sodium percentage of 6-10 will tend to be mildly dispersive, 10-15 moderately dispersive and >15 strongly dispersive. Structural decline on-heavier textured soils can occur for reasons other than dispersion. Excess cultivation and compaction by stock and machinery, particularly when the soil is wet, can also damage soil structure. In these cases where soils have poor structure but are not dispersive, minimum tillage, full-stubble retention, controlled traffic and inputs of organic matter in the form of amendments or green and brown manure crops may help build and retain soil structure.

In order to account for seasonal variation and the fact that there may be sodic layers in the subsoil which could take time for the gypsum to correct, the Liebe Group will continue to monitor this trial and see if there are any longer term benefits from gypsum application.

Acknowledgements

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Stephen Davies from DAFWA in Geraldton for support and technical advice.

Paper reviewed by: Stephen Davies, DAFWA.

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Evaluation of Spading vs. Deep ripping

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Grains Research & Development Corporation

Aim

- To determine if using a rotary spader on a 'good' sandy loam with minimal repellence and good pH profile can damage soil;
- To compare the impacts of spading and deep ripping.

Background

Rotary spading has been shown to be successful at improving crop establishment, growth and grain yield on water repellent sandplain soils, such as deep pale and coloured sands and sandy gravels. In addition, rotary spading loosens compacted soil and provides an opportunity to incorporate lime into acid subsoils. However, the impact of rotary spading of sandy loam soils with minimal repellence and a good pH profile is unknown. To determine this unknown, a trial was set up on 'good' loamy sand, east of Coorow.

Deep ripping is a cheaper and more cost effective means of reducing subsoil compaction than spading, the benefits of deep ripping tend to be greater in wetter seasons where nitrogen leaching is more of an issue. The benefits of deep ripping can be maintained for longer if controlled traffic is used to prevent future compaction.

The deep ripping treatment removes subsoil compaction without significant mixing while the rotary spading removes compaction but also mixes the soil.

Trial details

Property	Catalina Farms, East Coorow
Plot size & replication	16m x 100m x 2 replications
Soil type	Sandy loam
Soil pH ($CaCl_2$)	Topsoil 6, subsoil 5
Sowing date	17/5/11
Seeding rate	60 kg/ha Mace
Fertiliser	17/5/11: 50 kg/ha DAPSZC 17/6/11: 100 kg/ha Urea 4/8/11: 35 L/ha MAXamFLO
Paddock rotation	2009 wheat, 2010 lupins
Herbicides	17/6/11: 1 L/ha Sprayseed, 1.6 L/ha Trifluralin, 35 g/ha Trisulfuran 6/7/11: 350 mL/ha Paragon, 350 mL/ha Bromoxynil
Growing Season Rainfall	329mm

Results

Due to the partial burial of the organic matter in the topsoil, rotary spading tends to decrease the organic carbon content of the top 10cm while marginally increasing it in the 10-20cm layer (Table 1). The soil pH profile did not vary greatly between the treatments with the lowest pH of 4.7-4.9 occurring at the 20-30cm layer (Table 1). While this is not low enough to be a constraint it does indicate the ongoing need to apply lime to prevent further acidification.

Soil loosening and removal of compaction is one of the biggest differences between the treatments. In the untreated control the soil strength became high enough (>2MPa) to significantly slow root growth at 20-30cm (Table 1). In the deep ripped treatment the soil strength at this depth was 39% or 1.5MPa lower at this depth and remained significantly lower at 30-40cm

also. The spader was even more effective at reducing the soil strength in the top 30cm as it does not just create a ripped seam but completely loosens the soil to the working depth, however, it only loosened the soil to 30cm beyond which there was no difference to the control whereas the deep ripping loosened the soil to 40cm (Table 1).

Table 1: Impact of rotary spading and deep ripping on selected soil properties: organic carbon, soil pH and soil penetration resistance in untreated (Control), deep ripped and rotary spaded sandy loam soil, East Coorow 2011. Data is the average of samples taken from 2 replicate treatments.

Soil depth	Organic Carbon (%)			Soil pH ($CaCl_2$)			Soil Penetration Resistance (MegaPascals, (MPa))		
(cm)	Control	Ripped	Spader	Control	Ripped	Spader	Control	Ripped	Spader
0-10	0.30	0.44	0.27	6.0	6.1	6.0	0.4	0.2	0.2
10-20	0.14	0.16	0.19	5.0	4.7	5.1	1.6	1.1	0.5
20-30	0.07	0.09	0.07	4.9	4.6	4.9	3.8	2.3	1.8
30-40	0.10	0.09	0.07	5.4	5.2	5.3	3.6	2.9	3.7
40-60	0.10	0.06	0.13	6.3	5.9	5.7	2.8	2.8	2.8

Spading reduced plant emergence in this trial but had no significant effect on yield (Table 2).

Crop establishment was negatively affected by the cultivation treatments. On average 142 plants/m^2 were established in the untreated control, compared with 114 plants/m^2 in the deep ripped and only 67 plants/m^2 in the spaded (Table 3). Typically where crop establishment is poor in spaded soils it is a result of the seed being sown too deep in the soft soil which can often be exacerbated by wind erosion and furrow infill. Controlling seeding depth when there are variations in soil strength across different treatments can be particularly difficult.

Table 2: Wheat yield and quality on the main trial site after rotary spading and deep ripping.

Tillage treatment	Yield (t/ha)	Protein (%)	Screenings (%)
minimum tillage	4.6	10	2.9
Deep ripped	4.8	9.4	6.9
Spaded	4.9	9.8	5.1
LSD	*NS*	*NS*	*NS*
CV%	*15.5*	*3.4*	*59*

Table 3: Plant germination 10 days after sowing at the Main Trial Site after different tillage methods.

Tillage treatment	Plant m^2
Spader	67 a
Deep ripped	114 ab
Control	141.5 b

Note: Results with the same letter are not significantly different from each other.

Comments

The soil that this trial was conducted on would not normally be considered for spading. The soil does not have non-wetting constraints nor is it highly acidic. Therefore there is little to no advantage to spading the soil and if compaction is the principal constraint then deep ripping is cheaper, quicker and usually still effective. Deep ripping increases the rate of root growth in the top 30 or 40cm of the soil profile and helps the roots keep up with leaching nutrients, principally nitrogen. It is most effective on deep sands and in wetter seasons with a soft finish. The benefits of deep ripping can be maintained if a controlled traffic (tramline) farming system is employed to prevent future compaction after the soil has been loosened.

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Improved soil & stubble management for more profitable farming systems

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Aim

The Liebe Group's GRDC project '*Improved stubble management practices for sustainable farming systems in the Liebe area*' aims to:

1) Increase grower and researcher knowledge of the implication of stubble management on soil water;
2) Provide information that contributes to informed grower decision making, leading to effective adoption of soil amelioration practices;
3) Increase grower and researcher knowledge of the long term effects of soil biology on crop productivity.

Background

This project, funded by the Grains Research and Development Corporation, commenced in September 2009 and will finish in December 2012. The focus of the project was developed from growers' ambitions to increase crop resilience and increase water use efficiency in dry seasons.

Project activities for 2011

1. Soil pits, field walks and economic modelling

At the 2011 Spring Field Day Professor Bob Gilkes and Dr Steve Davies explained many aspects of soil structure, compaction, acidity and the effects of tillage from the bottom of two soil pits to around 180 growers. A survey conducted after the event indicated that these presentations were successful in increasing the knowledge of those who attended. The results from the projects other research trials were showcased in a marquee by Dr Yvette Oliver (Impact of stubble management and fallow on stored soil water), Dr Michael Robertson (Dry seeding: risks and opportunities) and Rob Sands (The economics of ameliorating acidic subsoils).

Based on the success of the soil pits at Spring Field Day a second field walk was held on the 6th of October, east of Wubin which featured three soil pits on three different soil types. Agronomist Dave Cameron and soils consultant Adriaan de Waal led the group discussions on the interaction between soil type, plant growth and farm profitability.

2. Long term soil biology trial

The soil biology trial is trying to answer the following questions:

- How much carbon can a deep yellow sand hold?
- How many years will it take to increase soil carbon?
- How will increasing carbon affect grain yield and quality?

By comparing management practices that remove carbon (burning stubble year after year) to management practice that would increase carbon (adding organic matter to the soil) the trial aims to show the upper and lower limits of soil organic carbon on sandplain soil. By 2012 this unique trial will be in its 10th season. In 2004 and 2008 the addition of organic matter increased crop yield by 18-23% whereas in 2005 plots where carbon was removed (burnt) yielded higher. 2011 results can be seen in the soil health section of this book.

3. Biochar trial

Biochar has the potential to increase fertiliser efficiencies and play a role in carbon sequestration. However, knowledge about the product is limited and more research is required. The Liebe Group, in collaboration with UWA is currently researching biochar in order to give growers and researchers a more fundamental understanding of biochar's properties and its opportunities. Biochar is formed through a process called pyrolysis, which is the high temperature heating of organic materials in the absence of oxygen. Pyrolysis produces a very stable and compact form of carbon. To date, addition of biochar to agricultural soils has shown both yield increases and decreases depending on the type of biochar used and soil type. The Liebe Group will continue to conduct research into this area so that members can get a better understanding of biochar's potential and risks. 2011 results can be seen in the soil health section of this book.

4. Stubble management trial

Different practices for managing stubble over the summer (burning, raking and full stubble retention) will affect stored soil water storage, evaporation, infiltration and nitrogen mineralization, all of which will effect growth and yield of the subsequent crop. As the climate changes summer rainfall may play an increasingly important part in the farming system. Currently there is little quantitative data available on the contribution summer rainfall events have on the following crops establishment and yield, therefore monitoring the effects summer rainfall events have on weeds, crop establishment and yield will be a focus in this trial. The 2011 trial results can be seen the in the soil health section of this book.

The main feature of this trial is the sub surface moisture probes which are buried below the rip line of a tyne seeder and continually monitor soil moisture to a depth of 1.8m. Data is fed to a computer via a mobile phone signal enabling growers to see how much water the plants are using, from where in the profile and how much soil water remains.

5. On farm soil amelioration demonstrations

Three on farm demonstrations were conducted in 2011 year, results can be found in this book:

- Evaluation of Spading x Lime incorporation in low pH, non-wetting sand, Hunt Partners – Marchagee.
- Revisiting Gypsum, Ian Hyde - Dalwallinu
- Deep ripping- is it ok on loamy sands? , Gary & James Butcher - Pithara

The trials will continue to be monitored for the next year to account for seasonal variability and the long term nature of some soil amelioration techniques.

6. Case studies

Two case studies have been produced and are available to members. The first explores spading to overcome non-wetting sands and the second looks at producing chickpeas and field peas in low rainfall environments.

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Increasing water use efficiency and managing input costs for more sustainable farming

Chris O'Callaghan, Executive Officer, Liebe Group

Aim

The overall objectives of the project are:

1). Increased adoption of strategies aimed at reducing input costs, whilst maintaining sustainability of nutrients, soil health, ground cover, rotations, finances and more;
2). Increased adoption of strategies aimed at increasing water use efficiency;
3). Increased capacity of growers to determine the appropriate best practice management strategy for particular seasons and soil types;
4). Increased community awareness of the projected impacts of climate change and seasonal variability on the farming system;
5). Increased grower awareness and practise of strategies available to mitigate the effects of climate change and season variability.

Background

Through the Australian Government's FarmReady initiative and the Grains Research and Development Corporation, the Liebe Group is currently delivering a project aimed at assisting Liebe growers to better adapt to a changing and a more variable climate.

The project aims to raise awareness of the drivers of climate and some of the predictions and scenarios going into the future. It will look at the current research into climate change, where the debate on climate change is at and how farmers can adapt to an increasingly volatile climate.

Increasing water use efficiency is an area where significant improvements to the farming system can be made. This can be achieved by an increase in the adoption of best practice management strategies including; optimising sowing time, using suitable crop varieties, managing soil type differences correctly, conserving soil moisture, managing fertiliser inputs correctly and understanding the capacity of their different soil types to make in-season decisions according to how the season is progressing.

Advances in precision agriculture techniques also allow growers to achieve best practice by increasing their capacity and efficiency across all farming operations. By managing inputs more effectively, chemical and fertiliser savings can be made, leading to a more financially resilient farming system.

Activities in 2011

Achieving water and nutrient use efficiency using Yield Prophet.

Yield Prophet is a web based interface for the agricultural production simulation model (APSIM). It uses real-time information from the paddock to simulate how the crop is growing and because it is based on historical rainfall records, how it may yield. This provides an accurate forecast (if everything is set up well) of the chance of achieving a certain yield at any point in time during the season. From this we can match inputs to these yield potentials.

In 2011 five contrasting paddocks were monitored with Yield Prophet to give growers an idea of what the yield potential of that soil type is and how inputs can be matched effectively. The Yield

Prophet report contains a tremendous amount of information about the development of the plant and the amount of stored soil water and nitrogen. Understanding plant development can be important to assist in making decisions about fertiliser and herbicide applications and also in other systems where cereals are grazed and the timing of this grazing is important.

Knowing the amount of stored soil water and nitrogen can help with decisions at seeding time and throughout the year, particularly relating to time of sowing and timing and amount of N to apply.

In 2012, Yield Prophet reports will again be produced and workshops will be held to compliment these reports to assist growers in their decision making at seeding and throughout the growing season.

A report on the Yield Prophet in 2011 has been included in this booklet.

Practice for Profit input trial
The Practice for Profit input trial is conducted to determine the optimum input 'package' for achieving the highest gross margin. Low, medium and high input packages are applied to different wheat & barley varieties to determine which combination provides the highest gross margin. In 2011 this trial was set up as a 5 year long term trial to try and evaluate to compounding effects of different management regimes. Information about this trial is also included in this book.

Water Use Efficiency & Precision Agriculture Workshop
Early in 2011 a Precision Agriculture workshop was held to update growers on the latest in Precision Agriculture technology. This utilised expertise from Curtin University and CSIRO.
A water use efficiency workshop was also held in October, called soil pit for prophet. This workshop utilised farm management consultants and soil science experts to discuss the mechanics of Yield Prophet, matching this to what is actually happening underneath the soil and also understanding some of the soil chemical and physical properties.

Planning Workshop.
In order to be responsive to a changing environment it is important to plan and be proactive towards change. In September, the Liebe Group utilised a rural management consultant to assist the Liebe Group to plan its activities for the next five years.

Activities in 2012
This project finishes in 2012, however, there will still be a few activities remaining to complete the project.

Yield Prophet will continue and will again be complemented by the Practice for Profit trial.
Case studies will be produced, exploring different aspects of the farming system focussing on precision agriculture and practices that will improve water use efficiency.

Further workshops will also be held early in 2012 covering more water use efficiency and precision agriculture topics**.**

Acknowledgements
This project is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under the Australia's Farming Future initiative.

This project is also supported by the Grains Research and Development Corporation.

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Innovative and Improved Strategies to manage Wind Erosion Risk in the NAR

Chris O'Callaghan, Executive Officer, Liebe Group

Aim

The overall aim of this project is to:

1). Increase adoption of strategies which reduce the extent and severity of wind erosion;
2). Explore innovative strategies being used by farmers to combat wind erosion;
3). Increase community knowledge of Natural Resource Management.

Background and Project Description

Through the Australian Government's Caring For Our Country initiative, the Liebe Group is working with growers to develop innovative strategies to overcome problems with erosion.

Growers have always been at the forefront of driving innovation when it comes to overcoming on-farm issues and the Liebe Group are working directly with them to identify how exactly growers are adapting to different issues.

With the numerous different types of farming systems in the Liebe area, it is important to capture the whole range of strategies growers have been using to overcome erosion given different soil types, rainfall zones and enterprise mix.

The aim of most wind erosion control strategies is to maintain or increase ground cover, whether by increasing plant growth through amelioration of low production soil zones; through growing an alternative crop or pasture that may provide more cover than traditional crops on a specific soil type; through managing stock differently so that over grazing of paddocks doesn't occur; or by managing stubble in a strategic way so that a paddock is never left bare.

Four demonstration sites that will be monitored over the life of the project have been established and are outlined below:

1) Using cereal rye as a cover cropping option on poor structured soils:

Cereal rye is a tall growing cereal crop which can be used as a cover crop to protect susceptible paddocks from wind erosion. The main advantages of using cereal rye are its height and ability to produce large amounts of biomass. This protects poorly structured soil from wind erosion, by reducing the wind speed at ground level and providing stability to the soil. The crop can also be grown as a companion crop to lupins, grazed for sheep feed, or harvested for grain, whilst still providing enough ground cover to reduce soil erosion.

2) Implementation of new perennial pastures into the farming system:

Poor performing soils are a major contributor to wind erosion in the Liebe Group area. Finding suitable options on these soils which may be too salty, acidic or poorly structured to support traditional winter cereal crops is considered vital to reduce erosion and soil degradation. Perennial Pastures may provide these options and through screening on a poor performing soil, the most effective species can be determined to optimise the system. This demonstration aims to compare different perennial pasture species on a poor performing soil type.

3) Alternative options to increase soil organic matter:
On poorly structured, sandy soils, organic matter levels are traditionally low, given they are highly susceptible to wind erosion. In addition, these soils are often continuously poor performing making it uneconomical to apply high amounts of fertiliser. This demonstration explores the benefits of applying alternative and potentially more cost effective ways of increasing organic matter and nutrition to try and improve crop growth and subsequent ground cover on these soils. These alternatives include animal manures and soil biological adjuvants.

4) Use of Feedlotting & Limit feeders to protect paddocks over summer:
In the Liebe Group region, the late summer and autumn feed gap is a major concern to growers with livestock and can be a major contributor to wind erosion in this area, particularly in times of reduced rainfall. Paddocks can be overgrazed and left bare, which can lead to a degradation of soil structure, loss of soil biodiversity and severe wind erosion events. By providing alternatives to feeding livestock in paddocks over summer this problem can be reduced. Limit Feeders and Feedlotting are methods of confinement feeding which can reduce the grazing pressure on paddocks over summer and autumn, reducing the risk and severity of wind erosion. This demonstration aims to provide information to growers about the practicalities of setting up such a system.

Activities in 2011
The four demonstration sites have been soil sampled and monitored in 2011 to continue the assessment of the strategies on soil health and erosion risk.

The Liebe Group conducted extension activities for three of the four sites in 2010. In these extension activities the respective strategy to overcome wind erosion was outlined to an audience of local growers.

Six case studies were presented and released at the Liebe Group Spring Field Day. ‘Frameworks for forward farming #3’ outlined the farmers’ perception of all the demonstrations plus extra strategies growers are implementing in the Liebe Group area.

In 2012, the project will continue and further exploration of innovative wind erosion measures that farmers are implementing will be explored.

Acknowledgements
This project is supported by funding from the Australian Government Department of Agriculture, Fisheries and Forestry under the Caring for our Country initiative.

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Profitable Crop Sequencing Project

Nadine Hollamby, Project Coordinator, Liebe Group

Aim

To track the real situation of break crops over a wide range of farms in WA to determine where and when they deliver a benefit.

Background

Should I grow wheat or canola? Is my legume crop more economical than applying nitrogen fertiliser? Should I keep sheep in the farming system? These are some of the questions being investigated in the Profitable Crop Sequencing Project.

While the possible benefits of a break crop are known it can be difficult to put a dollar value on these benefits or identify situations where a break crop will provide maximum benefit to cereal cropping. (A survey of 217 farmers in 2008 indicated 77% of farmers' rate break crops of major importance to farming). So by following the paddock rotation decisions of farmers across the state and collecting extensive agronomic and financial information the project aims to determine when and where break crops deliver a benefit.

How it works

Over the next 5 years the project will monitor 30 paddocks in the Liebe area (part of 144 across the state) to determine the strength and weakness of different crop rotations. This will be done by conducting vigorous field monitoring, economic modelling and capturing farmer experience. The project is lead by the Department of Agriculture and Food and incorporates 8 grower groups across the state. In order to include the wide range of farming systems, rainfalls and soil types in the Liebe area paddocks have been selected in the following areas:

- Coorow
- Dalwallinu
- East Maya
- East Buntine
- Kalannie
- Pithara

The project started in 2010 with all paddocks sown to wheat. Paddocks will continue to be monitored until 2015 with no restriction on the use of the paddock. Each paddock is visited 4 times a year to measure the following:

- Soil health and type
- Soil and plant nutrition
- Plant disease
- Soil disease via PreDicta B
- Weed populations and herbicide resistance

It is hoped an understanding of the paddock financial performance over a number of crops and seasons can be gained through the discussions with growers each year.

Results so far

Monitoring of the 33 paddocks in the Liebe region was completed throughout 2010 and 2011. Soil cores have been characterised and CSBP nutrient tested to depth. There is an understanding of the weed numbers and PreDicta B soil disease potential. Also collected were the levels of leaf and root disease which can be used for variety decisions in 2012.

Further results from 2010 and 2011 are still being compiled and analysied. In the northern area, wheat on wheat was the most prodiminate crop rotation so far with 46% of paddocks which were wheat in 2010 returning to wheat in 2011 (Table 1).

Soil nutrient tests and soil descriptions to depth, plant disease and weed numbers will be returned to growers at the beginning of each season as a point of reflection for the season ahead.

Table 1: Paddock usage for Northern Agricultural area for paddocks monitored as part of Profitable Crop Sequencing Project.

Crop type 2011	% of crop sequencing paddock
Wheat	46
Lupin	24
Canola	17
Volunteer Pasture	6
Barley	4
Chickpea	1
Oaten Hay	1

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Planfarm BankWest Benchmarks 2010-2011 Season

Both Planfarm and BankWest – producers of the two dominant and most respected farm business benchmarking surveys in Western Australia, have decided to join forces to create the Planfarm BankWest Benchmarks.

The Planfarm BankWest Benchmarks are derived mostly from the information supplied by clients of Planfarm Pty Ltd, BankWest and Bedbrook Johnston Williams, and represents a large cross section of WA broadacre farm businesses.

The survey results need to be viewed in context of the individual situation. If the performance of a business is low in a certain area then the factors affecting this area will need to be analysed. If the lower performance can be justified by something which cannot be changed (e.g. the farm in question has a lower than average rainfall or poorer than average soils than the group) then there may be little need for concern. However, where there are factors affecting performance that are directly influenced by management, then an assessment should be made on what changes will improve performance and profitability.

Definition of terms

Effective Area (Hectare) – land area used directly for the purposes of producing crops or livestock. Does not include non-arable land such as salt lakes, rocks and bush.

Gross farm income ($Eff/ha) – all income produced from farm related activities with respect to the area farmed.

Fertiliser ($Eff/ha) – cost of fertiliser applied with respect to the area farmed.

Plant Investment ($/Crop ha) – measures the value of machinery with respect to the area cropped.

Operating Costs (OPEX) – relates to any payments made by the farm business for materials and services excluding capital, finance and personal expenditures.

Operating Costs ($Eff/ha) – relates to any payments made by the farm business for materials and services excluding capital, finance and personal expenditures with respect to the area farmed.

Operating Surplus ($Eff/ha) – farm income less operating costs. Measures the return on farming activity before account is taken of depreciation expense.

Pesticides/Herbicides ($/Crop ha) – cost of any pesticides or herbicides used with respect to the area cropped.

May – October Rainfall (mm) – growing season rainfall (May-Oct) of survey participants.

Total Sheep Shorn – total number of sheep shorn including lambs.

Wool Cut (Kg/WGHa) – amount of wool cut with respect to winter grazed hectares.

Wool Price ($/kg) - value of wool sold with respect to the amount of wool cut.

Bottom 25% - the average of the low 25% of farms in the group surveyed ranked by operating surplus.

Top 25% - the average of the top 25% of farms in the group surveyed ranked by operating surplus.

These results have been extracted from the 'Planfarm BankWest Benchmarks 2010/2011'.
For more information please contact the BankWest Agribusiness Centre on (08) 9420 5179.

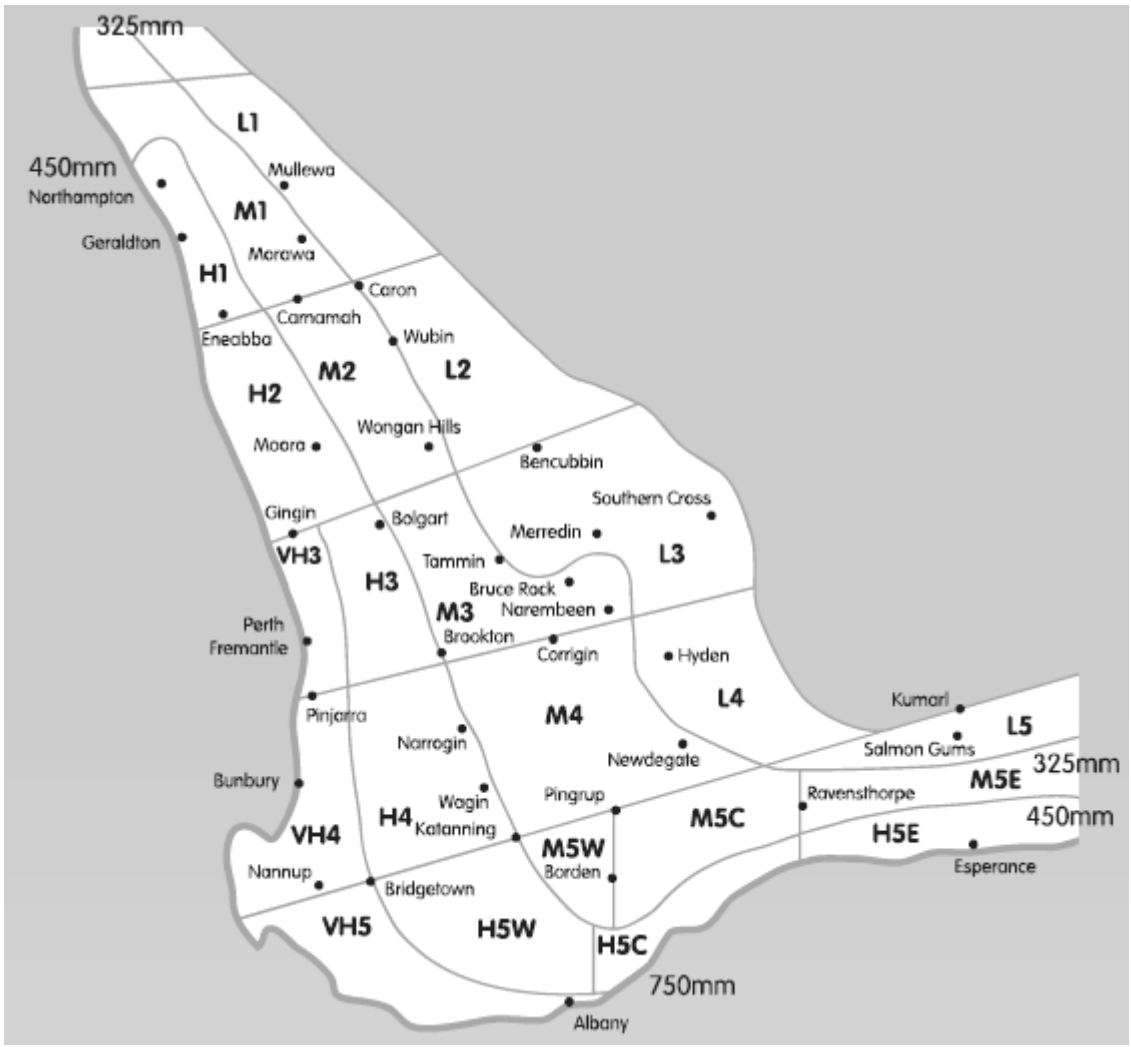


Figure 1: The regions used in the Planfarm Bankwest Benchmark survey.

Table 1: Farm Group Statistics Medium Rainfall Zone, Region 2.

Variables	Top 25%	Ave.	Bottom 25%
Effective Area (ha)	3186	3639	4358
May – October Rainfall (mm)	172	164	159
Permanent Labour (persons)	2	2.2	2.5
Casual Labour (weeks)	15.8	15.1	14.9
Eff Area/Perm Labour (ha)	1489	1495	1606
Income/Perm Labour ($'s)	757,766	575,042	489,407
Op Surplus/Perm Labour ($'s)	277,356	123,004	-19,626
Gross Farm Income (GFI) ($/eff ha)	526	400	323
Operating Costs (OPEX) ($/eff ha)	330	311	332
Farm Operating Surplus ($/eff ha)	196	88	-9
Farm operating surplus/mm GSR rainfall ($/eff ha)	**1.43**	**0.66**	**-0.08**
OPEX as % GFI (%)	63	78	103
Return on Capital (%)	3.4	0.3	-3.2
Total Crop area (ha)	2640	2846	3227
% Effective area crop (%)	82	79	76
% Of crop as legumes (%)	9	11	11
% Of crop oil seed (%)	21	20	20
% Effective area pasture (%)	17	22	26
Wheat Yield (t/ha)	1.97	1.64	1.44
Wheat Area (ha)	1635	1752	2049
Wheat kg/mm ave (kg/mm)	14.55	13.08	12.36
Lupin Yield (t/ha)	0.83	0.76	0.62
Lupin Area (ha)	368	418	496
Barley Yield (t/ha)	2.22	1.82	1.65
Barley Area (ha)	410	326	257
Canola Yield (t/ha)	0.82	0.62	0.5
Canola Area (ha)	553	568	633
N Use on Cereals (kg/ha)	54.62	51.01	50.53
P Use on Whole Farm (kg/ha)	11.29	10.21	9.83
Herbicide Costs ($/ha crop)	50	53	55
Plant Investments ($/ ha crop)	427	466	519
Opening Sheep Numbers (hd)	3240	2935	3364
Closing Sheep Numbers (hd)	3419	3030	3455
No. of Ewes Mated (hd)	1909	1633	1919
Lambs/WG Ha (no.)	3.1	1.9	1.5
Wool Price ($/kg net)	6.13	5.65	5.47
Wool Cut/Grazed Area (kg/wgha)	22.5	17.23	17.33
Stocking Rate (dse/wgha)	4.96	4.04	3.53
Wool Production (kg greasy)	16049	14105	13873
Ave kg/Sheep Shorn (kg)	3.91	4	4.09

Table 2: Farm Group Statistics Low Rainfall Zone, Region 2.

Variables	Top 25%	Ave.	Bottom 25%
Effective Area (ha)	4471	5993	7595
May – October Rainfall (mm)	147	137	115
Permanent Labour (persons)	1.8	2.1	2.4
Casual Labour (weeks)	15.1	19.1	23.3
Eff Area/Perm Labour (ha)	2264	2464	2513
Income/Perm Labour ($'s)	629,538	495,303	288,540
Op Surplus/Perm Labour ($'s)	283,071	121,746	-70,048
Gross Farm Income (GFI) ($/eff ha)	307	216	125
Operating Costs (OPEX) ($/eff ha)	173	161	152
Farm Operating Surplus ($/eff ha)	134	55	-27
Farm operating surplus/mm GSR rainfall ($/eff ha)	**1.28**	**0.49**	**-0.42**
OPEX as % GFI (%)	56	75	122
Return on Capital (%)	6.8	0.6	-6.5
Total Crop area (ha)	3150	3804	4104
% Effective area crop (%)	74	65	52
% Of crop as legumes (%)	6	8	11
% Of crop oil seed (%)	12	8	8
% Effective area pasture (%)	30	37	46
Wheat Yield (t/ha)	1.18	0.97	0.78
Wheat Area (ha)	2489	3009	3094
Wheat kg/mm ave (kg/mm)	11.54	10.47	11.15
Lupin Yield (t/ha)	0.55	0.47	0.33
Lupin Area (ha)	325	458	429
Barley Yield (t/ha)	1.23	1.11	0.70
Barley Area (ha)	295	33	347
Canola Yield (t/ha)	0.43	0.29	0.08
Canola Area (ha)	392	298	309
N Use on Cereals (kg/ha)	24.61	25.26	25.44
P Use on Whole Farm (kg/ha)	7.03	6.31	3.90
Herbicide Costs ($/ha crop)	33	37	42
Plant Investments ($/ ha crop)	294	327	474
Opening Sheep Numbers (hd)	2276	2419	2414
Closing Sheep Numbers (hd)	2174	2433	2380
No. of Ewes Mated (hd)	1145	1396	1384
Lambs/WG Ha (no.)	0.8	0.6	0.3
Wool Price ($/kg net)	4.93	4.91	4.89
Wool Cut/Grazed Area (kg/wgha)	7.61	6.08	4.64
Stocking Rate (dse/wgha)	1.23	1.30	1.12
Wool Production (kg greasy)	9641	11640	12183
Ave kg/Sheep Shorn (kg)	4.68	4.46	4.69

2011 Rainfall Report

	Dalwallinu	Kalannie	Coorow	Carnamah	Latham	Perenjori	Wongan Hills	Goodlands	East Maya	West Buntine
Jan	27.4	36.6	21.8	11.8	32.2	5	19.8	48.8	15	12
Feb	10.4	36.6	41.8	14	17.4	5	18.4	22.8	25	1
Mar	8.4	5	15	23.4	25.2	12	11.8	3.2	26.5	44
Apr	2.6	1.4	5.8	5.5	2.2	4	6.4	8.6	3	5
May	45	41.6	61.2	72.6	68.2	39.5	53.4	33.2	59.5	55
Jun	44.4	35.8	46.1	59.3	49.6	61.5	52.1	41.2	38.5	39.5
Jul	63.4	64.8	62.5	48.3	67.4	70	90.4	54.8	84.5	82.5
Aug	55.6	41.8	68.4	65.3	46.8	51.5	56.4	44.2	61	24.5
Sep	30.4	21	23.5	27.7	33.2	N/A	37	25.4	31.5	39
Oct	82.4	76.6	49.4	43.9	70.4	41.8	121.6	54	51.5	48
Nov	13	25.2	13.6	13.4	20.2	4	30.2	26.4	0	6
Dec	12.4	22.0	22.8	13.0	14.2	10.0	6.6	39.0	13.0	17.5
Total	395.4	408.4	431.9	398.2	447.0	304.3*	504.1	401.6	409.0	374.0

*September rainfall not included.

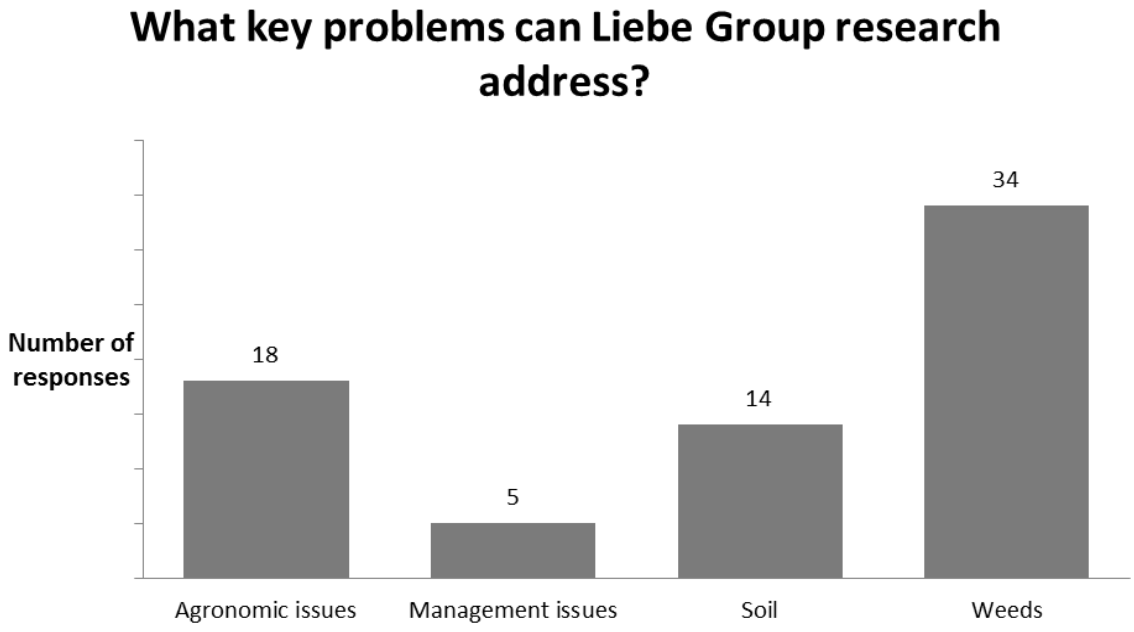
Information gathered from the Bureau of Meteorology at www.bom.gov.au and through Liebe Group rain gauges.

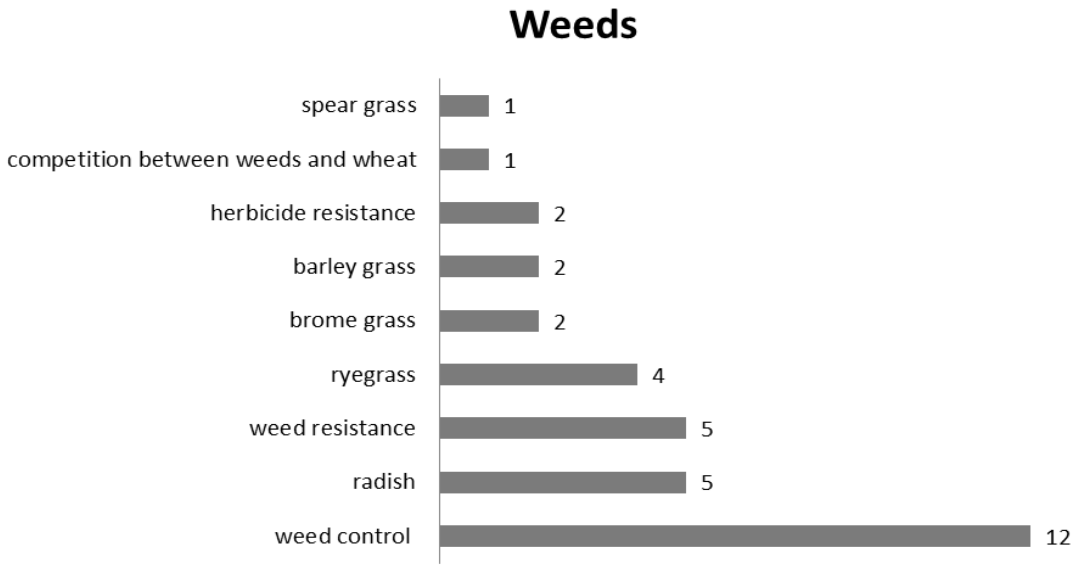
Contact the Bureau of Meteorology by phone on (08) 9263 2222, by fax on (08) 9263 2233 or by email at climate.wa@bom.gov.au

We have taken all due care but cannot provide any warranty nor accept any liability for this information.

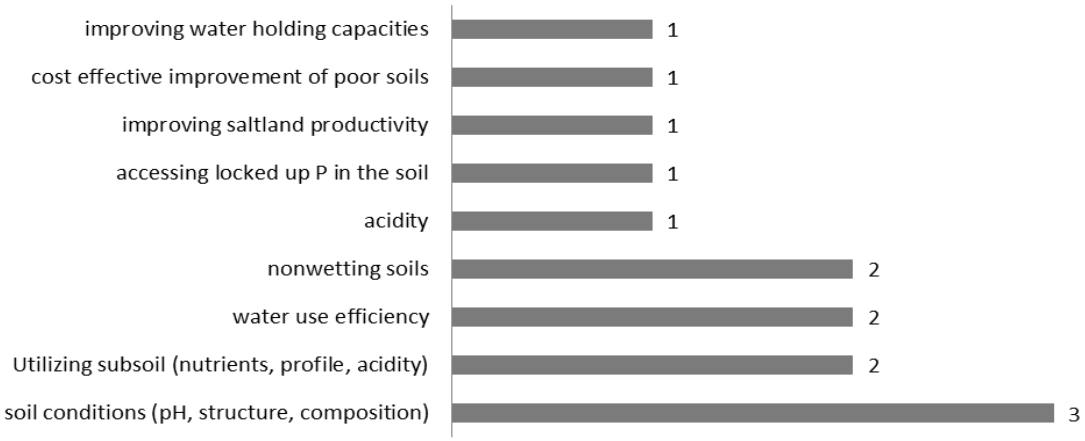
2011 Liebe Group R & D Survey Results

Conducted September 20122 at Spring Field Day

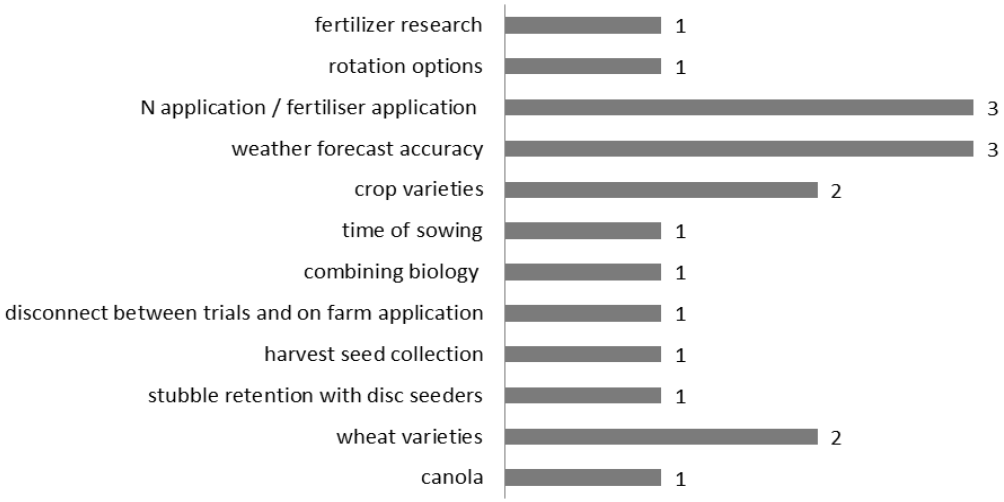




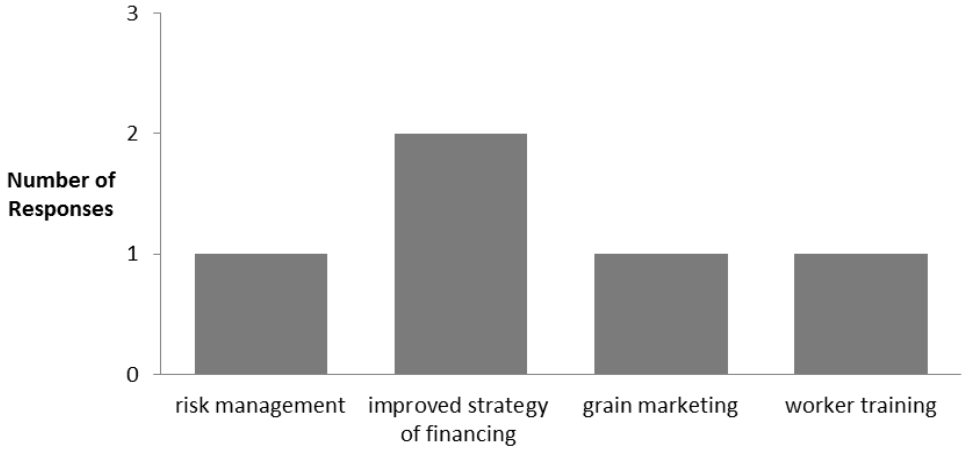
Soil

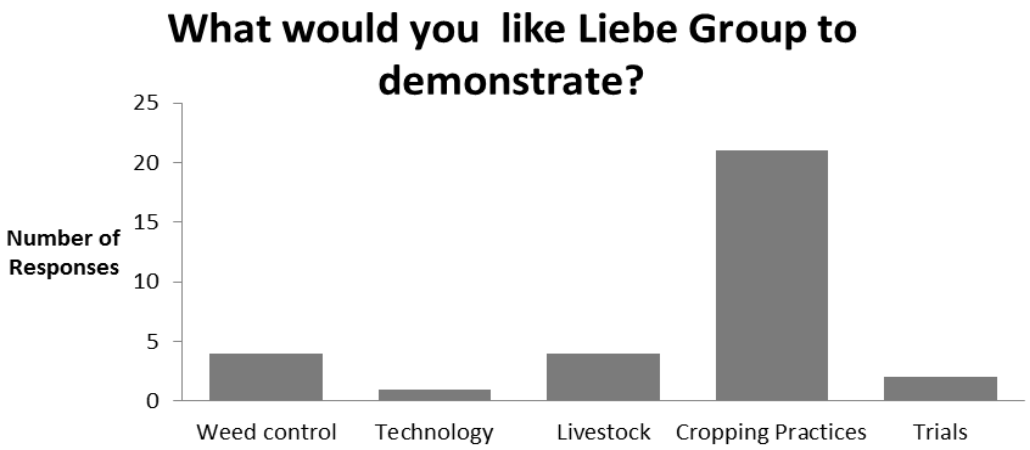


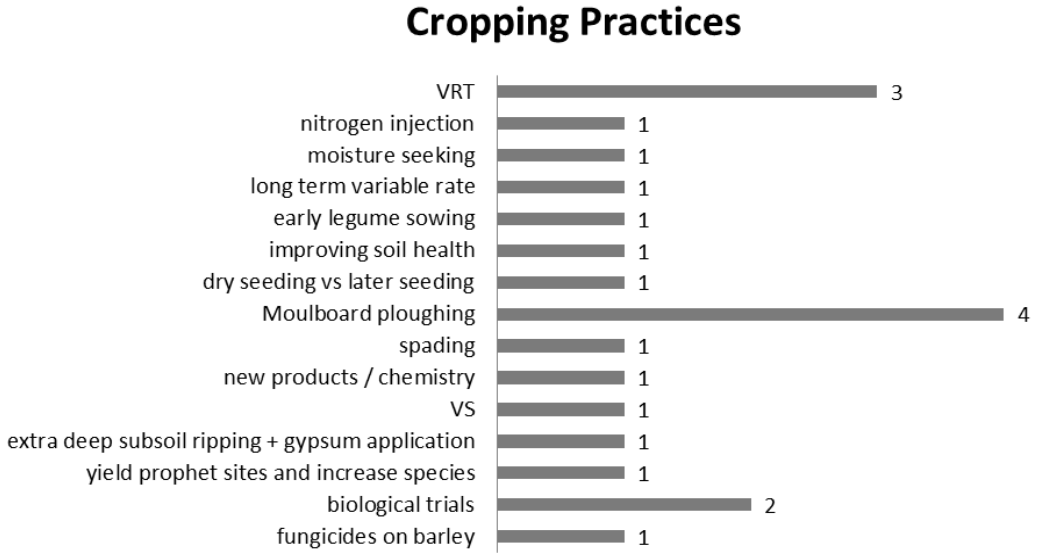
Agronomic issues



Management issues




What would you like Liebe Group to demonstrate?
Number of Responses
25
20
15
10
5
0
Weed control
Technology
Livestock
Cropping Practices
Trials


Cropping Practices
VRT 3
nitrogen injection 1
moisture seeking 1
long term variable rate 1
early legume sowing 1
improving soil health 1
dry seeding vs later seeding 1
Moulboard ploughing 4
spading 1
new products / chemistry 1
VS 1
extra deep subsoil ripping + gypsum application 1
yield prophet sites and increase species 1
biological trials 2
fungicides on barley 1

The Liebe Group
Strategic Plan 2012-2013

Our Vision
Vibrance and Innovation for Rural Prosperity

Our Mission
To be a progressive group, working together to improve rural profitability, lifestyle and natural resources

Our Core Business
- Agricultural research, development, validation and implementation
- Provide information, education, skills and training opportunities to members and wider community
- Strengthen communication between growers and industry and whole community

Our Values
The following are a set of evolving philosophies and values that the group maintains for members and employees. By accepting these values it enables us to build trust in order to make effective and efficient decisions and reach our potential.

Member Driven
Primarily the Liebe Group is here for its members, it must be to their cause & benefit. R&D, technology and capacity building is local and relevant and prioritized by the membership.

Innovation and Progression
The group is innovative and progressive and this is encouraged and valued. An ethos of constant review is adhered to ensure we are on track and achieving best practice.

Inclusivity
The group is inclusive which means we involve, encourage and support staff, members and the community to take part, have a voice and maintain their ideas and views as individuals.

Apolitical
The group is apolitical, which means collectively we won't represent the members without following a process to ensure we are representing all their ideas or opinions.

Empowerment
Empowerment and capacity building is encouraged of members and staff to ensure everyone reaches their potential and supports their career directions.

Independence
The group is Independent and acts from direction from the 'grass roots.' The group is objective in its views and stance.

Professionalism
The group is Professional which is encouraged and nurtured in the membership. The group is driven by the decision making capacity of the management and their supporting sub committees which use accountable and transparent processes. We expect staff to be confidential in their dealings with in the group.

Working Together
Effective networking and links to beneficial partnerships is encouraged to add value and opportunities for the group. The group works collaboratively within the agricultural industry to value add. The group maintains an ethos of team work and cooperativeness.

Respect
The group always values and respects their members and their resources and experience. We expect people to be open and honest, and build processes that reflect transparency of the administration and processes used in the group.

Fun
There is a social and fun philosophy within the group.

Introduction

The 2012-2017 strategic plan was developed in September 2011 with the assistance of Nigel McGuckian from RM Consulting Group and builds on the existing strategic plan. Strategic planning has always been a focus for the Liebe Group since the groups inception in 1997 and has become part of the groups progression and success over the years. This is the fourth strategic planning exercise the group has conducted.

During this process members were asked to describe the current external agricultural environment they are working in and what it may look like in 10 years time.

They described the future as having the following characteristics:

Faster and more diverse modes of communication
Real-time accessibility to anything, anywhere
Food is highly valued and as a result, quality and accountability pressures are high
Rapid technology advancement in crops, soils and input efficiencies leading to significant productivity gains
Declining and more diverse rural populations
Information is readily available and comes in many different forms and from many different sources
Time pressures continue to increase

Members were then asked to and define what role a farmer group may play in the future.

They described a group having the following characteristics:

Strong networks at a lot of different levels - locally, nationally and internationally
Impartial and independent information is highly valued in times of 'information overload'
Increased capability to capture, filter, catalogue and provide more targeted information
Ability to validate new technologies on-farm in a variety of different ways
Face-face interaction is valued more than ever and the group has good systems to support this

The members acknowledged that the future and the environment we are currently operating in is continually changing and the role of the Liebe Group needs to continually change and adapt in order to stay relevant. During this time, there will be opportunities for the group to capitalise on and threats to manage.

OPPORTUNITIES

- Capturing and fostering the group philosophy & energy to engage more people with similar interests
- Increase the use of new and varied tools for communication and extension.
- New systems to utilise and access knowledge from anywhere in the world instantly
- Increase problem solving capacity – highly skilled staff and contractors
- New methods of validating information and technology on-farm that is quicker and impartial
- Strong processes to capture, catalogue, filter and extend information
- Encouragement of new growth in rural towns through development of value adding projects
- Develop methods to support and stimulate innovative thinking and new ideas
- Creation of a more positive and attractive image of agriculture
- Continual engagement and support of young people in agriculture

THREATS

- Creation of a large gap between generations and those who don't relate to technology
- Lack of new ideas and innovation
- Loss of group vibrance through distance, population decline and burnout
- Farmers becoming distracted from their core business and what they do well
- Loss of capacity to operate at a continually growing level
- Vision is too far ahead of the membership which risks losing member involvement
- Declining profitability of farms
- Decline in agricultural students coming through the system leading to a skills drought
- Increasing call on resources increasing the risk of being too thinly spread to be effective
- Uneven distribution of technology through membership ie variable mobile signal coverage
- Loss of representation of members in the industry

Strategy Area 1

High Priority Research and Development, supported by targeted extension and improved validation methods

Rationale

Conducting high priority research and development is important to foster growth in the agricultural sector. R&D improves the capacity of people to make effective decisions, and when supported by targeted extension activities and validation methods, growers will have an increased capacity to make effective adoption decisions.

Liebe Group members will have access to the latest research and development activities conducted in Liebe Group area. R&D activities will be targeted towards issues identified by the members and prioritised by Liebe Group management. The prioritisation will be supported by a research and development advisory committee. The group will assist growers with implementation through conducting appropriate extension activities and methods to improve on-farm validation.

2012-2017 Targets

- 100% of Liebe Group members have made an effective adoption decision concerning the adoption of new technology assist by the Liebe Group;
- 20% increase in attendance at major events.

Activities

Attract and develop partnerships with agribusiness and research organisations

- Include key industry personnel on the Liebe Group mailing list;
- Maintain close relationship with Department of Agriculture and Food, Universities, CSIRO & other agribusiness;
- Keep abreast of GRDC research priorities and maintain close relationships Western Panel and grower group contact (Stuart Kearns);
- Develop and maintain partnerships with other industry and research bodies when opportunities arise;
- Distribute Liebe R&D priorities and trial site details to major research organisations and agribusiness.

Develop trials and demonstration to address local priorities at the Main Trial Site, Long Term Research Site, satellite sites and on farm

- Determine research and development priorities from annual member survey and R&D planning meeting;
- Develop trial program for the satellite sites in conjunction with DAFWA and agribusiness;
- Organise and conduct on-farm demonstrations;
- Discuss strategic R&D priorities at general meetings;
- Ensure we seek R&D opportunities that encompass a whole systems approach;
- Maintain Soil Biology Trial at the Long Term Research Site;
- Raise profile of the Long Term Research Site and attract research bodies wishing to conduct trials of a long term nature to the site;
- Maintain trial program at the Long Term Research Site;
- Ensure R&D protocols are adhered to.

Increasing adoption of new technologies

- Benchmark adoption levels of Liebe members;
- Conduct final audit to assess the influence of the project on growers decision making process towards technology adoption;
- Conduct farmer case studies and economic analysis on growers that have adopted new technology;
- Conduct on-farm demonstrations and economic modeling with growers that are considering technology adoption.

Extend Results of Research, Development and Validation

- Conduct a Spring Field Day at the main trial site;
- Conduct field walks at satellite sites and the Long Term Research Site;

- Hold an annual Crop Updates to prepare growers for the coming season;
- Extend results in an annual R&D Book and review priority research at a Trials Review Day;
- Promote results to the wider community;
- Assist in attracting members to events by having a high profile guest speaker.

Performance Measures

- Research and Development advisory committee to meet at least three times a year to develop R&D priorities and discuss issues with industry partners;
- Conduct an annual membership survey to understand farming issues and priorities;
- Conduct a technical audit every three years to benchmark technology adoption.

Strategy Area 2

Members with High Business & Farming Aptitude

Rationale

Making good decisions is a product of understanding the issues and the opportunities and risks associated with these. By providing training in areas of skills gaps within the membership ensures members have the capacity to function effectively and efficiently to improve their businesses and reach their potential. This strategy will give Liebe members access to professional training conducted in areas of identified skills gaps as well as well-targeted, high quality, independent and factual information.

Activities

Workshops and study tours

- Use member survey and feedback to identify member requirements;
- Conduct high priority workshops annually (eg Agronomic, Management, Financial, Skills, Communication);
- Conduct intra or Interstate tours, visiting innovative, interesting and sustainable farming systems.

Communication

- Members informed of local, relevant and timely information in monthly newsletters;
- Early notification of all dates and opportunities to provide members with plenty of time to schedule time off farm. Add dates to GGA calendar and check with local organisations to avoid clashes;
- Case studies of innovative farm practices produced.

Encourage all sectors of the community to attend Liebe Group events

- Conduct events that encourage young farmers and women to be involved;
- Encourage mentorship within the Liebe Group through encouraging interaction at events;
- Ensure we are being inclusive when catering for events.

Member Development

- Encourage greater input from non-involved members to come along to Liebe events. Bring a buddy philosophy;
- Promote external workshop or development opportunities to members via email and newsletter (Investigate sources of financial assistance for members to take up development opportunities or investigate possibility for Liebe Group to provide financial assistance;
- Review standard proposal for members to receive remuneration for voluntary time;
- Ensure members are being well serviced and areas for improvement are sought by phone interviews, farm visits and discussions at events;
- Ensure a sense of fun is incorporated at all Liebe event.

Performance Measures

- Conduct 3 major events annually;
- Conduct 3 training workshops on prioritised subjects annually;
- Produce nine monthly newsletters;
- Produce six media releases per year;
- Produce an annual calendar of events.

Strategy Area 3

A Collaborative and Connected Organisation

Rationale

The Liebe Group strives to connect its members to the industry and the media to ensure they are fairly represented and their successes are acknowledged. Collaborations with specific industry bodies allow for a participatory approach to research and a two-way feedback cycle to occur. Connections to other people whether locally, nationally or internationally allow members to share experiences with other like-minded people or groups. This approach fosters innovation and progress.

2012-2017 Targets

- Recognised by stakeholders as a leading farmer group involved in rural profitability, lifestyle and natural resources .

Activities

Develop and maintain linkages with agribusiness, government agencies, tertiary institutions and political organisations

- Maintain 'friends' list for publications with all industry contacts made throughout the year and reviewed yearly;
- The prospectus to be made available to the above bodies with an update occurring when necessary;
- Liebe Group website to be updated monthly and placed under high priority as our industry face;
- Encourage relevant industry to attend General Meetings;
- Attend an agricultural industry workshop developed by GGA and similar opportunities;
- Maintain industry profile, so that we are approached to facilitate contact if farmers individual opinions are required.

Promote agricultural successes in rural and non-rural media

- Maintain partnership with Farm Weekly to produce monthly Liebe updates for the paper;
- Invite media to main Liebe Group events and publish appropriate press releases;
- Develop contact and build rapport with the West Australian and Sunday Times to promote agriculture outside of the industry;
- Publish monthly updates in the local papers.

Celebrate Liebe and member successes

- Keep abreast of awards and nominate appropriate members
- Hold an annual Liebe Dinner
- Cater for post-event celebrations
- Promote great achievements and member success in Liebe newsletter
- Maintain and develop Liebe Group identity through staff uniform and badges to be worn at all events, promote sale of Liebe shirts and jumpers on membership flyer.
- Develop system to recognise members who have contributed significantly to the Liebe Group

Network Building

- Utilise existing partnerships to build strong networks locally, nationally and internationally to foster innovation;
- Utilise new ways of Interacting (ie Social Media, Websites, Ipads etc);
- Develop a 'sister' relationship with an overseas group;

- Ensure members are supported to be involved in networks;
- Get timely feedback from members;
- Build networks at a local level through mentoring, social interaction and fostering relations between various Liebe stakeholders.

Performance Measures

- Liebe Group to be represented at appropriate industry forums such as the Grower Group Alliance forum and Agribusiness Crop Updates;
- Contribute 6 media releases per year to the farm weekly;
- Hold an annual Liebe Dinner celebrating the success of the past year.

Strategy Area 4

Sustainable Group Finances

Rationale

Sound finances give the group the flexibility and control over its activities and progression. The Liebe Group seeks funding from different sources including membership, sponsorship and project funding.

2012-2017 Targets

- To have one years overhead costs in reserve.

Activities

Finance Sub-committee to oversee Liebe Group financials and budget

- Review project funding timeline;
- Prepare budget and allocations for management;
- Approve finance for expensive purchase items;
- Review & Account for the Liebe Group finances;
- Track progress of income and expenditure areas;
- Committee meets regularly and when necessary**;**
- Recommendation of fees and value of membership.

Seek Funding

- Maintain strong links with industry partners;
- Seek new sponsors and partners;
- Review sponsorship guidelines and return on investment for each;
- Identify & target high-return sources of funding (sponsors, programs, membership and subcontracting).

Develop membership contributions

- Review stability of membership numbers and ensure members are being well serviced.

Performance Measures

- Finance Subcommittee to meet at least quarterly and make recommendations to the Management Committee;
- Prepare a budget annually to be signed off by the management committee;
- Membership fees to cover administration officers position.

Strategy Area 5

High Performing Skilled Staff

Rationale

Maintaining and supporting appropriately skilled staff is a priority for the Liebe Group to ensure the group grows and roles are carried out effectively and efficiently. The staff are employed to manage the strategy and policies set by the management committee, by maintaining a philosophy of continual support and improvement in employees, the strategy can be implemented to its full potential.

2012-2017 Targets

- The Liebe Group will be viewed by the industry as a desired place of employment.

Activities

Support and Develop Liebe Group employees each year

- Review performance appraisal document;
- Review performance, salary, goals and objectives taking care to enhance employees areas of interest;
- Conduct annual performance appraisal including SWOT;
- Review new employee induction program, guided by protocol and list of training requirements;
- Identify & Provide staff with Professional Development;
- Conduct fortnightly team meetings;
- Ensure management maintain an ethos of supporting staff;
- Develop and review a mentoring policy for employees.

Maintain and increase employment base in order to meet group requirements

- Review list of all roles and responsibilities, delegating each responsibility to appropriate staff members;
- Identify gaps in roles and skills and investigate employment options;
- Seek external contracting of specialist skills where necessary;
- Seek feedback from employees to develop and maintain a conducive working environment.

Performance Measures

- Hold an annual performance review for each staff member;
- Provide $1000/yr training budget for each staff member;
- Each staff member to meet with staff support officer at least 3 times a year, including training;
- Produce an annual social calendar.

Strategy Area 6

Highly Effective Governance

Rationale

Good corporate governance underpins the success of an organisation. The ability of the management committee, supporting committees and staff to make well informed and effective decisions is driven by effective process and well-supported personnel. The Liebe Group is driven by the decision making capacity of its members and as such needs to adopt a process of constant review to ensure new committee members are continually up-skilled and aware of their roles and responsibilities on the committee. Good governance maintains integrity, accountability, transparency and quality in performance and reporting of our activities.

2012-2017 Targets

- The Liebe Group will be a 'best-practice' community group, as measured by an external audit.

Activities

Management Committee, subcommittee and reporting structure

- Management Committee meets on a monthly basis at a general meeting and are responsible for governing the Liebe Group. This involves policy development.
- The Management Committee directs staff through the employment of an Executive Offcer.
- A finance subcommittee of the Management Committee provides recommendations to the Management Committee. This subcommittee consists of some personnel with specialist skills in financial management.
- An ethics subcommittee of the management committee to provide recommendation to the management committee on issues of an ethical nature.
- A Research & Development Advisory Committee and Womens Advisory Committee, advise staff on operational activities. These committee's consists of some personnel with specialist skills and interests in these areas.
- An Employment Advisory Committee employs an Executive Officer and provides advice and support to the executive officer to employ other staff.
- The Executive Officer must sit on every Liebe Group committee.
- Review management committee, subcommittee and advisory committees purpose and responsibilities annually at the Annual General Meeting, analyse resources, skills and interests required for successful Liebe Group governance and management and individually approach members to be involved in various subcommittees.
- Distribute guidelines for effective committee meetings to all committee members annually.
- Follow succession strategy to increase member involvement on committees as per succession protocol

Effective group process

- Develop 5 year strategic plan and review objectives annually as a working document;
- Committee members understand their roles & responsibilities;
- Communicate Liebe Group strategy to Liebe Group stakeholders;
- Ensure inclusive processes are always used;
- Maintain transparency in processes;
- Develop written protocols on Liebe Group process to aid in transition of staff and group positions;
- All committees and staff are to operate by the Liebe Group code of ethics.

Performance Measure

- Conduct an Annual General Meeting in February every year;
- Hold 9 General Meetings per year;
- Review strategic plan objectives and targets annually;
- Skills audit conducted annually.

Liebe Group Calendar of Events – 2012

EVENT	DATE	LOCATION	CONTACT
Liebe Group AGM	13th February 2012	Buntine Hall	Chris O'Callaghan (08) 96610570
Liebe Group Trials Review Day	13th February 2012	Buntine Hall	Clare Johnston (08) 96610570
February General Meeting	20th February 2012	Liebe Office	Chris O'Callaghan (08) 96610570
Liebe Group Crop Updates	7th March 2012	Dalwallinu Hall and Discovery Centre Performing Arts Room	Angela Mazur (08) 96610570
March General Meeting	12th March 2012	Liebe Office	Chris O'Callaghan (08) 96610570
Business Management Workshop	21st March 2012	Wubin Sports Club	Angela Mazur (08) 96610570
April General Meeting	2nd April 2012	Liebe Office	Chris O'Callaghan (08) 96610570
June General Meeting	11th June 2012	Liebe Office	Chris O'Callaghan (08) 96610570
Women's Field Day	19th June 2012	Dalwallinu Recreation Centre	Jemma Counsel (08) 96610570
Post Seeding Field Walk & Beer 'n' Burger Night	26th July 2012	Main Trial Site – Mills Property, East Dalwallinu	Clare Johnston (08) 96610570
July General Meeting	23rd July 2012	Liebe Office	Chris O'Callaghan (08) 96610570
Annual Liebe Group Dinner	August 2012	TBA	Jemma Counsel (08) 96610570
August General Meeting	13th August 2012	Liebe Office	Chris O'Callaghan (08) 96610570
Spring Field Day	13th September 2012	Main Trial Site – Mills Property, East Dalwallinu	Clare Johnston (08) 96610570
September General Meeting	17th September 2012	Liebe Office	Chris O'Callaghan (08) 96610570
October General Meeting	15th October 2012	Liebe Office	Chris O'Callaghan (08) 96610570
December General Meeting & Christmas Drinks	10th December 2012	Liebe Office	Chris O'Callaghan (08) 96610570