Local Research and Development Results

February 2011

2007

LiEBE
GROUP
Working together in Agriculture

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Dear Liebe Group Member or Supporter,

It is with great pleasure we complete the Local Research and Development Results book for 2007. This book contains results from the majority of research and development conducted in the Dalwallinu, Coorow and Perenjori Shires from the 2006 season. Results not available at time of print will be printed in subsequent newsletters.

Many thanks to research and agribusiness organisations and growers who have conducted valued local research and development. We appreciate the opportunity to document the results in our 2007 book. Unfortunately due to the 2006 growing season there were some trials and grower demonstrations that were not taken through to harvest and therefore their results are not presented this booklet.

The increased research in technology adoption, livestock and cropping interactions and continued research into seasonal variability has provided greater value to Liebe members. We will strive for this to continue in 2007.

Agricultural technologies are developing at a rapid pace and we can all benefit greatly by fostering a ***"Working Together in Agriculture"*** *approach.*

Please interpret the results in this book carefully. Decisions should not be based on one season's data.

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 do acknowledge the invaluable support we receive from the Grains Research and Development Corporation (GRDC), Department of Agriculture and Food WA, CSBP, Rabobank, COGGO, Farm Weekly, GGA and others.

All the best for the 2007 season and lets hope it brings plenty of rain!

Kind regards,

Brianna Peake, Executive Officer
Emma Glasfurd, Project Coordinator
Chris O'Callaghan, R&D Coordinator
Sophie Keogh, Administration Manager
Merrie Carlshausen, Sponsorship Coordinator

LIEBE GROUP SUPPORTERS

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

- Grower Group Alliance
- Grains Research and Development Corporation
- Grain and Graze
- Northern Agricultural Catchments Council
- National Landcare Program
- CSIRO
- Department of Agriculture and Food WA
- University of Western Australia
- Farm Weekly
- Western Milling
- Shire of Dalwallinu
- Shire of Perenjori
- CRC for plant based solutions to dry land salinity

LONG TERM RESEARCH SITE SUPPORTERS

GRDC Grains Research & Development Corporation

The Liebe Group would like to acknowledge and thank Liebe Members, agribusiness and others for their generous support and assistance in the operations of the Long Term Research Site. This site has attracted valuable research into the Liebe area which will be continued into the future.

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

- Grains Research and Development Corporation
- Stuart McAlpine – seeding, spraying, harvest, organic matter supply and loan of equipment, and general support and assistance throughout the season
- Summit Fertilizers – fertiliser donation
- Syngenta – chemical donation
- Elders Dalwallinu – chemical donation
- Wesfarmers Federation Insurance – crop insurance
- UWA – Dan Murphy and staff
- Department of Agriculture – Fran Hoyle
- CBH Group of Companies – grain sampling
- CSBP Labs
- Mike Dodd – burning of allocated plots, tillage of allocated plots.
- Rod Birch – loan of equipment
- Steve, Paul and Daniel Bryant – spraying

LOCAL RESEARCH AND DEVELOPMENT RESULTS – FEBRUARY 2007

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Elders

ALLAN'S RURAL SUPPLIES DALWALLINU
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We're already nurturing the next crop.

WA growers and their communities are the lifeblood of our industry. No-one understands this better than the CBH Group. That's why we invest over $250,000 every year in rural community programs.

These include sponsorships of local sports clubs and community groups like the Kellerberrin Little Learners Program; providing children in the wheat belt with the opportunity to hear the WASO Education Chamber Orchestra; supporting industry grower groups, and donating funds to essential services like the Royal Flying Doctors and St Vincent de Paul's.

We believe healthy and vibrant rural communities are vital to all our futures, so if we look out for one another we can all grow.

CBH GROUP
PROUD HISTORY
EXCITING FUTURE

Redline CBH 0091

UNDERSTANDING TRIAL RESULTS AND STATISTICS

We have tried to present all trial results in one format in 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 trial results.

Mean

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

Significant Difference

In nearly all trial work there will be some difference between treatments, ie 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 (ie 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 we say P<0.05% this means we are greater than 95% sure 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 if we are 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 we can say this is a significant difference. This means we are 95% sure 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 we can't be sure the difference is a result of variety; it may be due to soil type.

Table 1. Yield of Five wheat varieties.

Treatment	**Yield (t/ha)**
Variety1	2.1
Variety2	2.4
Variety3	2.3
Variety4	2.9
Variety5	1.3
LSD (P=0.005)	0.6

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, we need to keep in mind that they aren't statistically correct.

NATIONAL VARIETY TRIAL, WHEAT - PITHARA

Information from ACAS (Australian Crop Accreditation System)

AIM

Evaluate new and existing wheat varieties.

TRIAL DETAILS

Property	Gary Butcher, Pithara
Soil type	Sandy Loam
Sowing date	26/5/06
Fertiliser (kg/ha)	26/5/06: MAPSZC 75 kg/ha, MOP 25 kg/ha
Paddock rotation	2005 = Legume pasture, 2004 = Wheat, 2003 = Legume pasture
Herbicides	26/5/06: Roundup Powermax 2 L/ha; Trifluralin 1.8 L/ha; Chlorpyrifos 1 L/ha

RESULTS

Variety	Yield (t/ha)	Hectolitre Weight (kg/Hectolitre)	Protein (%)	Screenings (2mm sieve) (%)
AGT Scythe	1.36	77.2	13.4	9.3
Annuello	1.10	75.9	14.9	6.9
Arrino	1.02	80.8	14.3	1.5
Binnu	1.10	83.1	13.4	3.1
Calingiri	0.98	78.3	14.3	3.6
Carinya	1.14	82.4	14.2	2.6
Carnamah	1.05	80.0	13.3	7.1
Cascades	0.97	79.2	14.7	7.0
Correll	1.21	74.8	13.6	6.6
Datatine	1.30	75.0	12.4	6.7
EGA Blanco	1.04	75.0	14.1	8.9
EGA Bonnie Rock	1.17	78.2	14.5	3.9
EGA Castle Rock	0.93	77.3	14.8	5.0
EGA Eagle Rock	0.92	75.8	14.6	4.8
EGA Wentworth	1.09	81.7	13.8	3.0
Filler	1.08	78.1	14.2	3.3
GBA Ruby	0.91	81.3	14.0	4.4
GBA Sapphire	1.05	78.7	14.3	4.0
Guardian	1.12	80.1	13.4	6.5
Janz	1.00	80.6	14.3	3.1
Reeves	1.07	78.6	13.8	2.1
Spear	1.30	80.4	14.2	8.9
Tammarin Rock	1.02	78.5	13.5	3.3
Westonia	1.07	79.3	13.0	9.8
Wyalkatchem	1.05	78.9	14.0	2.7
Yitpi	1.13	77.2	14.1	7.8
Young	1.30	80.9	13.9	5.5

COMMENTS

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

National Variety Trial, Wheat - Coorow

Information from ACAS (Australian Crop Accreditation System)

Aim

Evaluate new and existing wheat varieties.

Trial Details

Property	Mike Bothe, Coorow
Soil type	Sandy Loam
Sowing date	1/6/06
Fertiliser (kg/ha)	1/6/06: Urea 100 kg/ha, KGold 120 kg/ha,
Paddock rotation	2005= Lupins
Herbicides	25/5/06: Triasulfuron 35 g/ha; 1/6/06: Trifluralin 2 L/ha, Chlorpyrifos 1 L/ha, Glyphosate: 2 L/ha; 18/7/06: Bromoxinil + MCPA 1.4 L/ha, Clopyralid 0.3 L/ha, Clodinafop-propoargyl 0.21 L/ha

Results

Variety	Yield (t/ha)	Hectolitre weight (kg/hectolitre)	Protein (%)	Screenings (2mm sieve) (%)
AGT Scythe	1.52	77.1	13.0	6.4
Annuello	1.80	78.9	12.6	1.9
Arrino	1.59	80.8	13.4	1.0
Binnu	1.60	78.4	11.1	3.9
Bullaring	1.72	75.5	10.9	3.7
Calingiri	1.65	80.6	12.8	2.8
Carinya	1.23	80.4	13.3	4.8
Carnamah	1.60	80.7	13.0	2.6
Correll	1.86	74.2	12.9	4.6
Datatine	1.71	76.2	10.7	6.2
Derrimut	1.37	77.9	12.6	6.7
EGA Blanco	1.53	77.4	12.7	4.1
EGA Castle Rock	1.25	81.3	13.5	2.8
EGA Eagle Rock	1.48	73.2	13.9	4.8
EGA Gregory	1.60	79.9	12.3	4.2
EGA Wentworth	1.36	78.6	13.6	4.6
GBA Ruby	1.67	80.8	13.3	5.0
GBA Sapphire	1.33	80.2	13.3	4.3
Guardian	1.83	81.4	12.5	4.6
Janz	1.32	78.4	13.1	5.0
Reeves	1.61	79.5	13.0	1.0
Spear	1.72	78.8	12.9	4.7
Westonia	1.78	80.9	12.6	2.9
Wyalkatchem	1.70	80.8	13.1	2.0
Yitpi	1.72	74.4	13.3	3.9
Young	1.59	80.8	12.9	2.6

Comments

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

NATIONAL VARIETY TRIAL, WHEAT – MILING

Information from ACAS (Australian Crop Accreditation System)

AIM

Evaluate new and existing wheat varieties.

TRIAL DETAILS

Property	Neil Pearse, Miling
Soil type	Loam
Sowing date	8/6/06
Fertiliser (kg/ha)	8/6/06: Urea 100 kg/ha; MAPSCZ 100 kg/ha banded
Herbicides	8/6/06: Trifluralin 2 L/ha; Logran 35 g/ha; Chlorpyrifos 500 mL/ha

RESULTS

Variety	Yield (t/ha)	Hectolitre Weight (kg/hectolitre)	Protein (%)	Screenings (2mm Sieve) (%)
AGT Scythe	0.73	66.3	16.8	26.2
Annuello	0.63	71.1	15.8	26.4
Arrino	0.64	72.8	15.3	13.3
Binnu	0.63	73.1	15.8	21.1
Bullaring	0.62	71.5	14.4	20.3
Calingiri	0.66	73.3	16.9	12.3
Carinya	0.65	69.3	16.2	23.2
Carnamah	0.70	72.5	15.1	21.2
Correll	0.78	70.8	16.3	21.7
Datatine	0.58	71.6	14.1	21.9
Derrimut	0.57	67.2	15.4	26.0
EGA Blanco	0.61	75.1	15.9	9.7
EGA Castle Rock	0.55	75.3	15.1	16.7
EGA Eagle Rock	0.60	69.9	16.5	15.3
EGA Gregory	0.51	73.6	14.8	24.8
EGA Wentworth	0.61	71.8	15.6	34.1
GBA Ruby	0.73	74.8	14.8	21.7
GBA Sapphire	0.68	72.1	15.8	24.5
Guardian	0.61	73.4	17.1	35.4
Janz	0.57	68.7	16.4	27.0
Reeves	0.69	74.4	15.4	10.2
Spear	0.56	77.5	17.0	22.1
Westonia	0.66	70.2	15.5	14.1
Wyalkatchem	0.69	73.5	15.6	16.8
Yitpi	0.73	72.2	16.3	14.1
Young	0.64	73.9	15.4	32.7

COMMENTS

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

NATIONAL VARIETY TRIAL, WHEAT – BUNTINE

Information from ACAS (Australian Crop Accreditation System)

AIM

Evaluate new and existing wheat varieties

TRIAL DETAILS

Property	Ian Syme, Main Trial Site, Buntine
Soil type	Sandy Loam
Sowing date	19/5/06
Fertiliser (kg/ha)	17/5/06: Maxam, 100 kg/ha; MAPSCZ 100 kg/ha Banded
Paddock rotation	2005= Lupins, 2004= Wheat, 2003= Volunteer Pasture; 2002= Serradella/Cadiz; 2001= Wheat
Herbicides	17/5/06: Chlorpyrifos 1 L/ha; Roundup Powermax 2 L/ha; Ester 300 mL/ha; Trifluralin 1.7 L/ha; 20/7/06: Buctril MA 1.5 L/ha; Lontrel 300 mL/ha

RESULTS

Variety	Yield (t/ha)	Hectolitre Weight (kg/hectolitre)	Protein (%)	Screenings (2mm sieve) (%)
AGT Scythe	0.52	78.6	11.8	8.5
Annuello	0.70	80.4	11.1	5.7
Arrino	0.51	79.2	12.7	2.5
Binnu	0.53	74.4	10.7	7.2
Bullaring	0.55	72.7	10.9	8.4
Calingiri	0.59	74.8	12.4	5.2
Carinya	0.45	71.3	13.3	4.5
Carnamah	0.35	76.8	13.8	7.2
Correll	0.57	74.8	13.0	8.5
Datatine	0.53	77.1	10.9	11.8
Derrimut	0.55	74.2	14.3	7.9
EGA Blanco	0.58	75.7	13.0	6.4
EGA Castle Rock	0.39	78.4	13.5	4.1
EGA Eagle Rock	0.39	70.4	13.7	6.1
EGA Gregory	0.52	73.4	12.7	5.1
EGA Wentworth	0.59	78.0	13.2	4.1
GBA Ruby	0.58	73.5	13.2	4.9
GBA Sapphire	0.32	78.3	13.8	4.4
Guardian	0.80	79.6	11.7	7.3
Janz	0.37	75.9	12.7	9.4
Reeves	0.66	77.1	12.7	5.6
Spear	0.67	77.1	12.5	8.4
Westonia	0.64	73.6	12.2	18.7
Wyalkatchem	0.47	70.8	12.8	4.0
Yitpi	0.51	74.2	13.3	4.6
Young	0.44	73.8	13.2	6.9

COMMENTS

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

NATIONAL VARIETY TRIAL, WHEAT – EAST MAYA

Information from ACAS (Australian Crop Accreditation System)

AIM

Evaluate new and existing wheat varieties.

TRIAL DETAILS

Property	Peter Bryant, East Maya
Soil type	Sandy Loam
Sowing date	7/6/06
Fertiliser (kg/ha)	1/6/06: Urea 50 kg/ha; 7/6/06: MAPSZC 75 kg/ha; Sulphate of potash 25 kg/ha; Urea 50 kg/ha
Paddock rotation	2005= Lupins; 2004=Wheat; 2003= Spray topped pasture
Herbicides	7/6/06: Glyphosate (540 g/L) 2 L/ha; Chlorpyrifos 500 (g/L) 1 L/ha; Trifluralin 2 L/ha; Trisulfuron 35 g/ha

RESULTS

Variety	Yield (t/ha)	Hectolitre Weight (kg/hectolitre)	Protein (%)	Screenings (2mm sieve) (%)
AGT Scythe	0.64	75.6	14.9	6.6
Annuello	0.93	80.5	12.9	5.9
Arrino	0.87	80.7	13.7	1.1
Binnu	0.81	78.5	12.3	3.5
Calingiri	0.84	78.1	14.3	2.4
Carinya	0.67	78.9	14.9	2.9
Carnamah	0.72	76.1	14.3	3.9
Cascades	0.73	78.3	14.4	3.5
Correll	0.83	73.1	14.4	5.1
Datatine	0.75	74.0	12.4	11.7
EGA Blanco	0.63	79.2	13.9	4.4
EGA Bonnie Rock	0.94	79.7	13.5	3.8
EGA Castle Rock	0.60	76.90	16.0	3.4
EGA Eagle Rock	0.65	77.1	14.5	3.6
EGA Wentworth	0.65	76.3	15.3	5.1
GBA Ruby	0.84	79.0	13.5	2.2
GBA Sapphire	0.64	82.0	15.4	4.1
Guardian	0.94	79.3	13.2	4.9
Janz	0.50	78.0	15.1	4.8
Reeves	0.94	79.6	12.8	1.5
Spear	0.79	80.9	13.9	8.1
Tammarin Rock	0.91	77.2	13.1	2.8
Westonia	1.01	74.9	12.7	6.8
Wyalkatchem	1.03	80.6	13.2	2.4
Yitpi	0.75	77.2	13.1	4.8
Young	0.82	78.3	13.7	3.0

COMMENTS

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

PRACTICE FOR PROFIT

Darren Chitty, Research Agronomist, Agritech Crop Research

AIM

To determine optimal input packages for commonly grown wheat varieties in the Buntine area.

BACKGROUND

Agritech Crop Research conducted this trial on behalf of the Liebe Group in order to determine the profitability of four levels of wheat crop management inputs. These levels of input were applied to noodle varieties Arrino and Calingiri, hard variety Bonnie Rock and APW Wyalkatchem. Arrino was chosen for its disease susceptibility, whilst Calingiri is a longer season variety well adapted to the local environment. Bonnie Rock and Wyalkatchem are considered good performing hard and APW varieties in the area. Management practices are explained below.

- **Low** input treatments are based on a farmer delivering grain to the bin at the lowest possible cost, regardless of seasonal conditions ($52.30/ha).
- **District** average inputs are based on what is considered common grower practice in the Liebe Group area ($108.50/ha).
- **High** input treatments simulate a paddock with high yield potential matched with increased management inputs to maximize yields and profitability ($240.55/ha).
- **Active** treatments are dependent on seasonal conditions and are determined by the Liebe R&D Committee ($83.00/ha).

The trial is intended to run over 10 seasons, with this being the sixth year.

TRIAL DETAILS

Property	Ian Syme, Main Trial Site, Buntine
Plot size & replication	9m x 10m x 3 Replications
Soil type	Sandplain / sandy loam
Sowing date	27/5/06
Seeding rate	Low = 50 kg/ha, District = 75 kg/ha, High = 100 kg/ha, Active = 75 kg/ha
Fertiliser (kg/ha)	Various – as per treatment list
Paddock rotation	2004 – wheat, 2005 – lupins
Herbicides	Various – as per treatment list
Growing Season Rainfall	122mm

RESULTS

Table 1: Yields (t/ha) and gross margins ($/ha) from previous years (2001- 2005).

		Yield				Gross Margin				
Treatment		**2001**	**2003**	**2004**	**2005**	**2001**	**2002**	**2003**	**2004**	**2005**
Arrino	Low	1.83	1.95	1.31	1.00	$381.3	-$38.5	$448.5	$190.1	158.1
	District	2.00	2.37	2.19	1.37	$355.5	-$101.7	$492.0	$271.9	164.5
	High	2.13	2.20	1.93	1.17	$267.6	-$179.7	$351.5	$136.1	0
	Active		1.94	2.14	1.30		-$45.1	$411.1	$282.5	191
Calingiri	Low	1.93	2.24	1.42	1.19	$419.0	-$38.5	$512.4	$181.3	162.5
	District	2.07	2.41	1.92	1.44	$322.6	-$101.7	$483.8	$202.1	137.1
	High	2.10	2.37	2.00	1.21	$234.8	-$179.7	$392.4	$130.4	5
	Active		2.24	1.62	1.35		-$45.1	$487.1	$166.4	182.4

Note: 2002 was a drought and no harvest took place. Active Management introduced in 2002.

Table 2: Crop Vigour (1-9), weed control (%) and yield (t/ha) in 2006.

Part Rated Rating Data Type Rating Date		Crop Vigour 6/09/2006	Weed Control 6/09/2006	Crop Yield 8/11/2006
No.	**Treatment**			
TABLE OF A MEANS				
1	Arrino	6.2	8.0	0.499
2	Calingiri	6.3	8.0	0.539
3	Wyalkatchem	5.7	8.0	0.439
4	Bonnie Rock	5.7	8.0	0.458
LSD (P=.05)		**NS**	**NS**	**NS**
TABLE OF B MEANS				
1	LOW INPUT Trifluralin 1.2 L/ha DAP 50 kg/ha Diuron 350 mL/ha LVE MCPA 400 mL/ha	5.0 c	8.0	0.467 b
2	DISTRICT INPUT Premis 1 L/t Trifluralin 1.6 L/ha Logran 35 g/ha Agstar 100 kg/ha Urea 50 kg/ha 2,4-D Amine 1 L/ha	5.6 b	8.0	0.428 b
3	HIGH INPUT Deep Ripped 30cm Real 1.5 L/t Trifluralin 1.6 L/ha Logran 35 g/ha Agstar 140 kg/ha Urea 80 kg/ha MOP 50 kg/ha Giant 600 mL/ha	6.9 a	8.0	0.566 a
4	ACTIVE INPUT Deep Ripped 30cm Trifluralin 1.6 L/ha Agstar 43 kg/ha MCPA LVE 1.2 L/ha	6.3 a	8.0	0.473 b
LSD (P=.05)		**0.5**	**NS**	**0.089**

Means followed by same letter do not significantly differ (P=.05, LSD)

ECONOMIC ANALYSIS

Table 3: Grain yield, quality, receival grade and gross margins for 2006.

Treatment		Yield (t/ha)	Protein (%)	Screenings (%)	Grade	Gross Margin $/ha
Arrino	Low	0.391	13.5	2.4	ASW	32.16
	District	0.401	14.1	3.6	ASW	-22.74
	High	0.720	13.6	3.3	ASW	-86.47
	Active	0.484	12.5	2.8	ASW	21.06
Calingiri	Low	0.514	12.5	4.7	ASW	55.64
	District	0.561	13.2	6.0	ASW	7.58
	High	0.514	13.5	6.2	ASW	-134.15
	Active	0.566	11.4	5.2	ASWN	40.39
Wyalkatchem	Low	0.494	12.5	3.6	APW	58.85
	District	0.370	14.1	4.2	APW	-25.67
	High	0.509	13.7	4.3	APW	-127.04
	Active	0.381	11.5	4.8	APW	0.44
Bonnie Rock	Low	0.468	13.8	8.0	AH	50.66
	District	0.381	14.2	9.5	AH	-26.25
	High	0.520	14.1	8.4	AH	-126.15
	Active	0.463	13.0	6.5	AH	20.25

COMMENTS

Crop Vigour

The low input treatments showed the least amount of vigour; a direct result of minimal nitrogen and a low seeding rate (50 kg/ha). Although not significant, Arrino and Calingiri showed greater early vigour than Wyalkatchem and Bonnie Rock.

Weed Control

The weed burden in 2006 was very minimal. All herbicide options performed well.

Deep Ripping

Deep ripping was introduced in 2006 for the High and Active management treatments. Improved vigour was observed, however, no significant yield increase occurred, most likely due to the dry season. Given a year with more rainfall some differences in yield could be expected on this sandplain soil type.

Yield and Profit

Well below average rainfall in 2006 resulted in low yields. The highest yielding variety was Calingiri (0.54 t/ha), and the best yielding management practice was the High input (0.567 t/ha) (Table 2). The highest yielding treatment was Arrino – High input at 0.72 t/ha (Table 3).

The Low input treatment was the most profitable in 2006, ranging from $32-$59/ha. This treatment managed weeds effectively, provided adequate nutrition, whilst also keeping costs in line with potential yield. Active management was the second most profitable treatment ($0/ha - $40/ha). This treatment received no nitrogen apart from the nitrogen in the compound fertiliser. Although the High input treatments generally obtained the highest yield, substantial losses for all wheat varieties (-$86/ha to -$134/ha) highlighted the need for growers to remain focused on profit rather than yield.

ACKNOWLEDGEMENTS: Liebe Group, Farmanco.

PAPER REVIEWED BY: ASHLEY BACON

TRITICALE TESTING – STAGE 3

Jennifer Garlinge, DAFWA, Northam

AIM

Evaluate new and existing Triticale Varieties.

TRIAL DETAILS

Property	Bob Nixon, Kalannie
Soil Group	Soil pH (CaCl2) 6.1@10cm. 4.2@30cm.
Sowing date	28/6/06
Seeding rate	76 kg/ha
Rotation	2005 = Medic & Grasses Pasture, 2004 = Wheat, 2003 = Medic & Grasses Pasture,
Fertiliser (kg/ha)	28/6/06:Agras #1 80 kg/ha
Pesticides	28/6/06: Treflan 1.6 L/ha; Sprayseed 1.6 L/ha 15/9/06: Dominex 200 mL/ha 26/9/06: Wipeout 450 1.6 L/ha

RESULTS

Test Name	Yield (kg/ha)	% of Tahara	Growth Scores	% of Tahara
Tickit	612	121*	5.0	116
Everest	524	104	4.3	100
Prime-322	520	103	5.0	116
Credit	507	100	5.0	116
Speedee	507	100	5.3	123
Tahara	505	100	4.3	100
Muir	465	92	5.0	116
				*=*Significant (0.05)*
Mean	514		5	
Av. SED	37			
CV	8.8		16.8	
Adjusted Yield Data. Obs Dates: Yield: 21 Nov. Growth Scores: 5 Sep				

COMMENTS

Pre Sowing	Cultivated in April by farmer, 1st knockdown spray by farmer as a summer spray.
Early Season	Slow germination due to season.
Mid Season	Very stressed until good rain in September.
Pre Harvest	Droughted.

Report as at 11:23:44 03 JAN 2007 analysis as at 11 DEC 2006.

UDON NOODLE WHEAT TESTING – STAGE 4

Jennifer Garlinge, DAFWA, Northam

AIM

Evaluate new and existing Udon noodle wheat varieties.

TRIAL DETAILS

Property	Bob Nixon, Kalannie
Soil Group	Soil pH (CaCl2) 5.3@10cm. 6.2@30cm
Sowing date	28/6/06
Seeding rate	50 kg/ha
Rotation	2005 = Medic & Grasses Pasture, 2004 = Wheat, 2003 = Wheat
Fertiliser (kg/ha)	28/6/06:Agras #1 80 kg/ha.
Pesticides	28/6/06: Treflan 1.6 L/ha; Sprayseed 1.6 L/ha 15/9/05:Dominex 200 mL/ha

RESULTS

Test Name	Yield (kg/ha)	% of Calingiri
EGA2248	1302	115*
Arrino	1209	106*
WAWHT2856	1200	106*
WAWHT2771	1197	105*
Binnu	1186	104*
WAWHT2855	1174	103*
Westonia	1157	102
WAWHT2773	1145	101
Wyalkatchem	1140	100
Kulin	1137	100
Calingiri	1136	100
Reeves	1134	100
Wyalkatchem	1129	99
WAWHT2750	1100	97
WAWHT2772	1090	96
Datatine	1079	95*
Brookton	1069	94*
Cadoux	1001	88*
		*=*Significant (0.05)*
Mean	1149	
Ave. SED	34	
CV	3.7	
Adjusted Yield Data. Obs. Date 20th Nov		

COMMENTS

Pre Sowing	Limed and cultivated by farmer. 1st knockdown spray by farmer as a summer spray.
Early Season	Very slow growth and stressed.
Mid Season	Very stressed until good rain in September.
Pre Harvest	Droughted.

Report as at 11:23:33 03 JAN 2007 analysis as at 11 DEC 2006.

WHEAT VARIETY TESTING ON ACID SOILS

Jennifer Garlinge, DAFWA, Northam

AIM

To evaluate wheat varieties grown on acid soils.

TRIAL DETAILS

Property	Bob Nixon, Kalannie
Soil Group	Soil pH (CaCl2) 6.1@10cm. 4.2@30cm.
Sowing date	28/6/06
Seeding rate	51 kg/ha
Rotation	2005 = Medic & Grasses Pasture, 2004 = Wheat, 2003 = Medic & Grasses Pasture.
Fertiliser (kg/ha)	28/6/06: Agras #1 80 kg/ha
Pesticides	28/6/06: Treflan 1.6 L/ha; Sprayseed 1.6 L/ha 12/9/06 Broadside (Nufarm) 1.4 cod 15/9/06: Dominex 200 mL/ha

RESULTS

Test name	Yield (kg/ha)	% of Wyalkatchem
WAWHT2524	413	110
Wyalkatchm	388	104
Westonia	383	102
EGABonnieR	382	102
WAWHT2750	380	102
Calingiri	379	101
Arrino	376	101
Wyalkatchm	374	100
EGAJitarng	374	100
WAWHT2773	365	98
WAWHT2771	361	97
WAWHT2727	360	96
Binnu	358	96
Wyalkatchm	355	95
EGA2248	354	95
Perenjori	352	94
Spear	352	94
WAWHT2772	349	93
WAWHT2730	332	89
Reeves	330	88
WAWHT2726	323	86
ClearfdJNZ	319	85*
EWentworth	306	82*
BT-Schmbrk	301	81*
Tincurrin	300	80*
EGA Blanco	299	80*
Schomburgk	296	79*
Carnamah	292	78*
Brookton	291	78*
Bullaring	289	77*
WAWHT2713	287	77*
Corrigin	277	74*
GBASapphir	277	74*
AGTScythe	275	74*
Mitre	273	73*
Annuello	269	72*
Datatine	257	69*
Cadoux	255	68*
Cascades	241	64*
TammarinRk	239	64*
EGAEagleRk	235	63*
		**=significant (p=0.05)*
Mean	316	
Av. SED	32	
CV	12.3	
Adjusted yield data. Obs. Date 20th Nov		

COMMENTS

Septoria Nodorum Blotch Score 2 (Mid season (19 JUN)).

Pre Sowing	Cultivated in April by farmer, 1st knockdown spray by farmer as a summer spray.
Early Season	Slow germination due to season.
Mid Season	Very stressed until good rain in september.
Pre Harvest	Droughted.

Report as at 11:23:35 03 JAN 2007 analysis as at 11 DEC 2006.

Early Maturing Barley testing - Stages 3 & 4

Jennifer Garlinge, DAFWA, Northam

Aim

Evaluate early maturing barley varieties.

Trial Details

Property	Bob Nixon, Kalannie
Soil Group	Soil pH (CaCl2) 4.6@10cm. 5.3@30cm.
Sowing date	29/6/06
Seeding rate	75 kg/ha
Fertiliser (kg/ha)	29/6/06: Agras #1 80 kg/ha
Pesticides	15/4/06: Baytan C 150 g/L Triadimenol 200 g/L Cyper 1 mL/kg 29/6/06: Treflan 1.6 L/ha; Sprayseed 1.6 L/ha 15/9/06: Dominex 200 mL/ha

Results

Test name	Yield (kg/ha)	% of Stirling
Hindmarsh	841	132*
Hamelin	706	111*
Mundah	698	110
Flagship	675	106
Stirling	635	100
Baudin	628	99
Fleet	622	98
Barque	614	97
Buloke	612	96
WABAR2317	586	92
Vlamingh	555	87*
Gairdner	486	76*
Dash	410	65*
WABAR2312	339	53*
WABAR2315	311	49*
		**=Significant (0.05)*
Mean	596	
Av. SED	46	
CV	9.5	
Adjusted Yield Data. Obs. Date: 10 November		

Comments

Pre Sowing	1st knockdown spray by farmer as summer spray.
Early Season	Slow germination due to season.
Mid Season	Very stressed until good summer rains in September.
Pre Harvest	Droughted farmers crop yielded 1.5 tonne.

Report as at 11:23:37 03 JAN 2007 analysis as at 11 DEC 2006.

BARLEY TOLERANCE TO ACID/ALUMINIUM

Jennifer Garlinge, DAFWA, Northam

Department of Agriculture and Food

AIM

Evaluate tolerance of Barley to acid and aluminium toxicity.

TRIAL DETAILS

Property	Bob Nixon, Kalannie
Soil Group	Soil pH (CaCl2) 6.1@10cm. 4.2@30cm.
Sowing date	28/6/06
Seeding rate	76 kg/ha
Fertiliser (kg/ha)	28/6/06:Agras #1 80 kg/ha
Rotation	2005 = Medic & Grasses Pasture, 2004 = Wheat, 2003 = Medic & Grasses Pasture,
Pesticides	15/4/06: Baytan C 150 g/L Triadimenol 200 g/L Cyper 1 mL/kg 28/6/06: Treflan 1.6 L/ha; Sprayseed 1.6 L/ha 12/9/06: Broadside (Nufarm) 1.4 cod 15/9/06: Dominex 200 mL/ha

RESULTS

Test name	Yield (kg/ha)	% of Stirling
Yarra	392	116
Baudin	391	116
Gairdner	347	103
Stirling	338	100
Hamelin	327	97
Brndabella	286	85
WABAR2315	263	78*
WABAR2312	259	77*
Tulla	238	70*
WABAR2317	237	70*
Vlamingh	218	65*
Yambla	208	62*
		**=Significant (0.05)*
Mean	316	
Av. SED	39	
CV	15.2	
Adjusted Yield Data. Obs Date: 21 Nov		

COMMENTS

Capeweed Score 2 (Mid season (18 SEP)).

Pre Sowing	Cultivated in April by farmer, 1st knockdown spray by farmer as a summer spray.
Early Season	Slow germination due to season.
Mid Season	Very stressed until good rain in september.
Pre Harvest	Droughted.

Report as at 11:23:40 03 JAN 2007 analysis as at 11 DEC 2006.

Time of Sowing on Wheat Yields at Buntine

Christine Zaicou, DAFWA, Geraldton

Aim

To assist growers in making decisions on variety choice and management, a trial was conducted at Buntine to assess the yield, quality and economic response of new and potential wheat varieties to different sowing times.

Trial Details

Property	Ian Syme, Main Trial Site, Buntine
Soil type	Loamy sand, N – 1ppm, P – 19ppm, S – 3ppm, K – 185ppm, OC% - 0.90, pH – 5
Plot size & replication	1.54 x 20m
Sowing date	TOS1: 17/05/06; TOS2: 30/05/06; TOS3: 29/06/06
Emergence	TOS1: mid/late May; TOS2: late June; TOS3: early Aug
Seeding rate	Approx 70 kg/ha
Fertiliser (kg/ha)	TOS1, 2 & 3: Banded below seed-100 kg/ha Agras No 1
Herbicides (/ha)	Whole trial 16/5/06: 1.6L Wipeout 450 + 50% Wetter Preseeding: SpraySeed 250 (3 L/ha TOS1, 2 L/ha TOS2)+ Triflur X (1.6 L/ha TOS1 & 2) SpraySeed250 (1.6L TOS3)+ Treflan (1.6L TOS3) Post emergent: Jaguar 1 L/ha & Lontrel 0.3 L/ha (TOS1)
Paddock rotation	2005= Pasture, 2004= Wheat (Calingiri), 2003= Volunteer Pasture, 2002= Volunteer Pasture, 2001= Wheat (Calingiri)
Growing Season Rainfall	May to October 123mm

Results

Table 1: Effect of sowing time/emergence on yield, quality and economic returns of wheat on loamy sand at Buntine.

		Grain Yield (t/ha)			Protein (%)			Screenings (%)*			Hectolitre wt (kg/hl)			Gross income ($/ha)		
		TOS 1	TOS 2	TOS 3	TOS 1	TOS 2	TOS 3	TOS 1	TOS 2	TOS 3	TOS 1	TOS 2	TOS 3	TOS 1	TOS 2	TOS 3
HARD	Carnamah	1.26	1.06	0.70	15.1	15.6	16.3	4.6	10.5	9.3	78	75	76	330	262	174
	EGA BonnieRock	1.37	1.22	0.94	15.4	16.0	16.1	4.6	9.6	15.5	80	79	78	367	295	212
	EGA EagleRock	1.16	1.04	0.62	15.6	16.1	16.2	6.9	9.0	14.2	79	79	78	296	255	142
	GBA Sapphire	1.14	1.04	0.75	15.5	15.4	15.8	6.8	18.9	18.8	80	79	78	286	213	153
	Tammarin Rock	1.25	1.22	0.90	14.8	15.3	15.1	3.9	4.0	10.7	78	79	76	319	323	215
	Yitpi	1.20	1.16	0.88	14.8	15.4	16.0	6.5	10.1	7.1	79	78	75	309	286	224
APW	Ellison	1.00	0.87	0.62	17.0	17.4	18.0	7.1	13.4	8.2	80	77	77	250	189	152
	EGA Wentworth	1.04	0.94	0.62	15.9	16.2	16.3	9.7	22.1	20.9	78	76	76	250	193	126
	Wyalkatchem	1.41	1.30	0.84	15.2	15.5	15.5	2.5	6.6	10.4	81	79	76	365	326	201
	Young	1.30	1.15	0.85	15.2	15.4	16.3	8.3	15.7	26.5	80	79	77	319	241	212
ASW	AGT Scythe	1.13	1.08	0.68	15.8	15.9	16.9	7.5	14.3	17.0	75	73	72	264	233	140
	Guardian	1.32	1.14	0.89	14.7	15.0	15.3	9.8	16.5	22.3	80	79	78	300	238	181
	H46	1.16	1.06	0.83	15.3	15.9	15.5	7.7	13.9	23.3	80	79	78	272	227	171
	Sentinel	1.13	1.04	0.73	15.4	15.8	15.9	8.0	10.6	9.8	78	78	76	265	231	175
NOODLE	Arrino	1.22	1.22	0.77	16.0	16.2	16.5	2.5	7.1	12.3	79	78	75	302	288	169
	Binnu	1.33	1.11	0.87	14.6	15.2	15.5	9.2	14.1	20.3	79	78	76	306	240	178
	Calingiri	1.37	1.17	0.89	14.4	15.3	15.3	4.3	6.3	7.7	80	79	78	337	280	207
Potential	GBA03.1129	1.10	1.08	0.76	16.2	16.6	16.8	3.1	6.8	8.3	79	78	76			
	GBA3.09.AH	1.15	0.97	0.67	15.4	15.9	16.6	7.2	18.7	15.0	80	78	78			
	WAWHT2713	1.03	0.98	0.75	15.3	15.6	15.7	10.2	11.7	8.5	78	77	72			
	WAWHT2750	1.32	1.12	0.76	15.4	15.4	16.1	2.6	6.0	6.9	78	77	75			
	WAWHT2773	1.33	1.17	0.83	15.4	15.9	16.2	4.4	9.4	12.3	80	78	76			
	Ave TOS	1.21	1.09	0.78												
	TOS (lsd)	0.16														
	Var TOS (lsd)	0.18			0.64			2.4			1.0					
	Var (lsd) within TOS	0.14			0.62			2.1			0.9					
	%CV	10.2			2.4			11.9			0.6					

* Whole and cracked grain. Price Notes: Calculated using AWB Golden Rewards. Base rate APW:$250, AHP:$260, AH:$255, ASW:$237.

COMMENTS

Buntine

- TOS1 was sown in mid May and established well. TOS2 was sown in late May but did not emerge until late June. TOS3 was sown in late June and emerged a few days later.
- This site was very low yielding and moisture stresses throughout the year had a huge impact on yields of all varieties at all sowing times. Although sown and established in mid May (TOS1), the varieties experienced an extended dry period until late June which will have impacted considerably on the crop yields (Table 1).
- Similarly to Mingenew, screenings (whole and cracked) increased and hectolitre weight decreased with delayed sowing time. The varieties which tended to have reduced risk of screenings were Arrino, Calingiri, EGA Eagle Rock, GBA03.1129, WAWHT2750 and Wyalkatchem. However these rankings may change with the removal of cracked grains from the sample. (Table 1).

ACKNOWLEDGEMENTS

GRDC for financial support; Melaine Smith, Anne Smith and Geraldton RSU for technical support; Liebe Group and Syme Family for provision of land.

PAPER REVIEWED BY: BRENDA SHACKLE

Root traits for hardpan penetration of wheat

Tina Acuña and Len Wade, The University of Western Australia, Nedlands

THE UNIVERSITY OF WESTERN AUSTRALIA

Aim

To evaluate rooting depth and crop dry matter of 24 wheat cultivars at flowering, relative to changes in soil hardness and moisture content on two sites, ripped and un-ripped. The field trial (at Merredin and Buntine) followed a preliminary experiment undertaken at the Merredin Research Station in 2005, which found promising genotypic differences in rooting depth measured at flowering between sites and cultivars.

Background

Little is known regarding the hardpan penetration ability of roots of Australian wheat cultivars. This project, funded through the new GRDC initiative 'Root Systems for Australian Soils', builds on current and past research undertaken in WA that has described the pattern of root growth of annual crops in a range of field soils with chemical and/or physical barriers to growth, including hard soils and drought. It is not known whether genetic diversity exists for root growth in soils containing a hardpan among the currently-available wheat cultivars and breeding lines. Genotypic variation in root penetration ability has been reported in other cereals (Yu *et al.* 1995), and validated in our own research, using a pot technique where a thin disc of wax and petroleum jelly is placed in a soil column to simulate a hardpan (Botwright Acuna and Wade 2005). Our pot experiments have revealed differences in root penetration ability under drought among 24 wheat cultivars and breeding lines. It is important to confirm these results in field experiments. Results are reported here on rooting depth and biomass production of 24 wheat cultivars and breeding lines (Table 1) at Buntine in 2006, which included contrasting sites, ripped and un-ripped.

Table 1: Wheat breeding lines* and cultivars. Maturity classes: S, short; M, mid; L, late.

Name	Abb.	Maturity	Name	Abb.	Maturity
Ajana	AJA	S	Halberd	HAL	L
Amery	AMY	S	Janz	JAN	L
Brookton	BRK	L	Kalannie	KAL	S
Camm	CAM	L	Karlgarin	KAR	M
Carnamah	CAR	M	Machete	MAC	L
Cascades	CAS	M	Perenjori	PER	M
CM18*	C18	M	Spear	SPR	L
Cranbrook	CRA	M	Stiletto	STL	L
Cunderdin	CUN	M	V18*	V18	M
EGA Bonnie Rock	BR	M	Westonia	WST	S
EGA Castle Rock	CR	M	Wilgoyne	WIL	S
Gamenya	GAM	M	Wyalkatchem	WYK	M

Trial Details

Property	Ian Syme, Main Trial Site, Buntine
Plot size & replication	24 entries in 1m rows x 2 sites (ripped vs. unripped), with two replications
Soil type	Sandy loam
Sowing date	1/6/06
Seeding rate	100 plants/m^2 (0.5m between row spacing, 0.02m within row spacing)
Fertiliser (kg/ha)	Urea 90 kg/ha at sowing; NPK 90 kg/ha , 70% at sowing
Paddock rotation	2005=Lupins; 2004=wheat; 2003= volunteer pasture; 2002= serradella/cadiz; 2001=wheat
Herbicides	Nil. Hand weeded as required
Growing Season Rainfall	May to Oct: 122mm (long term average of 255mm)

Results

Buntine experienced severe drought in 2006, with only half the usual amount of rain falling from May to October. The ripped and un-ripped sites were characterised for soil physical properties and sampled for crop dry matter production and rooting depth using an auger on the 2nd October 2006, 122 DAS (days after sowing). The soil was quite dry and hard at the time of sampling, with soil strength increasing from 0.8 MPa in the soil surface to greater than 5 MPa at a depth of 12cm.

Wheat grown on soil ripped in the 2005 season matured earlier (Zadok score; 78 vs. 79), was taller (48 v. 43cm) and produced more tillers (10 vs. 9) than on the un-ripped site. Crop dry matter and rooting depth was the same at both sites.

Wheat cultivars with greater crop dry matter had more tillers and were taller. For example, C18 was relatively short (40cm) had the fewest tillers (5) and the smallest above-ground DM, while Bonnie Rock was taller (49cm), had the most tillers (11) and greatest crop dry matter.

Wheat cultivars did not significantly differ in rooting depth, although roots of Ajana, Bonnie Rock, Halberd and Machete all tended to grow to a depth of more than 45cm (Figure 1). The majority of cultivars had rooting depths of between 33 to about 40cm. Cultivars with more tillers had deeper roots.

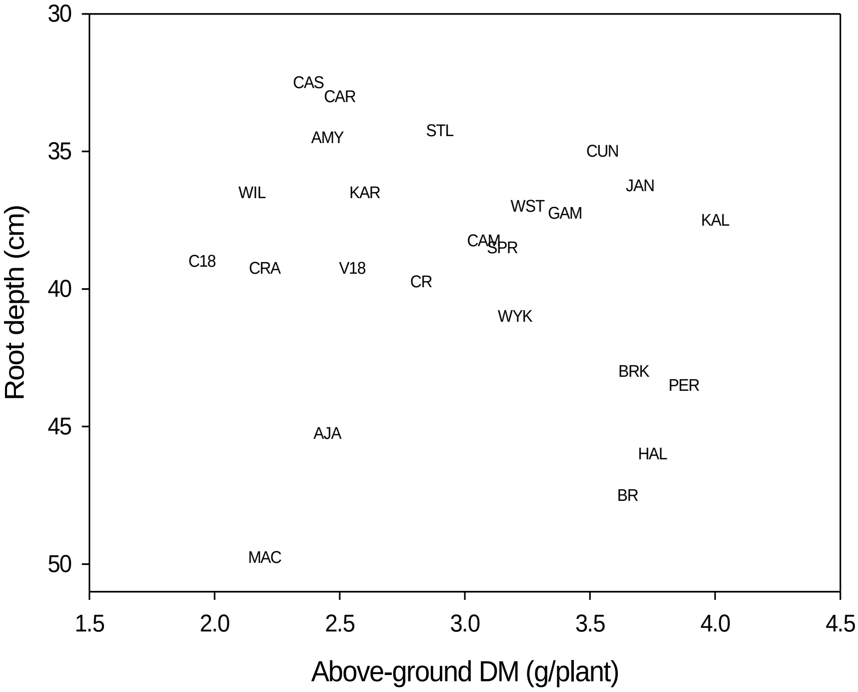

Figure 1: Root depth versus above-ground DM for 24 wheat cultivars and breeding lines, averaged across sites

COMMENTS

Severe drought resulted in soil being very dry at the soil surface and hard at the time of sampling, with soil moisture content increasing to only 4.5% at a depth of 60cm. Conditions restricted rooting depth to between 33 and about 40cm for most cultivars, which was very shallow compared with rooting depths of around 130cm reported for a similar soil type at Wongan Hills in a year with average (258mm) rainfall (Hamblin et al. 1982). Regardless, cultivars with more tillers produced deeper roots, and some cultivars grew roots deeper than 45cm. These same cultivars have performed well in our pot trials undertaken in controlled conditions. More favorable conditions for root growth and increasing the number of replications would improve our estimation of potential rooting depth of wheat cultivars in field soils that contain hardpans. We aim to repeat and validate these experiments in 2007.

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ACKNOWLEDGEMENTS

Lindsay Bell, Richard Bennett, Alven Soopaya, Terry Rose (UWA) and Estela Pasuquin (IRRI). Thanks also to Brianna Peake and Jade Bagley from the Liebe Group for their assistance.

PAPER REVIEWED BY: PROF. LEN WADE

PREFERRED WHEAT VARIETIES

Simon Crane, Landmark an AWB Company

Aim
To promote the adoption of Hard wheat varieties that are preferred by Australia's premium export markets.

Background
Increasing the proportion of EGA Castle Rock and EGA Bonnie Rock will improve the quality and value of hard grained wheat segregations in WA by improving milling yield, flour colour and colour stability.

Trial Details

Property	Ian Syme, Main Trial Site, Buntine	
Plot size & replication	1.8m x 10m, 3 replicates	
Soil type	Sandy Loam	
Paddock rotation	**1. Pasture, Wheat, Pasture**	**2. Wheat, Wheat, Wheat**
Sowing date	19/5/06	18/5/06
Seeding rate	75 kg/ha	
Fertiliser (kg/ha)	100 kg/ha MAPSZC	100 kg/ha MAPSZC + 60 L/ha Flexi-N
Herbicides	2 L/ha RU PowerMax, 1.6L Trifluralin, 35g Logran	
Growing Season Rainfall	122mm	

Treatments
A selection of commonly grown Hard wheat varieties were sown alongside AWB's Premium choice varieties in two rotation situations (continuous wheat and wheat-pasture). The intention was to apply extra nitrogen during the season to half the area of each trial to maximise the quality that could be achieved and demonstrate the potential benefit in gross margin of the Premium choice varieties.

Results
The poor growing season of 2006 meant that very little information was obtained from these trials. There was no extra nitrogen applied, the continuous wheat trial was not worth harvesting and although the wheat-pasture trial was harvested the yields were very low and the grain was deemed not worthwhile to be tested for quality.

Table 1: Wheat yields from Wheat-Pasture rotation trial.

Variety	Yield (t/ha)
EGA Bonnie Rock	0.38
EGA Castle Rock	0.19
GBA Sapphire	0.19
Carnamah	0.25
Wyalkatchem	0.27
CV	11.3%
LSD	0.05

Comments
Although this trial yielded less than half of other NVT trials conducted in AgZone 1 in 2006 there is some consistency with their results and the ranking of these varieties in this trial.

Acknowledgements
Thanks to former Landmark employee Tyrone Henning for his assistance with the planning of these trials and to Agritech Crop Research for conducting these trials on Landmark's behalf.

Paper reviewed by: BRUCE CAIRNS

Noodle Wheat variety demonstration

Chris O'Callaghan, R&D Co-ordinator, Liebe Group

Aim

To investigate the potential for noodle wheat varieties to achieve premium prices.

Background

Premium choice wheat varieties are targeted to better match quality with demand for international markets so as to preserve the value of the Australian wheat crop. Premium prices are paid for these varieties in an effort to encourage growers to increase their plantings of these varieties. Noodle wheat varieties Arrino and Cadoux receive an extra $14/t under the AWB Premium Choice Varieties Scheme. This trial compares these varieties with more commonly grown Calingiri and a hard wheat variety Eagle Rock.

Trial Details

Property	Clinton Hunt, Marchagee
Plot size & replication	150m x 13m x 3 replications
Soil type	Loamy Sand
Sowing date	20/6/06
Seeding rate	70 kg/ha of Calingiri, Cadoux, Arrino and Eagle Rock
Fertiliser (kg/ha)	100 L/ha Flexi N at seeding, 100 kg/ha Macro pro extra - 2/3rds banded 1/3rd with seed
Paddock rotation	2005= Wheat, 2004= Lupins, 2003= Wheat, 2002= Wheat
Herbicides	1 L/ha glyphosate, 800 mL/ha paraquat + 50 mL/ha oxyflurafen + 2 L/ha trifluralin, 500 mL/ha Jaguar + 600mL MCPA LVE+ 8g Logran
Growing Season Rainfall	149mm (April – October)

Results

Table 1: Yield and quality and of wheat varieties.

Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g)	Payment Grade
Calingiri	1.31	12.8	9.20	376.8	ASW
Cadoux	1.31	13.0	8.26	375.9	ASW
Eagle Rock	1.21	13.4	9.46	371.2	AH
Arrino	1.14	12.9	6.77	386.0	ASW
LSD	n.s				

Economic Analysis

Table 2: Economic Analysis ($/ha).

Treatment	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin
Calingiri	1.31	267.24	209.04	58.2
Cadoux	1.31	269.86	209.04	60.82
Eagle Rock	1.21	260.15	209.04	51.11
Arrino	1.14	238.26	209.04	29.22

Based on EPR of $210/ha ASW and $222/ha AH farm gate price as of 28th December 2006

Comments

- There were no significant differences in yields between all varieties.
- Dry growing season conditions may have restricted growth of yield components resulting in an evening out of yield between varieties.
- Experimental error may have slightly reduced yields of Cadoux.
- High screenings and high protein meant the wheat was paid on ASW prices and premiums were not gained

Acknowledgements: Clinton Hunt for running the demonstration.

Paper reviewed by: BRIANNA PEAKE

LongReach Plant Breeders Wheat Variety Trials - 2006

Matu Peipi & Matt Whiting, LongReach Plant Breeders

Aim

To evaluate new wheat germplasm adapted to the main Western Australian Agricultural Zones and develop and release commercial varieties to WA farmers.

BACKGROUND

LongReach Plant Breeders[1] has conducted trials in all the main production environments of the Australian wheat belt since it commenced operations in 2002. The LongReach breeding program reached full scale in 2005. Approximately 40% of the LongReach breeding investment is targeted at varieties for Western Australian growers.

In winter 2006, LongReach conducted 22 field trials across the WA wheatbelt, with the aim of testing new germplasm at various stages of development. Nine of these trial sites were Elite line evaluations, each planted with a total of 74 entries, including LongReach wheat lines closest to release (first year NVT entries in 2007), as well as commercially available controls to enable agronomic, disease, yield and quality comparisons. These trials were planted by independent contractors in carefully selected paddocks provided by farmer co-operators. Various assessments, including establishment, foliar disease resistance, maturity, height and lodging, were made through out the season. Each of the trial sites has been harvested and subsequently analysed for yield and will also be tested for receival standards. Samples from each development stage will be fully evaluated against industry standards for wheat quality and suitability for classification into WA commodity grades.

TRIAL DETAILS

Property	Nine trial sites located on farms in diverse locations (Arrino, Buntine (Steve Bryant), Cadoux, Esperance, Goomalling, Hyden, Katanning, Kellerberrin, Mingenew)
Plot size & replication	Plot size = 10m long x 1.2m wide; 3 replicates in each trial
Soil type	A range of soil types representative of each Ag Zone
Sowing date	All within the first 22 days of June, 2006
Seeding rate	Target 75 kg/ha
Fertiliser (kg/ha)	Rate & product is varied based on soil analysis results
Paddock rotation	Paddocks selected to reflect district practice and situations facing farming enterprises

RESULTS

The yield results of some of the new LongReach Plant Breeders wheat lines are shown in Table 1. in comparison with commercial varieties. The list shows only the top 10 ranked varieties, averaged across those trial sites (7) which proved to be statistically sound trials with a reasonable CV.

Table 1: Average yield of wheat sown in seven LongReach trials across the WA wheat belt in 2006.

	Goomalling		Buntine		Hyden		Mingenew		Esperance		Katanning		Arrino		WA Average		
Variety	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**t/ha**	**% of GM**	**RANK**
LongReach Guardian	3.2	139	1.8	118	2.3	112	1.0	132	2.4	120	2.0	130	1.7	115	2.1	124	1
Carnamah	2.7	119	1.9	124	2.3	112	1.1	138	2.1	106	1.9	124	2.0	138	2.0	121	2
Wyalkatchem	2.5	109	1.9	119	2.4	116	0.9	119	2.8	142	1.8	116	1.8	120	2.0	120	3
LPB04-0208	2.8	120	1.9	120	2.4	115	0.9	110	2.5	128	1.7	111	1.7	115	2.0	118	4
LPB0056	2.6	114	1.7	109	2.4	115	1.1	137	2.3	116	1.8	119	1.7	115	1.9	116	5
Datatine	2.8	123	1.6	100	2.6	125	0.9	113	2.2	109	1.7	112	1.7	118	1.9	115	6
Yitpi	3.0	130	1.7	109	2.5	121	0.8	105	2.2	109	1.6	108	1.5	101	1.9	114	7
Tammarin Rock	2.2	94	2.1	132	2.4	116	1.0	129	2.2	112	1.6	107	1.8	121	1.9	114	8
Arrino	2.6	115	2.1	132	2.2	104	0.8	98	2.2	110	1.6	106	1.8	121	1.9	113	9
Calingiri	2.8	123	1.8	113	2.2	107	0.8	106	1.9	98	1.8	121	1.6	110	1.9	112	10
Mean	**2.3**		**1.6**		**2.1**		**0.8**		**2.0**		**1.5**		**1.5**		**1.7**		

Reps w/data	3		3		3		3		3		3		3	
Entries w/data	74		74		74		74		74		74		74	
Design Used	RCB		RCB		RCB		RCB		RCB		RCB		RCB	
CV %	16.2		7.0		8.2		14.8		13.2		12.9		11.8	
RSQ:	0.54		0.84		0.72		0.67		0.66		0.61		0.65	

COMMENTS

The LongReach breeding objectives emphasise consistent field performance, attractive end-use quality and diverse disease resistance, and these targets are reflected in the evaluations conducted during the variety development process. Currently the LongReach breeding pipe line carries a diverse range of materials from numerous local and international sources, including derivatives of proven WA wheat lines. The 2007 trial program will continue testing a full range of germplasm, assessing each line for a range of agronomic features and post harvest traits. Promising lines will continue to be included in the NVT network to enable

[1] LongReach Plant Breeders is a division of Syngenta Seeds Pty Ltd.

growers to evaluate their suitability within each AgZone. LongReach Plant Breeders aim to have high quality milling wheats, with specific suitability to WA environments, available for commercial release within the next 2 years.

ACKNOWLEDGEMENTS

LongReach Plant Breeders acknowledges the assistance of numerous independent professional contract service providers and public agency researchers with the development of LongReach Guardian and the support of farmer co-operators in all parts of the Australian wheat belt who have provided trial sites since 2001.

PAPER REVIEWED BY: TONY KENT

DISEASE CONTROL FOR BARELY VARIETIES DEMONSTRATION

Chris O'Callaghan, R&D Co-ordinator, Liebe Group

AIM

To investigate the effectiveness of fungicides regimes for controlling net blotch and powdery mildew of barley.

BACKGROUND

Yield reductions in barley have been commonly noted by farmers in the Miling area in the past. These reductions have typically been due to leaf diseases such as net blotch and powdery mildew. This experiment targeted net blotch and powdery mildew before flag leaf emergence. Assimilates derived from photosynthesis in the flag leaf, flag leaf – 1 and the leaf sheath are known to greatly contribute toward final grain yield (Motley *et al*, 2004). Diseases that reduce photosynthetic area such as net blotch and powdery mildew reduce assimilate production and therefore reduce grain yield (Motley *et al*, 2004).

A seed dressing fungicide (Dividend) and foliar spray (Tilt) were applied to susceptible barley cultivars Gairdner and Baudin to determine the effect that applying these fungicides in different regimes has on yield, given that fungicides don't create yields, only protect yield potential. Powdery mildew should be treated early and when symptoms are not visibly severe whilst net blotch will usually spread from infected stubble onto the lower leaves then work its way up the plant, this can be treated as symptoms become apparent (Motley *et al*, 2004).

Dividend seed treatment provides systemic protection against seed-borne net blotch early in the season, however is ineffective for the control of powdery mildew. Tilt foliar fungicide provides protection against both powdery mildew and net blotch and is sprayed later in the season (1st -2nd node) to manage net blotch infections when the systemic protection wears off. This experiment aims to test how effective different regimes of fungicides are for protecting yield potential of barley.

TRIAL DETAILS

Property	Tony White, Miling
Plot size & replication	96m x 10m x 3 Replications
Soil type	Loamy Sand
Sowing date	30/5/06
Seeding rate	65 kg/ha: Baudin – Dividend 65 kg/ha: Gairdner + Dividend 65 kg/ha: Gairdner – Dividend 40 kg/ha: Baudin + Dividend
Fertiliser (kg/ha)	Macropro Extra 80 kg/ha, 100 L/ha Flexi-N
Paddock rotation	2005: Oat & Biserrula Silage, 2004: Wheat
Fungicides/Herbicides	Fungicides: Seed Dressing, Dividend – 100 ml/100kg, Foliar Spray, Tilt – 250 mL/ha applied at 2nd node Herbicides: Treflan 1.5 L/ha; Metrabuzin 50 g/ha; LVE 500 mL/ha; Logran 7 g/ha;
Growing Season Rainfall	185mm

RESULTS

Table 1: Yield and quality of Gairdner and Baudin barley treated with and without fungicide treatments.

Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Weight (g)	Payment Grade
Baudin (control)	1.84 a	13.53	56.76	318.5	Feed
Baudin + Dividend + Tilt	1.82 a	13.77	57.27	318.0	Feed
Baudin + Dividend	1.79 ab	13.89	63.76	311.3	Feed
Baudin + Tilt	1.76 ab	13.31	55.63	315.6	Feed
Gairdner + Tilt	1.71 bc	13.88	65.44	316.9	Feed
Gairdner + Dividend + Tilt	1.64 cd	14.02	52.26	321.5	Feed
Gairdner (control)	1.64 cd	14.44	66.07	318.0	Feed
Gaidner + Dividend	1.62 d	14.52	63.00	320.5	Feed
LSD	0.08				

Yields with common letters are not statistically significantly different (P=0.05).

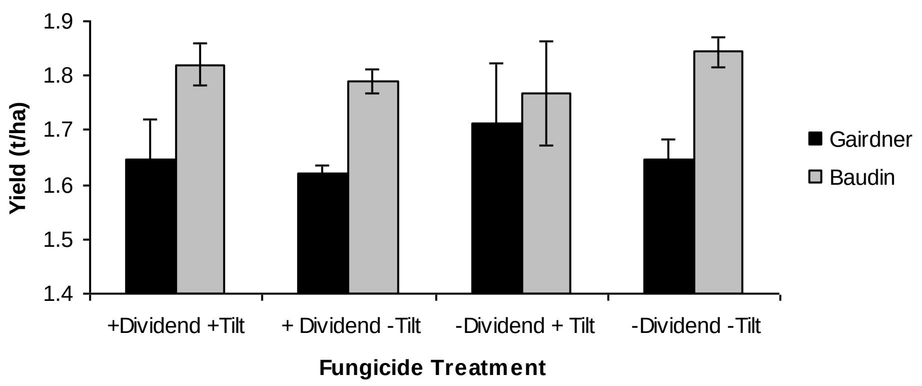


Figure 1: Mean yield and standard errors of Baudin and Gairdner cultivars under differing fungicide treatments.

ECONOMIC ANALYSIS

Table 2: Economic Analysis ($/ha)

Treatment	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin
Baudin	1.84	456.32	178.83	277.49
Baudin + Dividend + Tilt	1.82	451.36	186.30	265.06
Baudin + Dividend	1.79	443.92	179.80	264.12
Baudin + Tilt	1.76	436.48	185.33	251.15

Gairdner + Tilt	1.71	424.08	185.33	238.75
Gairdner + Dividend + Tilt	1.64	406.72	186.91	219.81
Gairdner	1.64	406.72	178.83	227.89
Gaidner + Dividend	1.62	401.76	180.41	221.35

Based on farm gate return of $248/t for feed barley as of 28th December, 2006.

COMMENTS

- Baudin produced a statistically higher yield than Gairdner under all treatment regimes.
- The dry growing season lead to a very low disease presence in the plots. This therefore eliminated any yield reductions that may be caused by disease infection, rendering fungicide treatments ineffective.
- Under non-experimental cropping situations, foliar fungicide sprays would not have been applied in the absence of disease, however in this trial the cost of foliar applications were not returned through improved yield.

ACKNOWLEDGEMENTS

Thank you to Tony White for conducting the demonstration.

REFERENCE

Motley, K., Rice, A. & Murray, G. (2004) *Protecting this years cereal crop with foliar fungicides*. Grains research and development co-operation, Forbes, NSW.

PAPER REVIEWED BY: BRIANNA PEAKE

ROTATION STILL A BENEFIT IN DRY YEARS

Steve Milroy & Kelley Whisson, CSIRO Plant Industry
Mick Poole, Research Consultant

CSIRO PLANT INDUSTRY

AIM

To explore constraints to wheat yield potential in the northern sandplain region.

BACKGROUND

In our environment, wheat yield is ultimately limited by rainfall amount and distribution. However, the rainfall-limited yield potentials are rarely met. Previous results from this experiment suggest that potential yields can be approached using management tools available to growers. This is the second cycle of an experiment which has included rotation crops, ripping and nitrogen rates.

TRIAL DETAILS

Property	Liebe Long Term Trial Site, West Buntine	
Plot size & replication	Main plots (Rotation) Subplots (N rates x Ripping) Treatment Design Experimental Design Replicates	= 10m 40m = 2.5m 20m = Factorial = randomized complete block = 4
Soil type	Deep yellow sand	
Sowing date	24 May 2006	
Seeding rate	Wheat (cv. Wyalkatchem) 90 kg/ha	

Fertiliser (kg/ha)	N as per treatment: 0, 40, 80 or 120 kg/ha
Paddock rotation	As per treatment: 2003 2004 2005 2006 wheat wheat wheat wheat canola wheat canola wheat lupin wheat lupin wheat serradella wheat serradella wheat lucerne lucerne lucerne wheat
Herbicides	Roundup 4 L/ha Trifluralin 1.7 L/ha
Growing Season Rainfall	128mm

RESULTS

This season's results were remarkable for the lack of response by the wheat crop to nitrogen or ripping. Neither factor affected yield or grain size / screenings. There was however, a considerable effect of rotation on yield. The yield of wheat after wheat was 1.44 t/ha and that of wheat after lupins was 1.93 t/ha. That is an increase of over 30% in yield. Grain size was not adversely affected by this increase in yield. All grain sizes were large and all treatments had less than 2% screenings except for the N=0 treatment in the wheat after wheat rotation. The N=0 treatments had received no N for four seasons.

It is interesting to note that the benefit of the lupin rotation could not be replaced by the application of fertiliser N in this season.

Lucerne has the benefit of drawing water from deep in the profile over the whole year, which is helpful for reducing the risk of salinity. However, this can cause a yield penalty in crops following lucerne if it is a dry season. In our results, even given the very dry season in 2006, there was no penalty relative to wheat after wheat, but wheat after lucerne did yield substantially less than wheat after the other two legume rotations.

Table 1: Yield and screenings of wheat sown in 2006 after different rotation species. Results are averaged over the ripping and fertilizer treatments since these had no effect. Grain protein results are not yet available.

Rotation	Yield (t/ha)	Protein (%)	Grain size (mg)	Screenings (%)
Wheat after Wheat	1.44	N/A	42.5	1.55
Wheat after canola	1.78	N/A	42.7	1.24
Wheat after lupin	1.93	N/A	42.1	1.14
Wheat after Serradella	2.08	N/A	43.1	1.20
Wheat after lucerne	1.34	N/A	41.0	1.09
LSD (5%)	0.16		0.8	

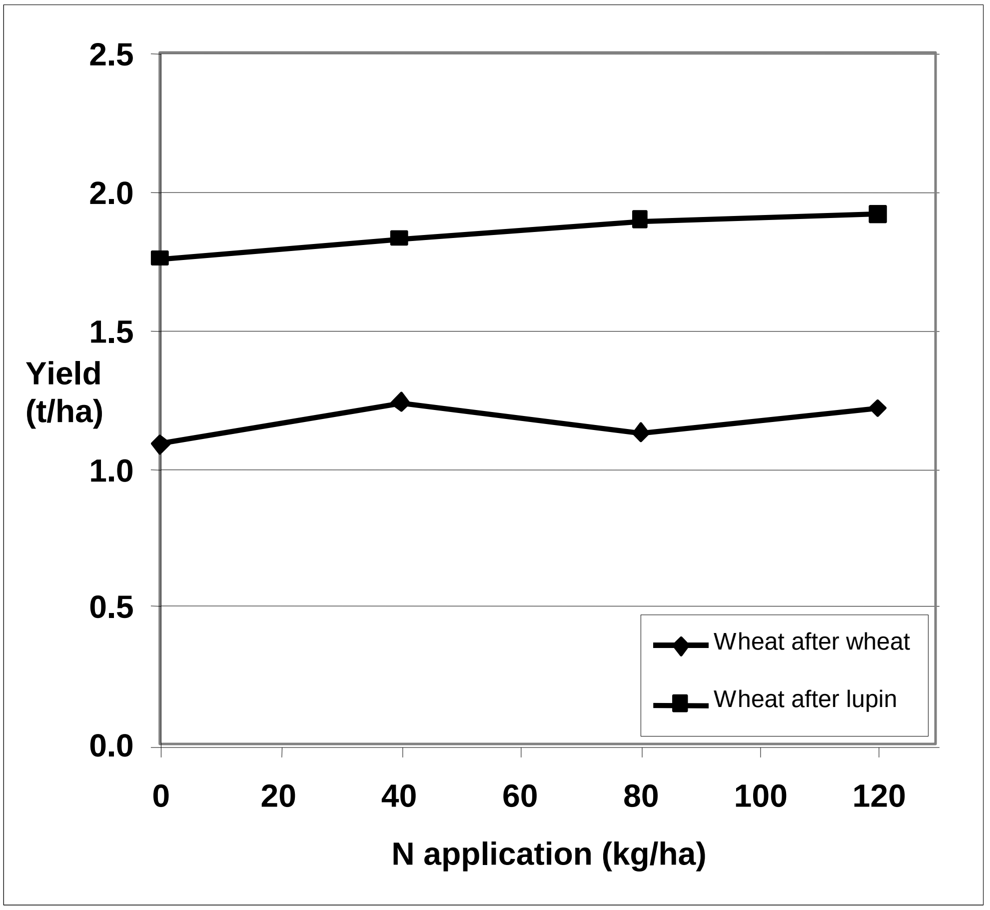


Figure 1: Yield of wheat grown after wheat and of wheat grown after lupin for four rates of nitrogen applied to the wheat. Applied N did not increase yield for either treatment in this year.

ECONOMIC ANALYSIS

Table 2: Cumulative gross margin for the lupin/wheat and wheat/wheat cropping sequences. For clarity, calculations are all based on 2006 prices.

Year	Yield (t/ha)	Lupin/wheat	Wheat/Wheat
2005	Crop	*Lupin*	*Wheat*
	Yield (t/ha)	*1.46*	*1.89*
	Gross Return	$284.70	$367.57
	Variable costs	$184.94	$160.32
	Gross Margin	$99.76	$207.25
2006	Crop	*Wheat*	*Wheat*
	Yield (t/ha)	*1.93*	*1.44*
	Gross Return	$375.35	$280.05
	Variable costs	$211.32	$211.32
	Gross Margin	$164.03	$ 68.74
Combined	Cumulative GM	$263.79	$275.99

Wheat price based on EPR for ASW Base Price $229/tonne. Lupin price based on ABARE data for Dec 2006. Input costs based on actual seed, fertilizer and herbicide, with other costs taken from DAFWA estimates for the NAR.

COMMENTS

Yields were low due to low rainfall. In spite of this marked constraint, there was still a clear benefit in wheat yield from the rotation crops. At this stage of the analysis it is not possible to separate out the reasons for this. It could be due to reduced disease, altered root penetration or other causes. In both cycles of the experiment the two-year cumulative gross margin for the lupin/wheat sequence has been similar to the wheat/wheat sequence. The low returns from lupin were offset by the increased yield of the subsequent wheat crop. The actual economic benefit of the cropping sequences depends to a large extent on the relative prices of the grains.

Using the French-Shultz analysis based on rainfall indicates a very high water use efficiency by the wheat. There was considerable preseason rain that is often not counted in French-Shultz calculations. In a dry season this makes up a significant proportion of the total water use. A full analysis of the water use of the crops over the course of the experiment will be reported later in the year as part of the final report of this project which concludes in mid 2007.

ACKNOWLEDGEMENTS
Thanks to the staff of the Liebe group for their support and to Stuart and Leanne McAlpine for their ready cooperation, assistance and patience. This research was co-funded by GRDC and CSIRO.

PAPER REVIEWED BY: DR PHIL WARD

INTERACTION OF TIME OF SOWING AND WEED MANAGEMENT OF LUPINS

Martin Harries & Jo Walker, DAFWA, Geraldton

AIM

- To better understand the tradeoffs between lupin yield and weed management with delayed sowing.
- To demonstrate shielded spraying in controlling large weed populations, which often arise after dry sowing.

BACKGROUND

Growers need to know the effect of altering time of sowing and sowing tactic (dry vs wet sown) on costs in terms of lupin yield and the benefits in terms of weed control. Sowing time and weed burden interact to affect final yield. This interaction of weed burden and sowing time on yield is dynamic and dependant on environment. Trials were sown with the Liebe Group and the Mingenew Irwin Group in an attempt to better understand the effect of dry and wet sowing on weed burden and yield over two differing rainfall zones.

It was intended to use a shielded sprayer to control weeds in some plots, however due to the season this treatment was not undertaken. The aim was to see if weeds could be effectively controlled in dry sown crops using a shielded sprayer. If this can be achieved it gives the option to dry sow without sacrificing weed control.

TRIAL DETAILS

Property	Ian Syme, Main Trial Site, Buntine.
Plot size & replication	50cm plots 2.0m x 18m, 25cm plots 1.75m x 18m, 4 replications.
Soil type	Red sandy loam grading to a clay at a depth of 30-40cm. pH 5.0 ($CaCl_2$) grading to 5.8 at 30cm.
Sowing dates	28/4/06 (Dry), 17/5/06 (On the break, the day after 14.5 mm), 30/5/06
Seeding rate	100 kg/ha cv. Mandelup
Fertiliser (kg/ha)	80 kg/ha Super deep banded below the row
Row spacing (cm)	50 & 25
Paddock rotation	2005= Wheat, 2004= Wheat, 2003= Wheat, 2002= Volunteer Pasture
Herbicides	Glyphosate 1.0 L/ha and simazine 1.5 L/ha immediately prior to each time of sowing. No post emergent herbicides were applied.
Growing Season Rainfall	124mm

RESULTS & DISCUSSION

Results presented are from Buntine, the trial seeded at Mingenew was abandoned.

There were significant differences in the numbers of lupins established at each time of sowing (Figure 1). The second time of sowing, seeding soon after the break, gave the poorest establishment. This occurred because the seeding operation dried the soil in a marginal moisture situation. The third time of sowing had the best establishment because it was sown into the best, wettest, seeding conditions.

The trial was designed to achieve a range of weed populations. It was anticipated that by using the different seeding strategies (dry, on the break and delayed after the break) this would be achieved. This did occur (Table 1, Figure 2). Weed populations prior to seeding were lowest in the dry sown and highest in the delayed sown. Hence by delaying seeding a higher proportion of the weed seed bank was controlled by knockdown herbicides and tillage at seeding. Conversely when weed populations were measured in August the dry sown plots had the highest weed populations and the late sown plots the lowest. The dry sown plots had almost five times the weed population of the delayed sown plots (Figure 2). At the end of the season all the ryegrass from the plots was harvested and weighed. Again the dry sown plots contained more ryegrass plants (Table 1). There was a clear trend that the earlier the plots were sown the more ryegrass biomass they contained (Figure 3).

Lupins were hand harvested. The final lupin dry matter (Table 1) includes the weight of whole plants with seed. Seed yield was too low to be worth threshing the plants. Throughout the trial, plants from the third time of sowing were visually much smaller than the earlier sown treatments. While individual plants were smaller in the third time of sowing the better establishment rate compared to the other treatments compensated for this and there were no significant differences in final lupin dry matter.

Row spacing did not influence any of the variables measured. It was included with the aim of using a shielded sprayer. This was not used as the crop was too poor.

Table 1: Weed population and lupin growth as affected by time of sowing and row spacing.

					Ryegrass			Lupin	
Sowing time	**Row spacing (cm)**	weeds/m2 prior to seeding	Establishment 18/6 (ppm2)	Weeds/ m2 3/8	Final No. plants	Plant wt. (g)	Total DM (g/m2)	Final pt. wt. (g)	Final DM (g/m2)
Dry	25	1.3	43.2	22.0	319	1.8	16.1	2.5	205.0
Dry	50	1.3	39.9	23.8	356	1.4	15.8	2.1	138.5
On the break	25	9.5	34.5	10.3	147	2.3	11.6	2.1	107.5
On the break	50	10.0	28.8	16.3	176	2.7	14.0	2.6	125.0
10-14 days after the break	25	12.8	58.9	1.5	152	1.4	5.8	1.4	151.5
10-14 days after the break	50	12.0	52.8	7.0	157	1.6	6.0	1.5	132.5
LSD 5% Sowing time		hs (3.175)	hs (8.31)	hs (8.42)	hs (89.6)	s (0.875)	ns	ns	ns
LSD 5% Row spacing		ns	ns	ns	ns	ns	ns	ns	ns

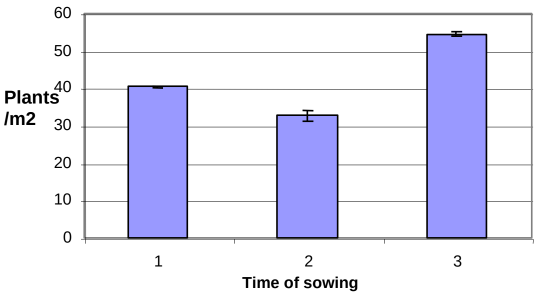


Figure 1: The effect of time of sowing on establishment.

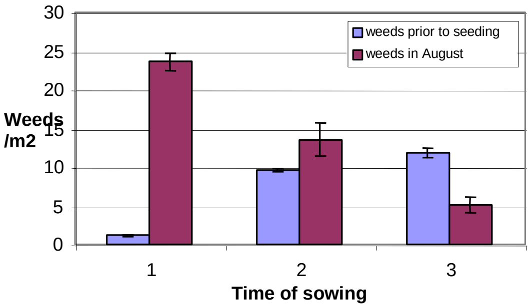


Figure 2: Weed populations prior to seeding and in August.

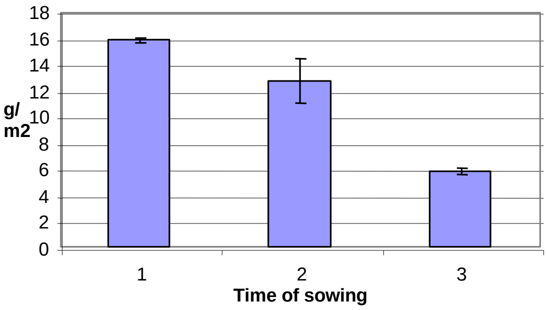


Figure 3: Ryegrass biomass at the end of the season.

COMMENTS

Dry sowing resulted in the poorest weed control at seeding and as a consequence this treatment was the weediest later in the year. Establishment was best at the third time of sowing. A well established crop will compete against weeds more vigorously than a poor established weak crop. Clearly delaying sowing is the best option for weed control. This needs to be weighed against typical yield declines of the district. Shielded spraying was not used in this trail due to the poor yield of the crop. If shielded spraying can be used effectively it will give a robust weed management option that can be utilised in conjunction with dry sowing, alleviating the need to delay sowing for adequate weed control.

ACKNOWLEDGEMENTS

– These trials were done in partnership with Liebe and Mingenew Irwin groups.
– GRDC for financial support of the lupin agronomy program.
– Department of Agriculture Wongan Hills and Geraldton Research Support Units.

PAPER REVIEWED BY: WAYNE PARKER

CHICKPEA TESTING, DALWALLINU WEST - STAGE 4

Jennifer Garlinge, DAFWA, South Perth

AIM

Evaluate new and existing chickpea varieties.

TRIAL DETAILS

Property	Harry Hyde, West Dalwallinu
Soil Group	Soil pH (CaCl2) 6.2@10cm. 6.6@30cm.
Sowing date	18/5/06
Seeding rate	72 kg/ha
Fertiliser (kg/ha)	18/5/06: Diammonium phosphate (D.A.P) 80 kg/ha
Pesticides	15/4/06: P Pickel-T (Thiabedazole+Thiram) 2 mL/kg 18/5/06: Sprayseed 2 L/ha; Simagranz simazine granules 830 g/ha; Bayer Balance 750 WG 100 g/ha; Talstar 100 mL/ha 4/7/06: Bravo - chlorothalonil @ 1.5 L/ha 25/7/06: Aramo 300 mL/ha 12/9/06: Bravo - chlorothalonil 1.8 L/ha 15/9/06: Dominex 200 mL/ha

RESULTS

Test Name	Yield (kg/ha)	% of Sonali
Kyabra	662	128*
Sonali	518	100
Genesis090	495	96
Genesis836	486	94
Howzat	459	89
Yorker	420	81*
Flipper	419	81*
Rupali	413	80*
Rupali	393	76*
Genesis508	392	76*
Rupali	377	73*
Rupali	334	64*
		**= Significant (0.05)*
Mean	453	
Ave. SED	50	
CV	13.5	
Adjusted Yield Data. Obs. Date 8th Nov		

COMMENTS

Pre Sowing	Sprayed and cultivated by farmer in April.
Early Season	Droughted. Slow growth.
Mid Season	Droughted. Stressed growth.
Pre Harvest	Droughted. Some insect damage.

CHICKPEA TESTING, CARNAMAH – STAGE 4

Jennifer Garlinge, DAFWA, South Perth

Department of Agriculture and Food

AIM

Evaluate Chickpea Varieties.

TRIAL DETAILS

Property	Bruce White, Carnamah
Soil Group	Loamy Earth – Alkaline. Soil pH (CacCl2) 6.3@10cm. 8.3@30cm.
Seeding Rate	71 kg/ha
Rotation	2005= Good Clover Pasture, 2004 = Wheat, 2003 = Good Clover Pasture, 2003 = Good Clover Pasture, 2003 = Good Clover Pasture.
Sowing date	17/5/06
Fertiliser (kg/ha)	17/5/06 Diammonium phosphate (D.A.P) 80 kg/ha
Pesticides	15/4/06: P Pickel-T (Thiabedazole+Thiram) 2 mL/kg 17/5/06: Simazine 2 L/ha; Lorsban 500 EC 900 mL/ha 22/6/06: Select 250 mL/ha 20/9/06: Fastac Duo (BASF) 250 mL/ha

RESULTS

Test Name	Yield (kg/ha)	% of Sonali
97037-1465	499	110
CICA0603	493	109
WACPE2117	469	104
99011-1007	465	103
97020-1489	458	101
38-01V4050	456	101
Sonali	452	100
97020-1351	445	99
97020-1561	433	96
WACPE2135	433	96
CICA0505	432	96
Rupali	427	95
99315-1130	425	94
Flip94509C	418	93
99004-1203	406	90
Flip94510C	402	89
Genesis836	401	89
97144-1118	395	87
97039-1415	391	87
97020-1488	389	86
98119-1-5	384	85*
97020-1893	380	84*
WACPE2133	376	83*

98047-2-12	375	83*
WACPE2115	375	83*
WACPE2119	371	82*
WACPE2128	371	82*
97020-1898	368	81*
97020-1343	358	79*
WACPE2116	358	79*
Flipper	354	78*
97020-1727	355	79*
Genesis508	354	78*
WACPE2120	344	76*
98318-3007	342	76*
Howzat	341	75*
WACPE2129	340	75*
WACPE2126	337	75*
WACPE2122	334	74*
98346-1-4	327	72*
WACPE2132	326	72*
CICA0503	319	71*
Genesis508	319	71*
WACPE2138	317	70*
Rupali	316	70*
WACPE2130	316	70*
WACPE2136	313	69*
WACPE2113	306	68*
Genesis508	306	68*
Genesis508	304	67*
Genesis508	303	67*
Yorker	301	67*
Genesis090	289	64*
WACPE2134	276	61*
WACPE2118	269	60*
Genesis508	263	58*
WACPE2127	260	58*
Genesis508	259	57*
WACPE2123	250	55*
WACPE2121	245	54*
WACPE2124	240	53*
Kyabra	227	50*
Genesis508	212	47*
		**=significant (0.05)*
Mean	355	
Av. SED	46	
CV	16	
Adjusted Yield Data. Obs. Date: 6th Nov		

COMMENTS

- Wimmera Rye Grass. Score 4 (Early season). 2 (Mid season (04 SEP)).
- Capeweed Score 4 (Early season). 2 (Mid season (04 SEP)).
- DROUGHT Score 5 (Mid season (04 SEP)).

Grain Yield comments - [P:1A,1,plot 118 not Genesis 90]

Report as at 12:43:07 10 JAN 2007 analysis as at 28 NOV 2006.

FIELD PEA TESTING – STAGE 4

Jennifer Garlinge, DAFWA, South Perth

AIM

Evaluate early maturing barley varieties.

TRIAL DETAILS

Property	Harry Hyde, West Dalwallinu
Soil Group	Soil pH (CaCl2) 6.2@10cm. 6.6@30cm
Sowing date	18/5/06
Fertiliser (kg/ha)	18/5/06: Diammonium phosphate (D.A.P) 80 kg/ha
Pesticides	15/4/06: P Pickel-T (Thiabedazole+Thiram) 2 mL/kg 18/5/06: Spinnaker 70 g/ha; Sprayseed 2 L/ha; Talstar 100 mL/ha 4/7/06: Bravo - chlorothalonil 1.5 L/ha 25/7/06: Aramo 300 mL/ha 12/9/06: Bravo - chlorothalonil 1.8 L/ha 15/9/06: Dominex 200 mL/ha

RESULTS

Test Name	Treatment	Yield (kg/ha)	% of Kaspa	Lodging Resistance score	% of Kaspa
Kaspa	80 Plants/m2 Semi-leafless	599	100	4	93
Moonlight	80 Plants/m2 Semi-leafless	534	89	3	70
Kaspa	80 Plants/m2 Semi-leafless	523	87	3	70
Kaspa	80 Plants/m2 Semi-leafless	512	85*	3	70
Sturt	67 Plants/m2 Conventional	490	82*	-	-
Dunwa	67 Plants/m2 Conventional	468	78*	-	-
Parafield	67 Plants/m2 Conventional	468	78*	-	-
Helena	67 Plants/m2 Conventional	468	78*	-	-
Yarrum	80 Plants/m2 Semi-leafless	349	58*	2	47
Bundi	80 Plants/m2 Semi-leafless	338	56*	2	47
					**=significant (0.05)*
Mean		500		3	
Av. SED		61			

CV		14.9			
Adjusted Yield Data, Observation Data unadjusted. Obs. Dates: Yield: 9th Nov. Lodging Res. Score 9th Nov.					

COMMENTS

Pre Sowing	Sprayed and cultivated by farmer in April.
Early Season	Droughted slow growth.
Mid Season	Droughted stressed growth.
Pre Harvest	Droughted some insect damage.

Report as at 11:23:30 03 JAN 2007 analysis as at 11 DEC 2006.

KASPA FIELD PEA VARIETY DEMONSTRATION

Wayne Parker, DAFWA, Geraldton

BACKGROUND

Field pea blackspot continues to be a debilitating disease of field pea in the northern agricultural region. Fungicides are expensive and ineffective and varieties currently available are not resistant. The most effective form of management is to sow late to avoid early infection. This restricts selection to short season varieties. Kaspa has many characteristics making it easier to harvest but it is not recommended for this region. Kaspa is a medium to long season variety and can't be sown late to avoid disease without compromising yield. This demonstration aimed to test the yield ability of a very early flowering experimental line WAPEA2113 that has similar harvest characteristics to Kaspa. Such a variety would lower blackspot prevalence and the cost of delayed sowing to avoid blackspot infection. If successful, such a variety could be sown late without compromising yield. A short season erect type pea would also reduce the harvest losses as occurred in this trial.

Trailing varieties Helena and Dunwa were included in the demonstration. These varieties have been the recommended varieties for Agzone 4. While biomass of these varieties was large, and yield potential high, much of the yield was lost due to pod shatter prior to, and during, harvest.

An early flowering experimental line WAPEA2113 made up the fourth variety in the demonstration. The variety has many favourable attributes for growers in low rainfall and high blackspot risk areas although it is still under evaluation and may not make it to release. The variety has yet to show consistent yield.

Despite its supposed lack of fit, Kaspa continues to impress as it out yielded the three other varieties in the demonstration. This can be put down to its height and ease of harvest. If paddocks aren't prepared and harvesters aren't set up for trailing field pea, then harvest losses make field pea uneconomic.

TRIAL DETAILS

Property	Rob Nankivell, East Maya

Soil type	Grey clay
Sowing date	13/5/06
Seeding rate	Approximately 102 kg/ha for each variety
Fertiliser (kg/ha)	107 kg/ha CSBP Big Phos
Paddock rotation	1999: hail damaged lupins 2000-2005: wheat
Growing Season Rainfall	**70mm,** January to April 240mm.

RESULTS

Table 1: Yield of each variety in each plot, averages and standard error shown.

Variety	Yield (kg/ha)	Average	SE
Helena	672		
Helena	634		
Helena	372	**559**	13
WAPEA2113	657		
WAPEA2113	542		
WAPEA2113	603	**601**	8
Dunwa	733		
Dunwa	802		
Dunwa	1020	**852**	12
Kaspa	1310		
Kaspa	1420		
Kaspa	1300	**1343**	8
LSD		**273**	

Table 2: Economic Analysis ($/ha).

Treatment	Yield (kg/ha)	Gross Return	Variable Costs	Gross Margin
Helena	559	165	170	-5
WAPEA2113	601	178	170	8
Dunwa	852	251	170	81
Kaspa	1343	396	170	226
*Based on Milling Price $295/tonne				

COMMENTS

- The yield of Kaspa was very impressive given the in season rainfall.
- WAPEA2113 flowers before it has grown enough biomass to fill the pods it flowers. This is one of the main reasons for its low yield in this trial. It is not likely to see release because of poor yield reliability.
- The trial was harvested using a conventional front. Huge yield variations between semi leafless and trialling varieties can be attributed to this. Much of the seed from Dunwa and Helena will have been left on the ground through harvest loss and pod shatter.

ACKNOWLEDGEMENTS

Many thanks to Rob Nankivell and Jade Bagley. Rob Nankivell for providing the time and machinery at sowing and harvest and Jade Bagley for the preparation of trial details.

PAPER REVIEWED BY: MARTIN HARRIES

NATIONAL VARIETY TRIAL, CANOLA - BUNTINE

Information from ACAS (Australian Crop Accreditation System)

AIM

Evaluate new and existing canola varieties.

TRIAL DETAILS

Property	Ian Syme, Main Trial Site, Buntine
Soil type	Loam
Sowing date	17/5/06
Fertiliser (kg/ha)	17/5/06: Maxam 150 kg/ha; MAPSCZ plus 100 kg/ha banded; 28/7/06: Maxam 150 kg/ha;

Paddock rotation	2005= Lupins, 2004= Wheat, 2003= Volunteer Pasture, 2002= Serradella/cadiz, 2001= Wheat
Herbicides	17/5/06: Chlorpyrifos @ 1 L/ha; Roundup Powermax @ 2 L/ha; Atrazine @ 2 L/ha; Trifluralin 1.7 L/ha 3/7/06: Atrazine @ 2 L/ha; Targa @ 375 mL/ha; Chlorpyrifos @ 2L/ha 27/7/06: Select @ 250 mL/ha; Hasten 1% v/v; Fastac due 400 mL/ha

RESULTS

Variety	Yield (t/ha)	Oil (%) (Moisture Corrected	Meal Protein Content (%) (Moisture	Seed Protein (%) (Moisture
ATR Banjo	0.19	37.2	41.4	25.0
ATR Barra	0.07	35.2	40.9	25.6
ATR Beacon	0.14	33.6	39.5	25.4
ATR Hyden	0.22	35.5	42.1	26.2
ATR Marlin	0.26	36.9	41.9	25.4
ATR Stubby	0.23	35.5	40.8	25.5
ATR Summitt	0.05	33.8	38.7	24.8
BravoTT	0.17	34.4	39.7	25.1
CBWA Boomer	0.30	37.4	42.6	25.7
CBWA Trigold	0.30	38.2	40.4	24.0
Flinders TTC	0.16	35.3	40.4	25.3
Rottnest TTC	0.23	33.6	39.6	25.5
Surpass 501 TT	0.13	39.9	40.9	23.6
Tanami	0.31	34.8	40.4	25.4
ThunderTT	0.10	34.4	40.4	25.6
TornadoTT	0.20	37.3	41.7	25.1

COMMENTS

For further information please refer to www.nvtonline.com.au.

Peter Burgess from Agritech will be presenting NVT results for the Liebe region at Liebe Group Crop Updates, 7th of March, 2007.

PRODUCTIVE PASTURES IN THE WHEATBELT

David Scholz, Elders Ltd, Dalwallinu/Kalannie

AIM

To demonstrate the growth of different pastures and pasture mixes in comparison to current practices.

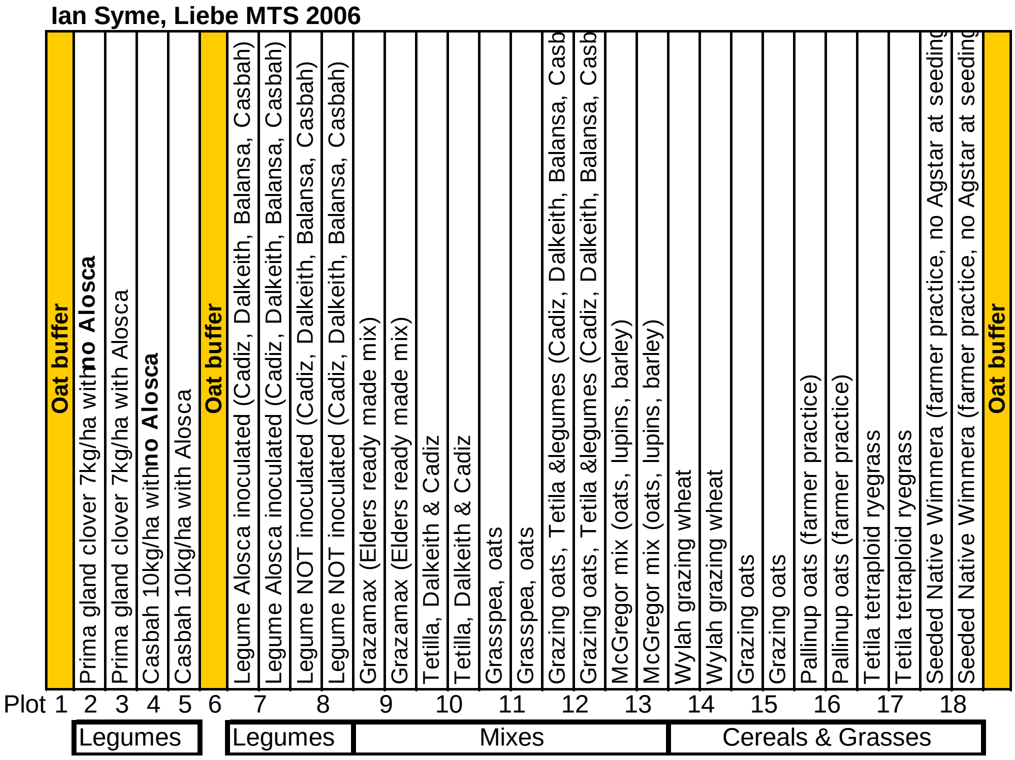
BACKGROUND

In a dry year such as this, one or two paddocks of improved pasture can provide extra feed and be the difference between retaining or selling stock. Improved pastures also provide rotational benefits such as increasing soil nitrogen, improving soil organic matter and providing options for control of grasses and radish. Elders have released ready-made pasture mixes (eg. Grazamax, included in this trial) and this is being compared to “make your own” mixes and oats, grasses or legumes by themselves. Current practices are also reflected with the Pallinup oats and Wimmera ryegrass plots seeded. The granular inoculant Alosca, an innovative method of legume inoculation, is also demonstrated.

TRIAL DETAILS

Plot size & replication	Demonstration strips with two reps of each treatment x 20m.
Soil type	Loamy sand, cloddy at seeding with poor seed / soil contact
Sowing date	29/5/06
Seeding rate	Various
Fertilisers/timing	All plots received 80 kg/ha Agstar deep banded or PSPE (Alosca demo), tactical strip N & K
Herbicides/timing	Roundup Powermax 1.2 L/ha + 25 mL/ha Hammer IBS
Insecticides/timing	1.5 L/ha Chorpyrifos IBS

TREATMENT LAYOUT



RESULTS

Table 1: **Above ground biomass (kg/ha) cut from**

Plots	kg/ha
prima no alosca	236
prima alosca	235
casbah no alosca	362
casbah alosca	255
legumes alosca (extra N/K)	726
legumes no alosca (extra N/K)	586
legumes alosca (No extra N/K)	352
grazamax	1336
tetila,losa,cadiz	1686
g.oats,tetila,legumes (extra N/K)	974
g.oats,tetila,legumes (No extra N/K)	1302
oats, lupins, barley mix	922
Wylah g.wheat	959
g. oats (Lordship)	1944
pallinup oats	1788
tetila ryeg	985
wimmera ryeg	414
grasspea oats	400

Table 1 gives the biomass taken from a single cut from each plot taken 21st September. These measurements only give an indication of pasture growth as plots were very variable and only one cut was taken per plot.

Grasses, especially oats, gave the highest biomass. The grazing oats (Lordship) produced 1.9 t/ha followed by Pallinup oats with 1.8 t/ha. These were followed by mixes that had a grass component. Another notable difference was the low production from the native Wimmera ryegrass compared to Tetila tetraploid ryegrass. Legumes gave a general trend for lower biomass when compared to cereals and grasses (at the time of sampling).

The difference in plots with or without Alosca was variable. This corresponded with visual

COMMENTS

The trial was seeded just after a 5mm rainfall event. This was not enough for complete germination and the next decent rain was not until towards the end of June. Had it been before the 5mm the trial would have had a much better start. The site was also variable across the workings with some hardpan evident and some patches did germinate before others. The oats had the best germination in the dry conditions, which was generally reflected in the biomass measurements. The legumes did not germinate until late July, which hindered their biomass production. As a general comment this trial looked depressingly ordinary until the late rain on 8th September. The 2006 trial is in stark contrast to the astounding production we got last year on Hyde's property (main trial site 2005).

Earlier production from cereals compared to legumes was evident in this trial, especially the long season grazing oats. The late season production from legumes following late rains demonstrated the value from seeding seed mixes with cereal and legume components.

The legumes were just cranking up after the good rain 8th September and warm weather, therefore extra growth did occur with the legumes after the measurements were taken. Likewise, the longer season grasses such as Lordship oats and Tetila ryegrass also improved markedly with the late rain.

ACKNOWLEDGEMENTS

Peter Carlton and Bevan Addison for seeding trial, Brianna Peake and Emma Glasfurd for assistance with trial setup, seed and measurements.

PAPER REVIEWED BY: PETER CARLTON

SELECTION & EVALUATION OF AUSTRALIAN LEGUMES FROM THE GENUS *CULLEN* FOR PERENNIAL PASTURE PHASES – NE WHEATBELT TRIAL

THE UNIVERSITY OF WESTERN AUSTRALIA

Richard Bennett, UWA, CRC for plant based management to dry land salinity

AIM

To evaluate the *Cullen* genus, a group of Australian perennial legumes, to select species useful for perennial pastures adapted to the northern wheatbelt's low rainfall and acid soil conditions.

BACKGROUND

Native Australian species from the legume genus *Cullen* have some attributes that may make them useful new perennial pasture species. They generally have excellent seedling vigour, biomass production, drought tolerance and seed production. Due to the fact that they are natives, they may also be very well adapted to the highly acid Australian soils that limit the use of lucerne.

There is a great deal of variation within the 120 ecotypes and 9 species available in germplasm resource centres. The variation needs to be identified and characterised before the species and collections that are best adapted to use as pastures can be selected. For example, different species and different collections within a species have different growth habits, with some strongly prostrate and others erect or shrubby. Some species and collections originally come from the arid interior of Australia and others from high rainfall zones in eastern Australia. It is expected that this variation to affect agronomic attributes like grazing tolerance, drought tolerance, ability to easily harvest seed, nutritive value and productivity.

This field trial will explore and document this variation and will be combined with information from a similar trial at the UWA Shenton Park Field Station and glasshouse trials to select collections of *Cullen* that are productive, persistent, nutritious, tolerant of grazing and well adapted to the acid sandplain soils of WA's wheatbelt.

TRIAL DETAILS

Property	Liebe Group long term research site – West Buntine
Plot size & replication	Total size – 25m by 45m. Three replicates, each with three plants of 105 collections – 945 plants in total
Soil type	Loamy sand, pH in water ~ 5
Sowing date	Seedlings were established for 5 weeks in the glasshouse and then planted out on 6/9/06
Seeding rate	Single plants spaced 1 metre apart
Fertiliser (kg/ha)	None (50 kg/ha TSP applied to site on 8/5/06 when seeding lupin crop)
Paddock rotation	Paddock has come out of wheat into lupins which were sprayed out a month before sowing
Herbicides	Knockdown area prior to hand planting 2 L/ha Glyphosate
Growing Season Rainfall	131mm

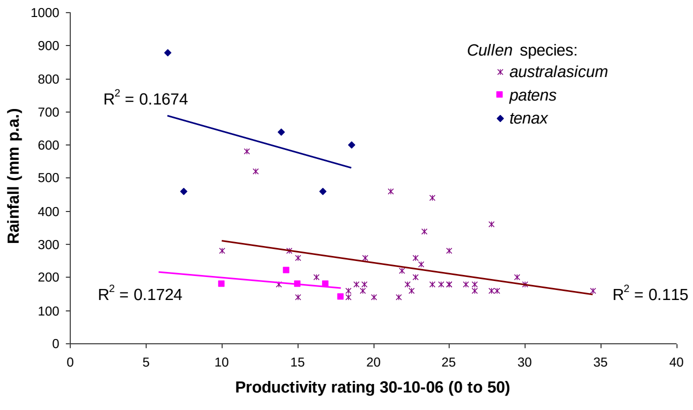


Figure 1: Average productivity rating of *Cullen* collections compared to the average annual rainfall of collection sites.

RESULTS

Results from the last three months monitoring are just beginning to be analysed.

A comparison of the average productivity of collections over the first three months and the average rainfall of their collection sites (Figure 1) shows some general trends indicating that, for most species, collections from low rainfall areas produce more biomass in the dry conditions at Buntine. These correlations are weak but it is hoped that they will strengthen over time.

The opportunity arose to assess the palatability differences between collections, following a moderate locust attack November. The average damage to different collections of *Cullen australasicum* and *Cullen tenax* by locusts is shown in Figure 2. It is clear that *C. tenax* is highly palatable; with a few exceptions, and also that most collections of *C. australasicum* are only moderately palatable. It is still unclear as to how well grazing preferences of locusts correlates with that of sheep and cattle.

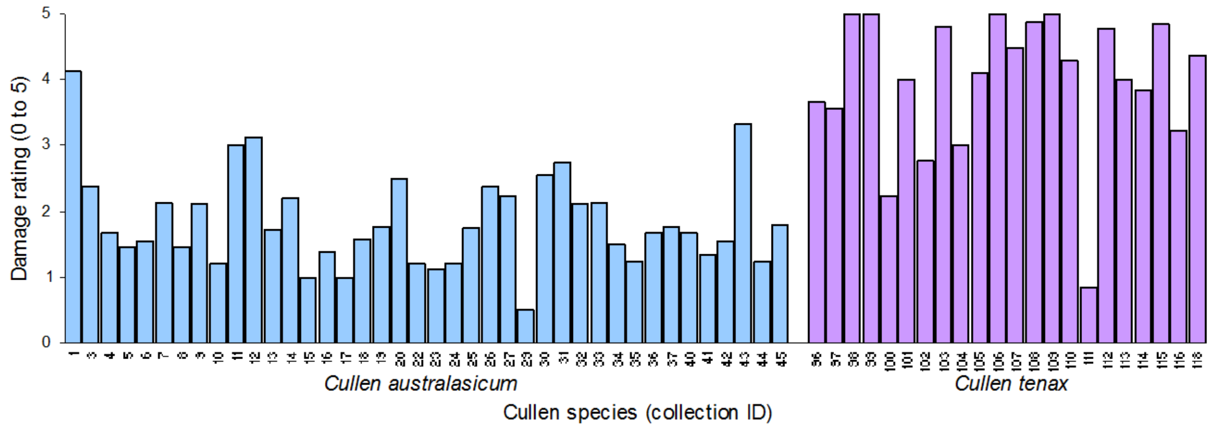
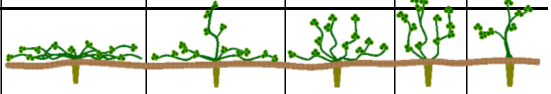


Figure 2: Variability in the damage rating of various collections of two *Cullen* species from locust attack during November 2006 (0 = no damage, 5 = biomass completely removed).

Finally, the variation in morphology of different collections of *Cullen* species is shown in Table 1. Growth habit varies between and within species. *Cullen australasicum* and *Cullen cinereum* tend to have an erect growth habit, *Cullen discolor* is always prostrate and *C. tenax* has an intermediate growth habit with many stems growing erect from the crown. It is expected that the '3' morphology classification to be the most productive and grazing tolerant, since it has a strong crown and plenty of growing points low-down on the plants.

Table 1: The number of collections of various *Cullen* species in each growth habit classification.

Growth habit classification	1	2	3	4	5
Growth habit					
Cullen australasicum	-	-	5	23	12
Cullen cinereum	-	-	2	6	13
Cullen discolor	2	-	-	-	-
Cullen lachnostachys	-	-	1	-	-
Cullen pallidum	-	-	-	3	1
Cullen parvum	-	-	2	1	-
Cullen patens	-	-	2	3	1
Cullen pustulatum	-	-	1	-	-

COMMENTS

As the trial is still in its initial stages, I (Richard) am looking forward to continuing the monitoring over the next 18 months. It will yield a wealth of information on the agronomic potential of these species. It will be particularly interesting to see which species and collections are able to survive through long, hot summers and rebound in the autumn to produce valuable green feed.

Acknowledgements

I would first like to thank the Liebe group for their cooperation and for hosting the trial site. My postgraduate studies are supported by an Australian Postgraduate Award, Meat and Livestock Australia, The University of Western Australia and The AW Howard Memorial Trust. I would like to thank these funding sources and my supervisors: Dr Daniel Real, Dr Megan Ryan and Dr Tim Colmer.

PAPER REVIEWED BY: LORI KROISS

NEW SUB-TROPICAL GRASSES FOR SOUTHERN AUSTRALIA -TESTING PROMISING PANIC GRASSES AT LIEBE LONGTERM TRIAL SITE

Geoff Moore, DAFWA, South Perth and John Titterington, CRC for plant based management of dry land salinity

BACKGROUND

Summer-active, sub-tropical grasses are showing considerable promise in the northern agricultural region, especially where the rainfall is more than 450mm. One of the most promising species across a range of sites are the panic grasses (*Panicum maximum*) often known by the common names ‘green’ (or Petrie) panic and ‘Gatton’ panic.

All the sub-tropical grass varieties grown commercially in Western Australia were selected for sub-tropical environments like south-east Queensland which has a summer dominant rainfall pattern and a very different suite of soils to those in WA. A project in the CRC for Plant-based Management of Dryland Salinity with funding from MLA aims to develop new warm season grasses specifically for the soils and climate of southern Australia with improved persistence, out-of-season dry matter production and feed quality. Since the project commenced in December 2003, a wide range of new germplasm has been evaluated at the main breeding sites on Badgingarra Research Station and at north Wellstead.

A number of promising accessions of *Panicum maximum* have been identified from these initial germplasm evaluation trials at Badgingarra and north Wellstead. These accessions show excellent persistence through both hot, dry summers and cold winters and excellent biomass production. The promising accessions had superior dry matter production following summer rain (Feb. 2006) and also in spring than the control varieties (Gatton, green panic). The feed quality of both the promising accessions and the controls is very good (65-70% dry matter digestibility). The promising lines are known as: Pan_max_010, 011, 045, 049, 050, 055, 057, 059, 060, 062 and 067.

It was desirable to evaluate the promising *Panicum maximum* lines at a wider range of sites, so in spring 2006 nursery row trials were established at three new sites; Mingenew (450mm), Muresk Agricultural College and at the Liebe Group long-term trial site near Buntine. These trials comprise 11 accessions of *Panicum maximum* plus controls (Gatton, Petrie-green panic). Each row consists of 6 spaced plants with 5 reps. The trials were established using seedlings to ensure uniform establishment. The number of treatments was increased to 15 to balance the spatial design, so in affect there are 6 reps of many treatments (75 rows/trial). The plants were watered two to three times post-planting to ensure successful establishment due to the very dry conditions in spring.

By early December the grasses had established well and the first dry matter assessments were made, but it is premature to report the results. We plan to continue to measure the persistence, production and feed quality over the next 24 months.

Grain & Graze, Quantity and Quality Perennial Grass Trial, Buntine

Brianna Peake, Liebe Group

Aim

To measure the persistence and seasonal production in terms of both quantity and quality for a range of sub-tropical perennial grasses and legumes.

Background

The focus of the NAR Grain and Graze project is to increase the capacity of growers to change their rotations/systems to include perennials so that economic and environmental success is assured.

There is minimal information on the production of warm season grasses in different environments and on different soil types. This information is essential for producers to be able to make informed decisions on the expected production and quality from warm season grasses in different regions of south-western Australia. Seasonal production and quality data is also required for cost:benefit analysis and to run farming system models to optimize the mix of enterprises in a region.

To address this issue, a series of trials were established in spring 2004 across the agricultural area of WA to measure the seasonal production of warm season grasses both for quantity and quality.

The trial at west Buntine includes a range of sub-tropical species compared with Lucerne sown in autumn and spring, Veldt grass (a temperate perennial grass) and annual volunteer species.

The trials are to be monitored for the 4 year duration of the project. Initial establishment counts were recorded in 2004 and persistence counts have been recorded at the break of season and beginning of the summer period (Dec) every year. In June 2005 monthly measurements of herbage biomass began to be recorded for the trial.

FARM DETAILS

Property	Ross Fitzsimons, West Buntine
Plot size & replication	12 treatments x 3 replications. Plots 7m x 3.6m
Soil type	Sand over gravel
Sowing date	26/8/04 all except lucerne autumn and veldt grass 25/5/05 lucerne autumn and veldt grass
Seeding rate	Varies with species and seed quality
Seeding Machinery	1.2m wide cone seeder Knife point followed by single disc opener and press wheel @ a depth of 5-10mm
Fertiliser (kg/ha)	At sowing: super:potash 3:1 @ 200 kg/ha Post: 13/5/05 15 units of P, 20 units of N and 20 units of K using DAP and muriate of potash 20/6/06 120 kg/ha super:potash 3:1 29/8/06 30 units of urea on all C4 grasses and veldt grass 1/11/06 30 units of sulphate of ammonia on all C4 grasses and veldt grass
Herbicides	Pre: Knockdown – Roundup @ 2 L/ha Post: 27/5/05 - Bromocide 200 (Bromoxynil @ 200 g/L) @ 1.5 L/ha - Lucerne and Siratro plots were covered

RAINFALL (MM): WEST BUNTINE, 2006

Jan	Feb	March	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	**Total**
88.5	5.5	3.5	28.5	25.5	9	17	18	25.5	0.5	15	0	**236.5**

RESULTS

Table 1: Persistence, measured as plants/m^2 and frequency (% groundcover) of the sown species in the perennial trial at Buntine for 2004, 2005 and 2006.

	26/10/04	8/12/04		11/5/05		19/12/05		19/5/06		15/12/06	
	Est.	Plants	%	Plants	%	Plants	%	Plants	%	Plants	%
Bambatsi panic	10	3	2	25	22	6	5	16	42	15	27
Callide Rhodes grass	41	18	15	10	63	10	56	9	84	11	45
Green panic	50	0	0	14	35	3	3	12	61	9	15
Katambora Rhodes grass	38	12	8	13	72	11	87	7	65	8	44
Lucerne autumn	44	29	22	13	24	6	3	16	34	9	8
Lucerne spring						7	5	9	15	7	8
Premier Digit grass	33	12	10	8	20	3	3	11	46	9	20
Signal grass	23	9	7	9	30	2	2	2	42	3	14
Siratro	13	8	8	7	9	2	4	3	15	2	4
Splenda setaria	14	3	2	4	18	2	2	4	62	5	27
Veldt grass						9	6	21	45	25	36

Table 2: Average biomass production, measured as kg DM/ha of the sown species in the perennial trial at Buntine for 2005 and 2006.

	30/6/05	**5/9/05**	**7/10/05**	**20/2/06**	**19/5/06**	**2/11/06**	**Total**
Annual Volunteer	1294	2320	1057	460	358	916	6405
Bambatsi panic	19	15	21	696	1107	385	2243
Callide Rhodes grass	603	444	715	1011	1171	667	4611
Green panic	136	114	62	540	1077	389	2318
Katambora Rhodes grass	1285	678	531	1571	1124	1206	6395
Lucerne autumn			63	191	173	423	850
Lucerne spring	83	103	102	121	24	223	656
Premier Digit grass	9	22	12	174	469	261	947
Signal grass	30	7	7	40	188	33	305
Siratro	1	0	0	42	15	9	67
Splenda setaria	29	16	8	147	640	29	869
Veldt grass			33	154	354	1265	1806

Comments

- In 2006 Buntine received 100mm less rainfall than the average rainfall for that area. The largest rainfall event for the year was in January and therefore would have greatly benefited the sub-tropical perennial grasses.
- This is shown in the Table 2 where there is a significant increase in biomass produced when recorded in February of 2006.
- After the sub-soil moisture was fully utilised the plants showed extreme drought stress for the remainder of the year.
- Both Rhodes species are the standout varieties for this region with Katambora being more productive than Callide. However due to the high plant density in the Rhodes trial plots the plants have begun to compete for moisture therefore limiting growth due to water stress. The plants have dried out the soil profile which puts them under pressure in times of low rainfall.
- As shown in Table 2, annual volunteer was able to produce more winter dry matter than Rhodes grass in 2005 (average rainfall). However in a poor rainfall season such as 2006, in winter, the Rhodes grass was able to produce over triple the production of the annual volunteer even though it is a summer active perennial.
- Veldt grass has proven to be productive and seems to be able to withstand the harsh conditions.

Acknowledgements

– Thank you to Ross and Lyn Fitzsimons for the use of their land.
– This trial is jointly funded by the Department of Agriculture and Food and the Northern Agricultural Region (NAR) Grain and Graze project.
– The NAR Grain and Graze project is funded by Meat and Livestock Australia, Australian Wool Innovation Ltd, Grains Research and Development Corporation, Land & Water Australia and Northern Agricultural Catchments Council.

Paper reviewed by: Phil Barrett-Lennard

NITROGEN TIMING FOR WHEAT AND BARLEY

Erin Cahill and Stephen Loss, CSBP Ltd

AIM

To compare the optimum rate and timing of nitrogen applications (Flexi-N) for the yield and quality of Wyalkatchem wheat and Baudin barley.

BACKGROUND

Wheat and barley have different end uses with differing protein and quality requirements. Unlike wheat growers, barley producers are often reluctant to apply high rates of nitrogen, especially post-emergent, in case this causes high screenings and excessive protein levels. In doing so, they are often limiting tiller survival and yield potential. It is well documented that split applications increase nitrogen use efficiency and can also be used as a risk management tool for cereal and other crops in variable environments.

TRIAL DETAILS

Property	Ian Syme, Liebe Group Main Trial Site, Buntine
Plot size & replication	20 x 2.1m
Soil type	Light brown sandy loam
Sowing date	31/05/06
Seeding rate (kg/ha)	100 kg/ha Wyalkatchem + Jockey, or 80 kg/ha Baudin
Fertiliser (kg/ha)	Basal – 140 MacroPro Extra + 400 mL/ha Impact coated
Paddock rotation	Wheat 2004, grassy pasture 2005
Herbicides	Wheat plots sprayed with 2.0L Treflan, 2.0L Sprayseed & 35g Logran. Barley plots sprayed with 1.8L Treflan 2.0L Sprayseed & 135g Lexone.
Growing Season Rainfall	122mm

SOIL ANALYSIS

	Description	pH	Salt	OC	N(Nit)	N(Amm)	P	Fe	K	S
0-10cm	Light brown loamy sand	4.7	0.056	0.52	11	3	16	327	68	3.2
10-20cm	Light brown loamy sand	4.4	0.022	0.38	2	1	7	676	34	4.6
20-30cm	Brown yellow loamy sand	4.5	0.029	0.24	2	1	2	620	29	12.5

RESULTS

Table 1: Grain yields from wheat and barley sown on 31/05/06 at the main Liebe trial site.

Trt	Variety	Flexi-N banded at sowing (L/ha)	Flexi-N 5-6 WAS (L/ha)	Total incl. basal (kg/ha)			Grain Yield t/ha
				N	P	K	
1	Wyalkatchem	-	-	14	16	16	0.318
2	Wyalkatchem	100	-	56	16	16	0.328
3	Wyalkatchem	-	60	39	16	16	0.349
4	Wyalkatchem	100	-	77	16	16	0.375
5	Wyalkatchem	100	60	81	16	16	0.370
6	Baudin	-	-	14	16	16	0.286
7	Baudin	100	-	56	16	16	0.349
8	Baudin	-	60	39	16	16	0.328
9	Baudin	100	-	77	16	16	0.339
10	Baudin	100	60	81	16	16	0.380

COMMENTS

Crop growth and yield potential were severely limited by one of the driest seasons on record at this site. Hence, the very poor grain yields and no response to nitrogen applications (Table 1).

A greater number of nitrogen treatments and measurements were planned for this trial, however these were cut back during the season because of the low rainfall and poor yield potential.
The plots at this site will be sown to wheat in 2007 to examine responses to residual nitrogen carried over from the dry 2006 season.

Acknowledgements
The authors wish to thank Dan Bell and Ryan Guthrie (CSBP) for their contribution to the trial.

NITROGEN SOURCES AND TIMING TRIAL- KALANNIE

Andrew Donkin, Summit Fertilizers

AIM

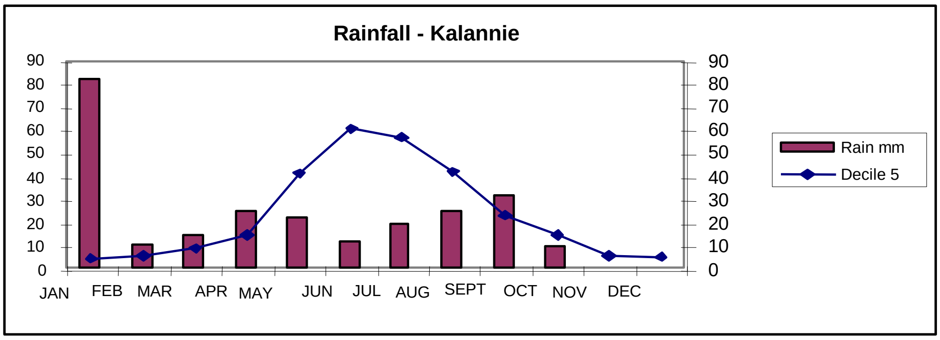
To compare applied sources of Nitrogen at various placements and timing in Kalannie.

BACKGROUND

This trial is a part of several across the state in season 2006 where we challenged the different sources of nitrogen in the market place like UAN, Urea and SOA at various timings and placement.

TRIAL DETAILS

Property	Brian McCreery, Kalannie
Plot size & replication	20m x 2.2m and randomly replicated
Soil type	Red Sandy Loam
Sowing date	25/05/06
Seed type & rate	Arrino at 80 kg/ha
Fertiliser (kg/ha)	Basal Phosphate – 130 kg/ha Vigour
Paddock rotation	Pasture, Wheat.
Herbicides	Pre -Sprayseed 1 L/ha + Trifluralin 1.4L + Logran 35g + Chlorpyrifos 1 L/ha
	Post - nil



SOIL TEST REPORT

	pH	PRI	OC %	EC	P	K	S	Cu	Zn
Site A	4.7	7	1.43	0.1	28	32	13	0.72	0.22
Site B	4.8	6	1.37	0.1	35	34	18	0.76	0.24
Site C	4.9	7	1.13	0.1	21	30	22	0.7	0.25

TRIAL COMMENT

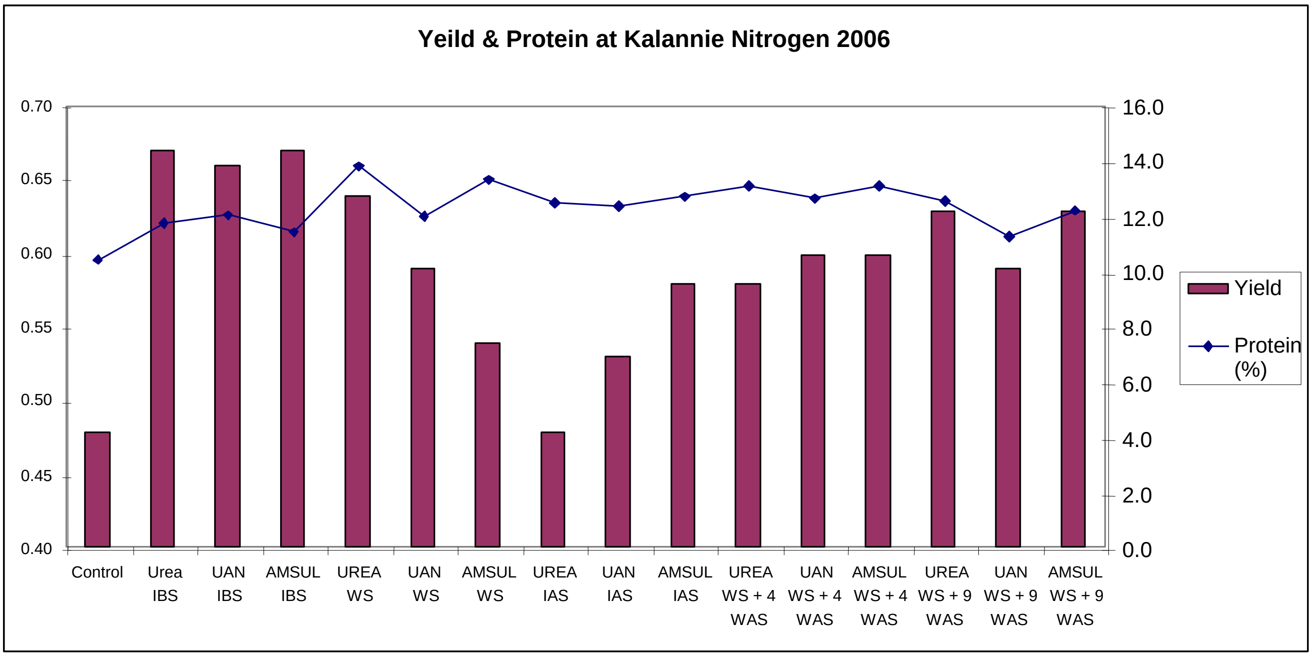
The soil on the site was a red loam that had been ploughed in March to control radish. The lack of rainfall after early April and the tillage dried the top 15cm to fluffy dry dust. We chose to seed the site at the end of May as per local farmer practice and because rainfall was forecast. (This unfortunately did not happen!)
The wheat seeds sat dormant in the furrow till late June when they received 4mm which germinated most wheat seedlings. The germinating plants struggled out of the ground creating patchy areas that grew slightly better where higher moisture retention occurred.
Interesting enough the post treatments did not significantly benefit the crop even though they were applied just before rainfall events. The site was clean of weeds and any competition. Basal dressings of Phosphate, Potassium and trace elements were applied through 130 kg/ha of Summit Vigour®.

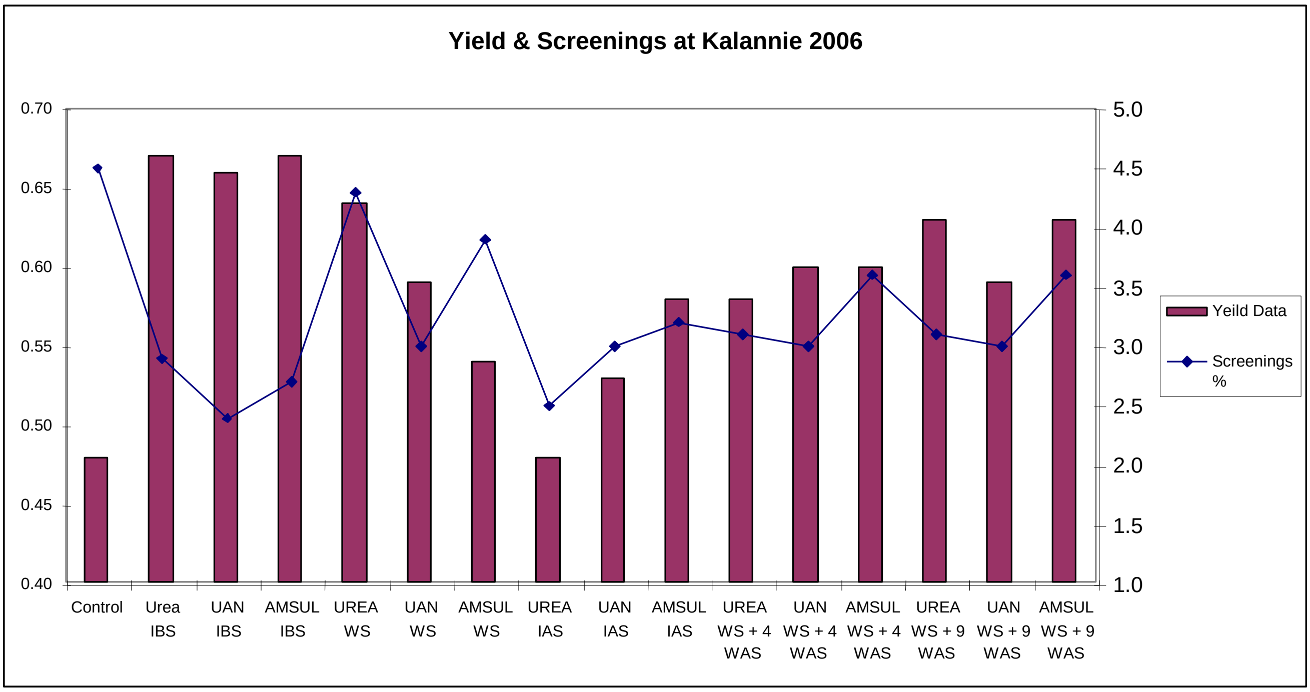
ANALYSIS

The yield data suggested that the plot randomisation helped to even out the mixed germinations across the trial site. It seems that one full replicate germinated ahead of the other two. It is noticeable that the IAS treatments of Urea and to a lesser extent the UAN IAS yielded less than all other treatments. They were applied by hand spreader/sprayer over the furrows after seeding and were subject to about two weeks of hot bright sunlight with minimal moisture. All other treatments were half buried or were not subject to as much volatilisation loss. The site was not sulfur responsive, the SoA treatments should respond similarly to the UAN and Urea when buried because all were at a rate of 50 kg/ha Nitrogen.

The cost of applied Nitrogen in this trial was approximately $41/ha. The yield advantage of the nitrogen treatment over the nil treatments was around 200 kg/ha, at AWB EPR 31st Nov $235T ASW. The gross return on the investment would have been $47/ha. Even in the driest season Nitrogen applied could have returned a profit of $6/ha.

YIELD RESULTS





CONCLUSION

This trial was effected by the drought over WA this season. The use of Nitrogen demonstrated a growth advantage in all plots over the control treatment. The differences between the source of Nitrogen and timing in this site demonstrated no significant advantages, except where losses of Nitrogen occurred due to exposure. Screenings data suggests that where protein levels were slightly higher than the norm, then so were the small grains. The Nitrogen source used did not affect yields.

Acknowledgements

Brian & Rowan McCreery, for the land.
David Armstrong, Summit Fertilizers
Agritech Crop Research, harvest data.

PAPER REVIEWED BY: SANDY ALEXANDER

IN-SEASON NITROGEN ON WHEAT ON PADDOCK MANAGEMENT ZONES – WEST BUNTINE

Michael Robertson, Kathy Wittwer, CSIRO Precision Agriculture Project

AIM

To evaluate the response of wheat (yield and protein) in different paddock management zones to in-season application of nitrogen fertilizer, using the Yield Prophet system as a guide.

BACKGROUND

Management zones within paddocks differ in yield potential due to soil type characteristics, and hence will respond differently to inputs like fertilizer. At the start of the season the response to inputs like nitrogen fertilizer is uncertain. In-season methods for estimating yield potential and hence demand for N could aid in managing sub-paddock zones by matching fertilizer application to need.

Previous work in the GRDC Precision Agriculture project has focused on a well-characterised paddock on Stuart McAlpines farm where management zones and their soil type basis has been well established. We decided to test the transferability of this knowledge to another paddock on the same farm, but that did not have the detailed understanding of soil types. We used the Yield Prophet crop modeling system to follow zones through the season and compared different rates of fertilizer N applied in each zone.

TRIAL DETAILS

Property	Stuart McAlpine, paddocks 20 and 21. These paddocks are mirror images of each other with higher yielding valley soils (perhaps with some salt) and low yielding shallow soils on ridge tops.
Plot size & replication	At each sampling position wheat yield, biomass, protein, screenings was measured from 4 0.5m^2 quadrats at harvest, and crop biomass and N content was measured in the late vegetative period to test for early N responses
Soil type	Plots running E-W were set up on lines covering deep sand soil types in the valley bottom and shallow and medium depth gravels to the north and south on elevated areas.
Sowing date and starting conditions	30/5/06, but did not emerge until late June due to dry conditions. Yield Prophet runs were set up for deep yellow sand, medium gravel, shallow gravel using starting soil water and N measured 10/4/06 at 5 positions in the paddock. More N has mineralised than Stuart expected given that the paddock was wheat after canola. This is not surprising though when thinking about the summer rain, good weed control (paddock has been subsequently burnt). Nitrate-N in top 30cm was about 60 kg/ha and an additional 30 kg/ha for the next 60cm (only applicable to deeper soils). In addition there is 20-30 kg/ha of NH_4-N. In total this was enough to grow a 2 t/ha crop.
Seeding rate	70 kg/ha, Calingiri wheat
Fertiliser (kg/ha)	Given the starting N and limited yield potential of the shallow soils we were proposing to put no extra N (aside from that which goes out with the basal) on the shallow gravel but 60 L/ha of flexi-N on the deep sands in the valley-bottom (except low yielding western end which are medium gravel soils), which have a yield potential of 3 t/ha. The flexi-N areas were interspersed with four 100m strips of zero flexi-N. The flexi-N was designed to give another 0.5 t/ha of yield potential on top of the 2 t/ha at seeding with soil N plus starter and so allowed the flexibility of bailing out of anymore N if the season turns dry. Also, if there is a big leaching event then Yield Prophet was to be used to indicate the possibility of top up N on all areas. 1. Deep sand – 0 kg N/ha as flexi-N at sowing and 0 kg N/ha as follow-up 2. Deep sand – 25 kg N/ha as flexi-N at sowing and 0 kg N/ha as follow-up 3. Shallow gravel – 0 kg N/ha as flexi-N at sowing and 0 kg N/ha as follow-up 4. Shallow gravel – 25 kg N/ha as flexi-N at sowing and 0 kg N/ha as follow-up 5. Shallow gravel – 0 kg N/ha as flexi-N at sowing and 21 kg N/ha as follow-up
Paddock rotation	2005 (canola)
Growing Season Rainfall	April to October = 114mm

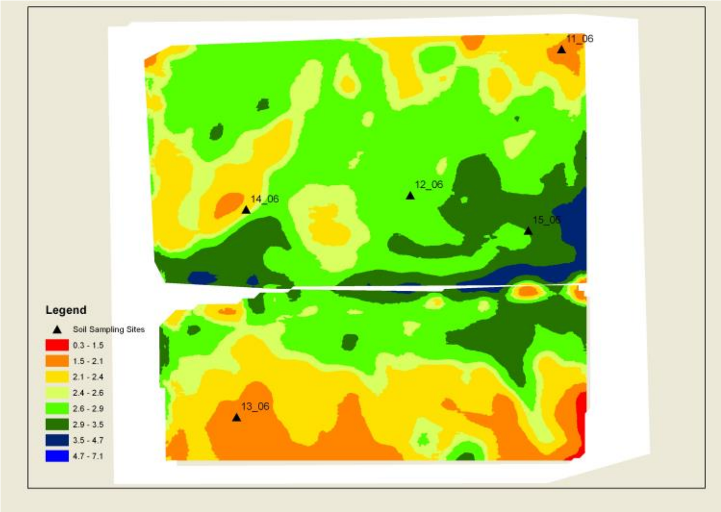


Figure 1: Layout of the sampling locations on paddocks 20 (north) and 21 (south) at Stuart McAlpine's farm. Also shown is a previous yield map to indicate high and low yielding zones.

RESULTS

Table 1: Crop biomass and N% of wheat sampled on 29/8/06. The crop was sown at Buntine on 2 soil types at a range of N fertiliser regimes within one paddock.

Soil type	N applied (kg/ha)	Crop biomass (t/ha)	Biomass N (%)
Deep yellow sand	9 + 0 + 0	0.62	2.44
(starting N = 110 kgN/ha)	9 + 25 + 0	0.82	2.45
Shallow gravel	9 + 0 + 0	0.67	3.20
(starting N = 70 kgN/ha)	9 + 0 + 21	0.53	3.13
	9 + 25 + 0	1.10	2.51

Table 2: Yield, quality and gross income of wheat sown at Buntine on 2 soil types at a range of N fertiliser regimes within one paddock. Sampling conducted 6/11/06.

Soil type	N applied (kg/ha)	Yield (t/ha)	Protein (%)	Harvest index	Screenings (%)	Hectolitre Wt (g)	Gross Income $/ha
Deep yellow sand	9 + 0 + 0	1.07	9.9	0.45	3.4	83	90
	9 + 25 + 0	1.13	12.0	0.43	4.8	81	58
Shallow gravel	9 + 0 + 0	1.10	11.2	0.47	3.7	83	90
	9 + 0 + 21	0.93	11.1	0.45	5.5	79	63
	9 + 25 + 0	1.18	10.3	0.47	2.2	83	58

Based on EPR Base Price $188/tonne, $110/ha variable costs (excluding N fertilizer) and $1.3/kgN applied.

COMMENTS

- There was a small discernable response in early season biomass to N applied at seeding at the sampling on 29th August, but not in N%. This occurred despite high levels of soil N sampled in April and may have been due to better positional availability of fertiliser N relative to soil N under the dry seasonal conditions.
- The early differences in biomass did not translate into differences in grain yield, protein, screenings and hectolitre weight. Nearly all treatments made the noodle wheat window. Header yields also taken at harvest were about 70% of the quadrat yields shown in Table 2, with a similar lack of treatment response.
- Lack of N response meant that treatments with higher rates of N applied had lower gross margin
- Soil type differences were also minimal. This is not surprising given that water storage in the seasonal was minimal and crops would have grown only on available rainfall.
- As early as late July Yield Prophet runs showed median yield expectation ranged from 0.8 to 1.8 t/ha depending on soil type, no response to extra N at sowing and also no response to added N.
- As the prospects for the season deteriorated yield expectation from Yield Prophet also declined. By early September median yield expectation ranged from 0.3 to 1.0 t/ha depending on soil type. Final simulated yield was 0.7-1.0 t/ha, and closely matched the measured in Table 2.

ACKNOWLEDGEMENTS

Stuart McAlpine, Brianna Peake with assistance with Yield Prophet simulations, CBH for grain analysis, GRDC for funding through the SIP09 Precision Agriculture Initiative.

PAPER REVIEWED BY: YVETTE OLIVER

Grain & Graze: Whole Farm Feed Supply – Grazing Days/Season/Pasture Type

Brianna Peake, Liebe Group

Aim

TO UNDERSTAND HOW A RANGE OF PASTURE TYPES COMBINE TO FORM A WHOLE FARM FEED SUPPLY.

Background

The aim of the Northern Agricultural Region (NAR) Grain and Graze project is to maximize farm profitability through the successful integration of perennials pastures into the whole year feed resource, complementing grain and annual pasture production. The NAR Grain and Graze project is a partnership between the Liebe Group, Evergreen Farming, Mingenew-Irwin Group, the Shire of Victoria Plains, the Department of Agriculture and Food (DAFWA) and Northern Agricultural Catchments Council (NACC).

The Liebe Group is located in the low to medium rainfall zone of the WA wheatbelt. In the past there has been limited trialing of perennials pastures in this area. However, perennial fodder shrubs such as Saltbush have proven to grow successfully on salt affected land. Due to the uncertain reliability of perennial pastures and the dominance of cropping enterprises in the Liebe region the project is locally focused on better matching total feed supply with livestock demand so as to better manage the whole farm feed resource.

One of the project objectives is to collect grazing records from 4 focus farms in order to determine an overview of the feed resources growers in this region currently have available and how these are being utilised. This information allows us to further focus the project on the feed resources that are providing the most value to the farm and identify where growers can potentially be better utlising these feed resources.

Key Findings from the 05/06 Season:

1) **Perennial grasses – Where do they fit?** The Liebe Region is a predominantly cropping area. Perennial pastures will most likely have a place in our system if they can be grown on small areas of unproductive cropping land or bordering salt affected areas. They can be difficult to establish in our rainfall zone and therefore once established cannot be cropped over if the stand is to be maintained. The most promising varieties for this area include Rhodes varieties, Bambatsi panic and Green panic.

2) **The value of fodder crops or grazing cereals:** The sowing of cereals for grazing proved to be a successful implementation for Farm 4 in the 2005 growing season. Many Liebe members have been frustrated with the lack of production that can be gained from annual legume pastures in this region in the past. Therefore many growers followed the lead of Farm 4 and sowed grain oats in 2006 either alone or as a bulk feed with an annual legume component. Generally the variety grown was Pallinup oats. They have good early vigour which provides feed when other pastures can be slow to establish but they can also provide good weed control. Growers are finding that the oats are less palatable than weeds, which force the livestock to selectively graze weeds.

3) **Saltbush success story:** Due to programs such as Sustainable Grazing of Saline Lands (SGSL) saltbush has been widely implemented in the Liebe region and is viewed in the area as the major success story for gaining production from unproductive salt affected land. Due to the cost of seedlings or a seeding operation, saltbush stands have been implemented on farms over a number of years. Saltbush is viewed by growers to be of most value during the summer and especially the autumn feed gap. Farm 2 uses saltbush areas as nursery paddocks for lambing. If the paddocks are kept small then the ewes do not have far to travel to water and there is plenty of shelter increasing the chance of survival of lambs.

4) **Matching feed supply and demand:** Locally, McGregor's have exhibited a good case for matching feed supply with demand. Through trading large numbers of stock they have been able to run significantly higher winter and spring stocking rates - generally twice those of what is being achieved by the other demonstration farms. This is due to a number of reasons; 1) The highly productive fodder crop and 2) Knowing that they do not have to conserve feed for summer they are able to push their pasture system for maximum grazing through winter and spring. The key to this system is to get stock

off the property before summer because if they stay longer there will be issues with feed availability and possible weight loss. It is also very beneficial to have a feedlot to be able to finish stock when required or if paddock conditions are not suitable, however this can be expensive. This type of system is possible through pastoral alliances or profit share agreements with the cattle destined for the live export trade. We are yet to see this system trialed with sheep in our area.

Case Study Farm 1:

Property	Keith, Rosemary and Boyd Carter
Location	East Wubin, Jibberding
Arable	6,000ha
Cropped	4,200ha
No. Breeding ewes	2,500
Flock Structure	Self replacing merino
Lambing	May
Ann. Rainfall	285mm

Table 1: Summary of grazing records for the period of June 2005 to May 2006.

Feed type	DSE/ha	Total DSE Grazing days	Area (ha)	% of total area	% of total grazing days
Volunteer Pasture	3.4	1,163,221	924	17	43
Volunteer Pasture with sub clover base	2.1	214,101	281	5	8
Cadiz, Charano	1.1	184,658	380	8	7
Cadiz 2nd yr	3.4	241,969	194	4	9
Crop Stubble	0.7	950,387	3,537	65	35
Perennials	2.1	23,966	31	1	1

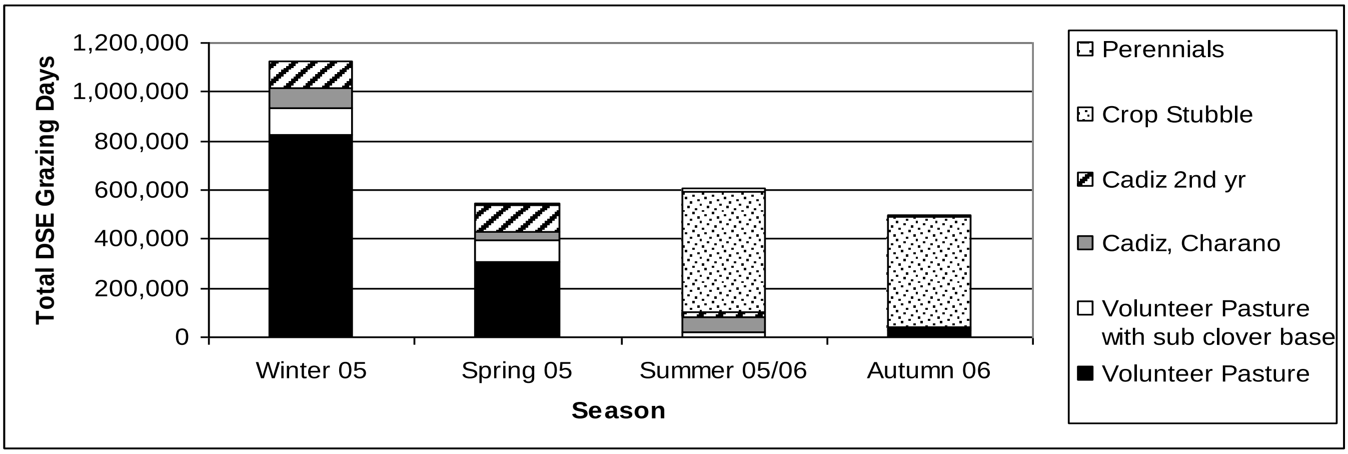


Figure 1: Total DSE grazing days per season per feed type from June 2005 to May 2006.

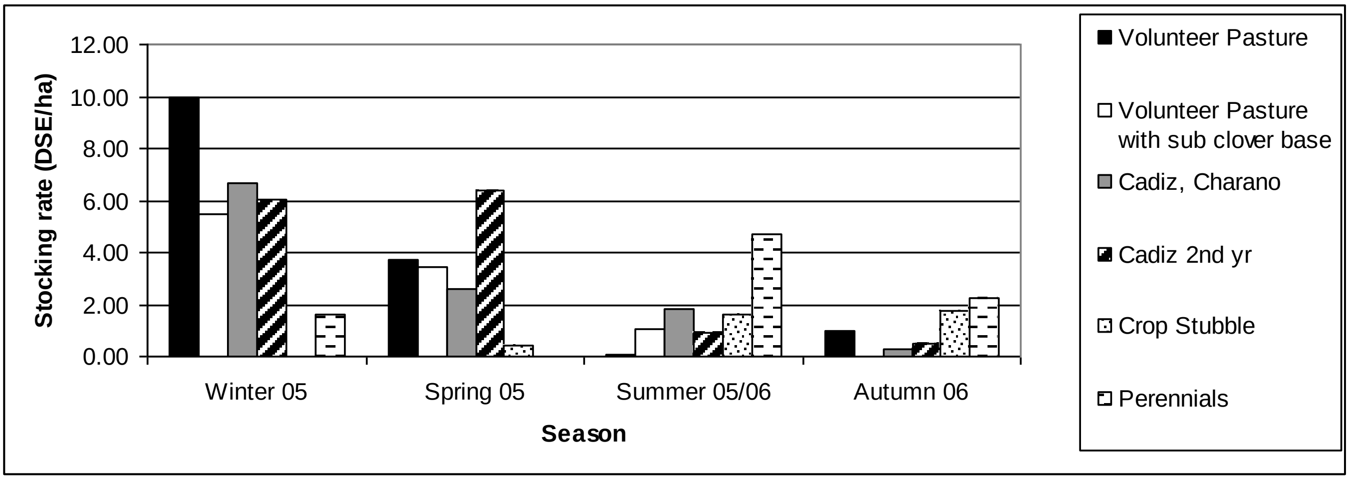


FIGURE 2: ***DSE/HA PER SEASON PER FEED TYPE FROM JUNE 2005 TO MAY 2006.***

Comments

- Grazing pressure is greatest in winter, with volunteer pasture providing the majority of the value.
- The stocking rates used on the improved pastures are also relatively high.
- Perennial pastures provide a small percentage of total grazing value but when grazed in summer and autumn the stocking rates are the highest used for both the seasons.
- Crop stubbles provide the majority of the grazing value in summer and autumn however they are grazed at very low stocking rates.

Case Study Farm 2:

Property	Gary, Kerry and James Butcher
Location	East Pithara
Arable	2,800ha
Cropped	2,200ha
No. Breeding ewes	1,300
Flock Structure	Self replacing merino
Lambing	June
Ann Rainfall	300mm

Table 2: Summary of grazing records for the period of June 2005 to May 2006.

Feed type	DSE/ha	Total DSE Grazing days	Area (ha)	% of total area	% of total grazing days
Vol Pasture	4.1	339,480	226	9	31
Caliph medic	1.4	81,693	158	6	8
Cadiz & Oats	2.5	248,489	267	10	23
Oats	1.0	82,804	231	9	8
Crop Stubbles	0.3	211,666	1,907	65	19
Saltbush	0.8	2,304	8	0	0
Saltbush & Perennials	0.5	4,064	22	1	0

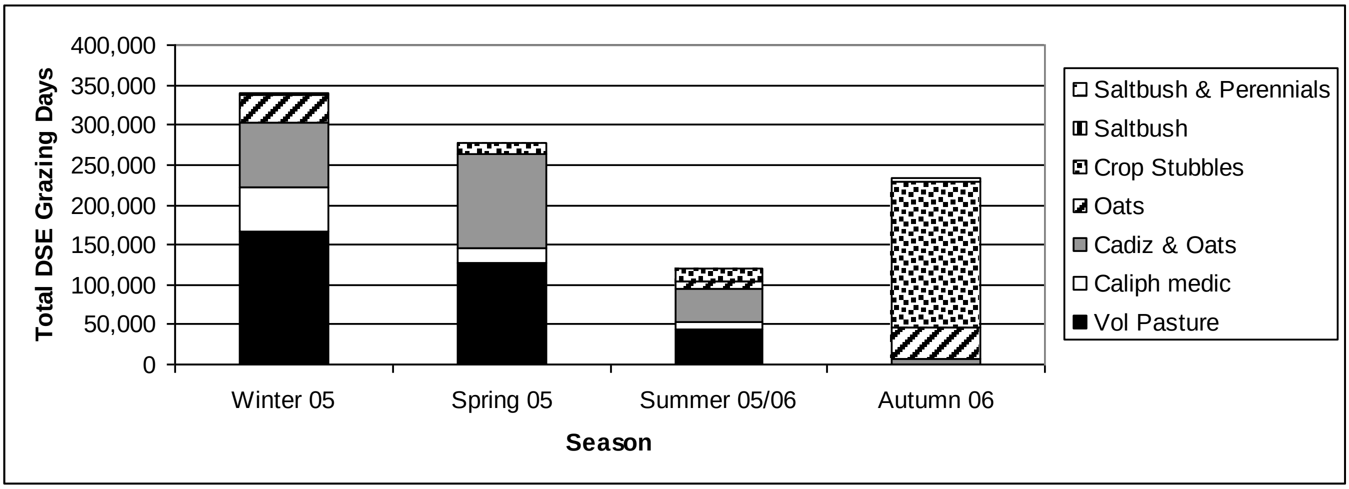


Figure 3: Total DSE grazing days per season per feed type from June 2005 to May 2006.

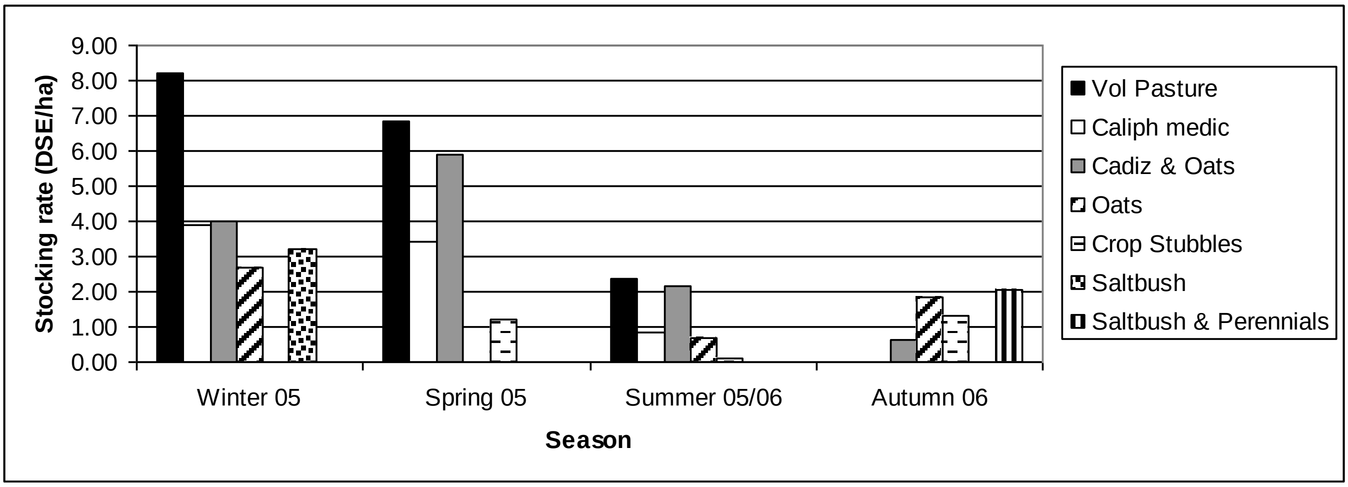


FIGURE 4: ***DSE/HA PER SEASON PER FEED TYPE FROM JUNE 2005 TO MAY 2006.***

Comments

- Grazing pressure is greatest in winter, followed by spring and autumn. The Grazing pressure is lowest in summer, as expected.
- Volunteer pasture and a cadiz and oats mix provide the majority of the feed value in winter and spring. The stocking rates for winter are greatest for the volunteer pasture and in spring they are approximately the same for volunteer pasture and the cadiz/oats mix.
- The majority of value for autumn grazing is attributed to crop stubbles however these are grazed at a very low stocking rate. Saltbush and perennials are grazed at the highest stocking rate over autumn.
- The saltbush and perennials area is used for a sheltered lambing environment in autumn.
- The remains of the volunteer pasture and improved legume pastures are utilised in summer grazing however stock numbers are reduced significantly over summer.

Case Study Farm 3:

Property	Ross and Lyn Fitzsimons
Location	East Buntine (main property) + 1,100 ha west Buntine
Arable	4,800ha
Cropped	2,200ha
No. Breeding ewes	1,600
Flock Structure	Self replacing merino
Lambing	Late April/early May
Ann. Rainfall	325mm

Table 3: Summary of grazing records for the period of June 2005 to May 2006.

Feed type	DSE/ha	Total DSE Grazing days	Area (ha)	% of total area	% of total grazing days

Volunteer Pasture	1.4	941,844	1,823	43	65
Crop Stubble	0.6	505,236	2,372	57	35

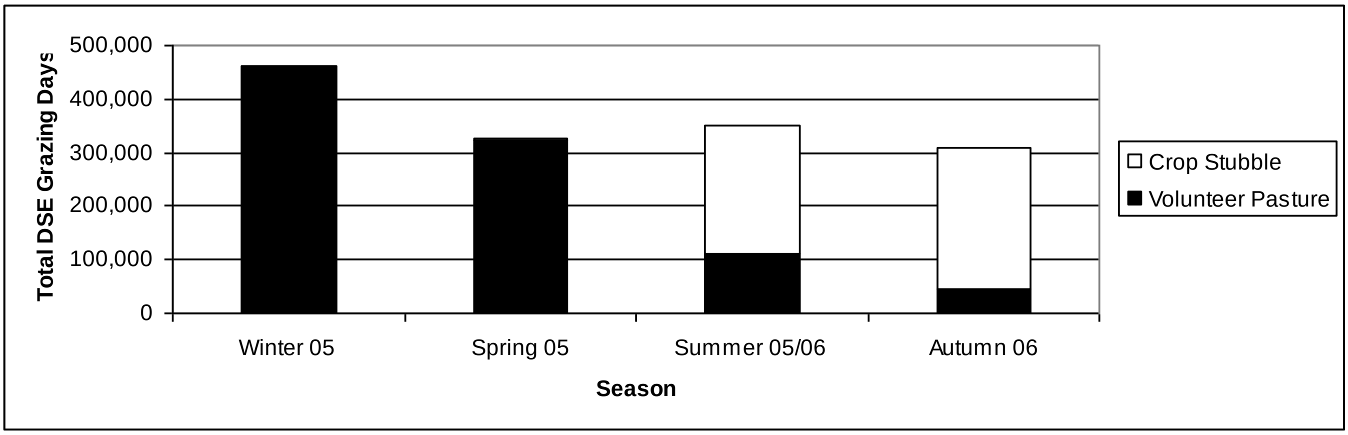


Figure 5: Total DSE grazing days per season per feed type from June 2005 to May 2006.

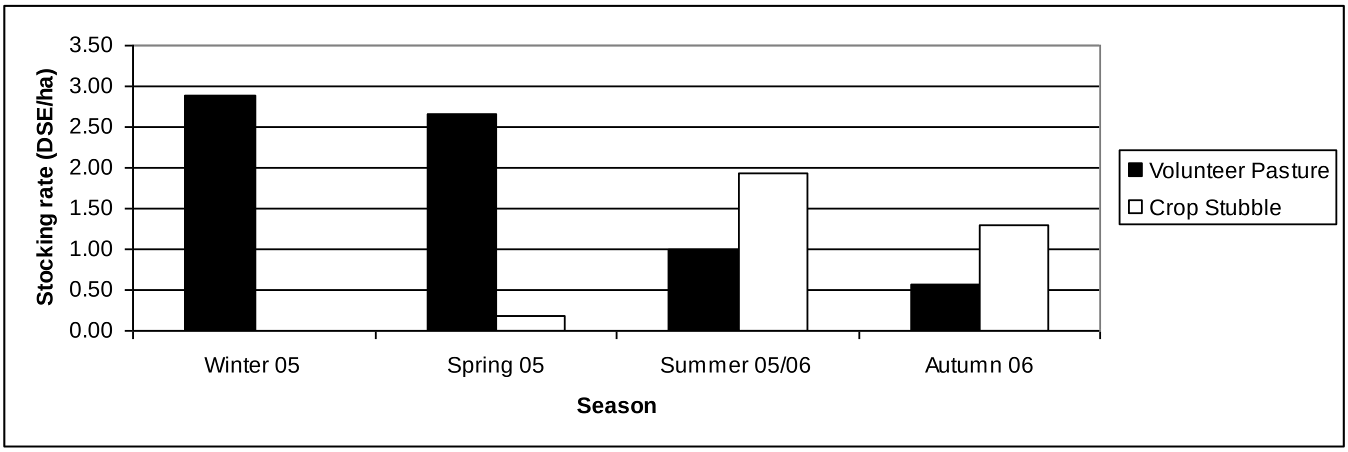


FIGURE 6: ***DSE/HA PER SEASON PER FEED TYPE FROM JUNE 2005 TO MAY 2006.***

Comments

- Grazing pressure is greatest in winter and is reduced in spring, summer and autumn.
- Volunteer pasture provides all the feed in winter and the majority in spring.
- Crop stubbles provide the majority of the feed in summer and autumn.
- Both the crop stubbles and remaining volunteer pasture are grazed at low stocking rates through summer and autumn.

Case Study Farm 4:

Property	Colin and Jill McGregor
Location	East Maya
Arable	2,100ha
Cropped	400ha
Fodder crop ha	1,400
No. Breeding cows	300 Droughtmaster
Backgrounding cattle	5,700 heifers and mickey bulls (mixed breeds)
Calving	April/May
Ann. Rainfall	325mm

Table 4: Summary of grazing records for the period of June 2005 to May 2006.

Feed type	DSE/ha	Total DSE Grazing days	Area (ha)	% of total area	% of total grazing days
Crop Stubbles	3	467,260	411	19	8

Volunteer Pasture	7	996,807	383	18	18
Fodder Crop	9	4,171,067	1,318	62	74

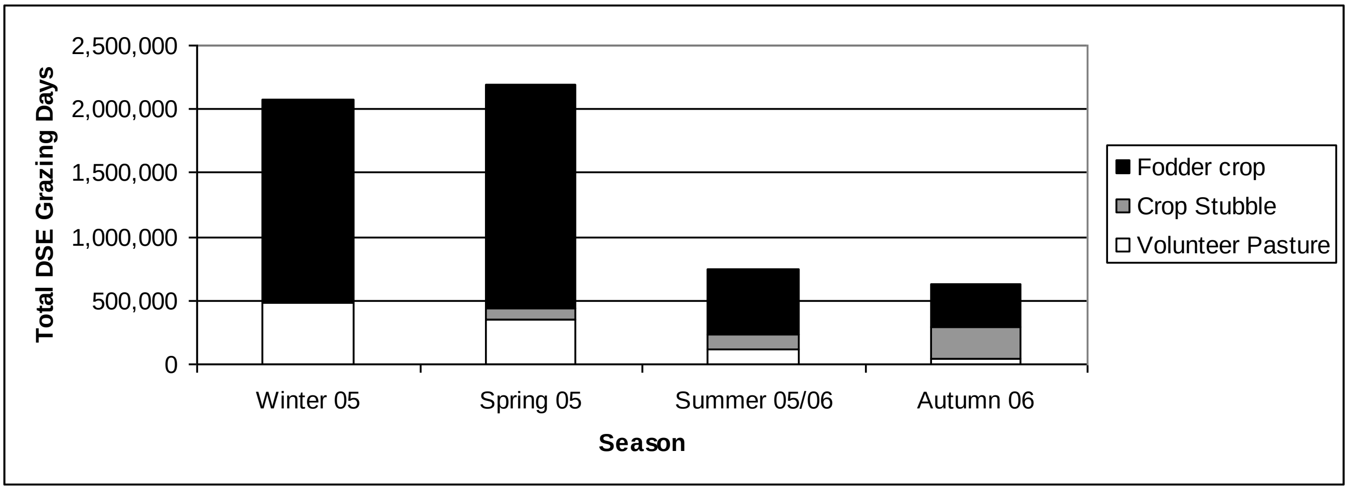


Figure 7: Total DSE grazing days per season per feed type from June 2005 to May 2006.

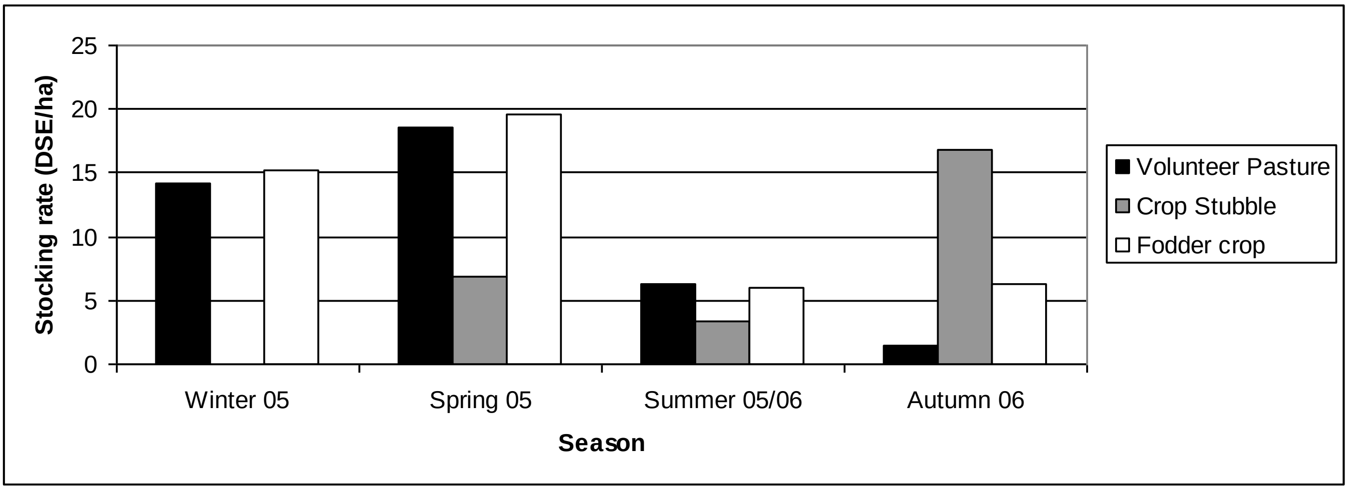


Figure 8: DSE/ha per season per feed type from June 2005 to May 2006.

Comments

- Cattle are brought onto the property from stations from June to September at an average weight of about 140 kg/ha and then leave from mid-October to mid-February at approximately 300 kg/ha.
- This enables the grower to utilise feed when it is at its peak growth and to de-stock when there is little feed in summer and autumn.
- The grower sows a relatively low cost fodder crop for feed which is either grazed standing, cut for hay or harvested for grain. If the cattle are not of the desired weight to leave the property they are finished in a feedlot where they are fed hay and the harvested grain mix
- Figures 7 and 8 show that this system allows the grower to run an exceptionally high number of stock at high stocking rates through winter and spring

Acknowledgements

– The NAR Grain and Graze project is funded by Meat and Livestock Australia, Australian Wool Innovation Ltd, Grains Research and Development Corporation, Land & Water Australia and locally supported by the Northern Agricultural Catchments Council and the Department of Agriculture and Food.

PAPER REVIEWED BY: PHIL BARRETT-LENNARD

LONG TERM SOIL BIOLOGY TRIAL

Emma Glasfurd, Project Coordinator, Liebe Group

AIM

To investigate the potential of biological and organic matter inputs to increase soil water storage, target long-term yield increases and soil improvement.

BACKGROUND

This trial forms part of the Liebe Group's GRDC funded adoption project, '**Growers critically analysing new technologies for improved farming systems**'. This project continues work from the GRDC funded soil health project **'A sustainable dryland community achieved through proactive research on effective management of the soil resource'.** This long term trial has been established to address management of soil constraints limiting yield, specifically the biological component. The trial site was selected as it had no significant chemical or physical soil constraints and is intended to demonstrate the capacity for increasing grain production through improving moisture conservation and enhancing the soil biota. The basic treatment structure of the trial was established in 2003 with a lupin crop and 2004 was the first cereal crop followed by a cereal crop in 2005. Yields were obtained to reflect differences in treatment effects in these wheat rotations.

Wheat (cv. Wyalkatchem) grown after brown manured lupins and wheat after addition of 20 t/ha organic matter (barley straw) in 2004 were significantly higher yielding than the control, with a 500-600 kg/ha improvement or 18-22% increase in grain yield above the control treatments (harvested lupin: wheat rotation). In 2004, main treatment effects from a brown manure crop and addition of organic matter overshadowed any yield benefits from other treatments that aim to encourage microbial activity. However, this was not unexpected as improving soil biological fertility is a long term process.

In 2005, the trial was again sown to wheat (cv. Wyalkatchem) to assess the residual value of treatments and to determine the ongoing improvement to the soil resource. The long term biology trial provided some very interesting results in 2005. The yields obtained reflect what many farmers encounter in the initial phases of converting to a full stubble retention system as opposed to stubble burning and these yield differences relate mostly to a change in the C:N balance and microbiological processes that occur in the soil. The highest yielding treatment in 2005 was burnt stubble, yielding 560 kg/ha or 25% greater than full stubble retention (control).

The Lupin phase within the soil biology trial is effectively a 'set up' rotation, allowing weeds to be controlled and specific treatments such as brown manuring and organic matter to be applied for the subsequent wheat crop. Harvest cuts are not obtained in a lupin phase and so no yield results and gross margins have been presented in this report. However, in 2006 the ongoing improvement to the soil resource has been evaluated, results from 2006 are presented below.

TRIAL RESULTS FROM 2004 AND 2005

Table 1: *Grain yield components of Wyalkatchem wheat grown in 2004 under treatments imposed at the long term Liebe trial site.*

Treatment Averages	Yield (t/ha)	Harvest index (%)	Hectolitre weight (g)	Protein (%)	N uptake (kg N ha)	Head no./m²	Grain no/head
6. Control Brown Manure	**3.56**	**42.49**	**82.89**	**10.85**	**67.18**	**209.03**	**25.94**
10. BM +Humates + Zeolites + Microbes	3.56	41.65	82.75	10.68	66.12	221.11	21.76
8. BM + Zeolite	3.52	41.87	83.11	11.09	67.90	200.97	25.46
18. Western Mineral package (compare to brown manure control)	3.47	42.74	83.07	10.91	65.84	181.53	27.38
9. BM + Microbes	3.46	41.89	83.64	10.8	64.99	198.61	23.05
7. BM+ Humates	3.44	42.94	82.66	10.89	65.15	211.81	24.61
13. Load-up organic matter	3.44	42.25	82.87	11.43	68.38	194.03	21.91
14. Load-up organic matter + decomp agent	3.41	42.8	82.07	12.19	72.30	213.33	23.31
12. Control Incorporate stubble	3.23	41	83.03	9.4	52.80	165.69	24.31
16. Incorporate stubble + decomposing agent	3.20	42.72	83.03	10.02	55.76	167.78	25.71
2. Control + Humates	3.14	44.51	83.48	9.99	54.56	184.38	24.65
4. Control + Microbes	3.14	41.47	82.12	10.7	58.38	176.67	24.25
3. Control +Zeolite	3.12	42.29	82.38	9.78	53.06	169.72	24.96
5. Control + Humates + Zeolites + Microbes	3.06	40.57	82.93	9.8	52.16	170.69	23.74
1. Control	**2.91**	**41.68**	**83.16**	**9.61**	**48.64**	**167.36**	**24.57**

*Table 2**: Grain yield components of Wyalkatchem wheat grown in 2005 under treatments imposed at the long term Liebe trial site.***

Treatment	Yield (t/ha)	Biomass at anthesis (t/ha)	Plant density (no./m^2)	Head density (no.m^2)	Protein (%)	Screenings (%)	Gross Return ($/ha)
17. Burn Stubble	2.79 a	4.81 a	115	303 ab	9.00 abc	1.73	346
14. Till + OM + decomp agent	2.60 ab	5.06 a	112	291 a-f	9.30 a	2.55	317
13. Till + OM	2.49 bc*	4.63 a*	112	286 a-g*	9.06 ab	1.95	309
7. BM + humate	2.44bcd	3.36 b	118	293 a-e	8.67 def	2.04	293
5. Control+hum+zeo+mic	2.38 bcde	3.92 b	115	299 abcd	8.60 defg	1.41	290
8. BM + zeolite	2.34 bcde	4.24 a	120	301 abc	8.83 abcd	2.26	281
9. BM +microbe	2.33 bcde	4.11 a	122	265 a-h	8.43 fgh	1.78	280
18. Western Mineral package (compare to brown manure control)	2.31 bcde	4.07 ab	110	252 efgh	8.70 bcde	1.83	282
10. BM + hum + zeo +	2.30 bcde	4.21 a	112	304 a	8.35	1.49	276

mic					fghi		
6. Control Brown manure	**2.25 cde**	**4.33 a**	**108**	**268 a-h**	**8.00 ij**	**1.74**	**270**
1. Control	**2.23 cde**	**3.58 b**	**117**	**270 a-h**	**8.00 ij**	**2.02**	263
3. Control + zeolite	2.18 de	3.66 b	113	236 h	8.10 hij	1.73	262
12. Control Till	2.17 de*	4.09 b*	117	273 a-h*	8.07 hij	2.25	256
16. Till + decomposing agent	2.11 de	4.18 a	112	272 a-h	7.97 j	1.99	247
2. Control + humate	2.08 e	3.55 b	112	276 a-h	8.15 hij	1.65	250
4. Control + microbe	2.08 e	3.80 b	110	260 a-h	8.20 hij	2.37	245
LSD (5%)	0.33, 0.29*	1.05, 0.91*	-	45.2, 39.2*	0.38	n.s.	-

TRIAL DETAILS 2006

Property	Liebe Long Term Research Site (LTRS), West Buntine
Plot size & replication	10.5m x 80m x 3 replicates
Soil type	Yellow sand
Sowing date	8/5/06
Seeding rate	75 kg/ha Mandelup Lupins
Fertiliser (kg/ha)	50 kg/ha TSP
Paddock rotation	2005 Wheat, 2004 Wheat, 2003 Lupin, 2002 Wheat
Herbicides	1 L/ha Glyphosate, 1.25 kg/ha Simazine, 0.5 kg/ha Atrazine, 1.3 L/ha Sprayseed, 10 g/ha Metrabuzin, 10 g/ha Brodal, 16 g/ha Select, 30 g/ha Leopard and 1 L/ha Sprayseed (crop-topping)
Growing Season Rainfall	131mm

TRIAL DESIGN

The trial consists of 3 banks of 19 randomised plots. The site was deep ripped to 300mm on 450mm spacing prior to seeding in 2004, to ensure subsurface compaction was not constraining yield. Average topsoil pH across all treatments in 2005 is 5.26.

Treatment List 2006:

1. Control (full stubble retention)
2. Control (full stubble retention)+ Humates
3. Control (full stubble retention)+ *Zeolite (removed 2006, to be replaced by a pelletised Custom Compost Product in 2007)*
4. Control (full stubble retention)+ Microbes (foliar application)

5. Control (full stubble retention)+ Humates + *Zeolite (removed 2006, to be replaced by a pelletised Custom Compost Product in 2007)* + Microbes (foliar application)
6. Control Brown manure Lupin 2003 (full stubble retention of 2004 cereal crop)
7. Brown manure Lupin 2003 (full stubble retention of 2004 cereal crop) + Humates
8. Brown manure Lupin2003 (full stubble retention of 2004 cereal crop) + *Zeolite (removed 2006, to be replaced by a pelletised Custom Compost Product in 2007)*
9. Brown manure Lupin2003 (full stubble retention of 2004 cereal crop) + Microbes
10. Brown manure Lupin 2003 (full stubble retention of 2004 cereal crop) + Humates + Zeolite + Microbes
12. Control Tilled soil (incorporate all stubbles)
13. Tilled soil (incorporate all stubbles) + Load up organic matter (2003 only)
14. Tilled soil (incorporate all stubbles) + Load up organic matter (2003 only) + decomposing agent
16. Tilled soil (incorporate all stubbles) + decomposing agent
17. Burnt stubble (Brown manure Lupin 2003, burn 2004, 2005 cereal stubble)
18. Western Mineral Fertiliser Package (Compare to brown manure control plots. Treatment will not be implemented in 2007)

Applications

Table 3: Rate and application method of various treatment components.

Treatment	Rate	Application Method
Organic matter (barley straw 2004 only)	20 t/ha	Spread pre seeding by hand
Brown manure Lupin (2003, 2006 only)	5 t/ha biomass	Foliar Desiccant
Zeolite (2004 & 2005)	1 t/ha	Top dressed pre seeding
Humates (2004, 2005, 2006)	5 kg/ha	Top dressed pre seeding
Decomposing agent (2004, 2005, 2006)	10 L/ha brewed concentrate	Pre seeding spray
Microbes (2004, 2005, 2006)	20 L/ha brewed concentrate	Post emergent foliar spray
Western Mineral Application 2004		
Dolomite	650 kg/ha	By Hand – prior to seeding
Granular Fertiliser	107 kg/ha	At seeding
UAN	60 L/ha	Pre-emergent
Top Dress WMF granular	40 kg/ha	6 weeks after seeding
WMF Nitrogold/SOP mix	40 kg/ha	8 weeks after seeding
Trichoderma microbes	120 L/ha	Foliar spray 21days after emergence
Western Minerals Applications 2005		

WMF NPK Crop mineral fertiliser (microbe coated)	120 kg/ha	Banded below seed
Liquid UAN	60 L/ha	Banded below seed
WMF Ag Blend microbes plus Liquid activator	150g microbe+150mL activator /ha	Post emergent foliar spray
Western Mineral Application 2006		
WMF high P crop mineral fertiliser (coated ag blend microbes)	80 kg/ha	Applied down the tube at seeding

RESULTS

No significant differences for soil moisture in the top 10cm of the soil profile were observed between all treatments at seeding time (Figure 3). There is however, a slight trend towards the brown manured plots having a higher soil moisture content at seeding time for the top 10cm (Figure 3). The greater moisture content in the 0-10cm soil layer can result in increased ability for early establishment and increased vigor of seedling growth for a crop. There were no significant differences between treatments for soil moisture in the soil profile at seeding (Figure 1).

Soil moisture at harvest results were taken from 3 control plot locations across the soil biology trial, these results are presented in Figure 2.

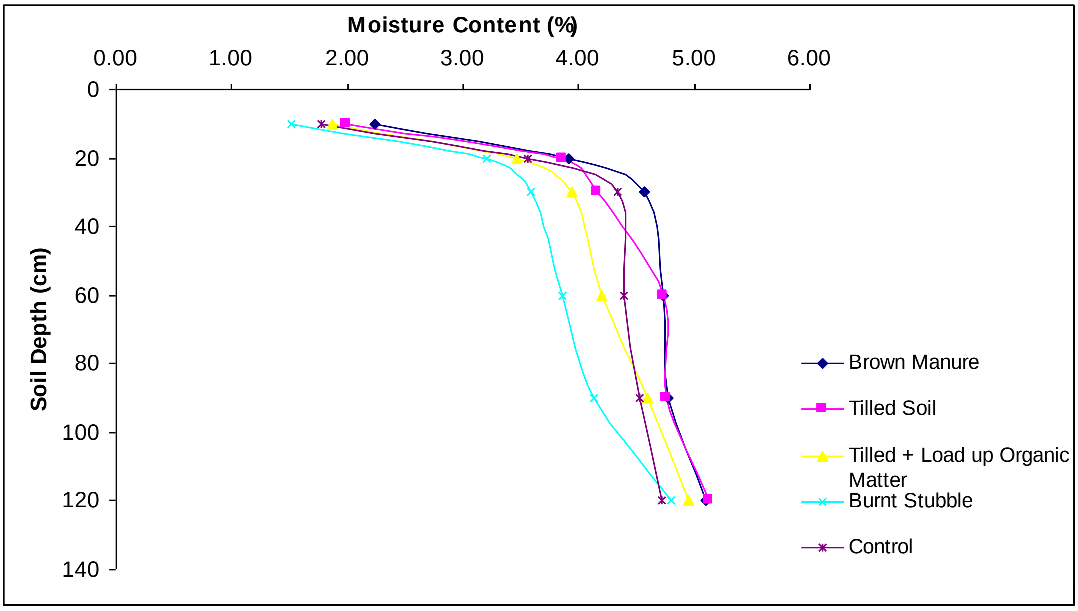


Figure 1: Gravimetric soil moisture (%) of selected treatments at six soil depths (0-10, 10-20, 20-30, 30-60, 60-90 and 90-120 cm) during lupin seeding May 2006.

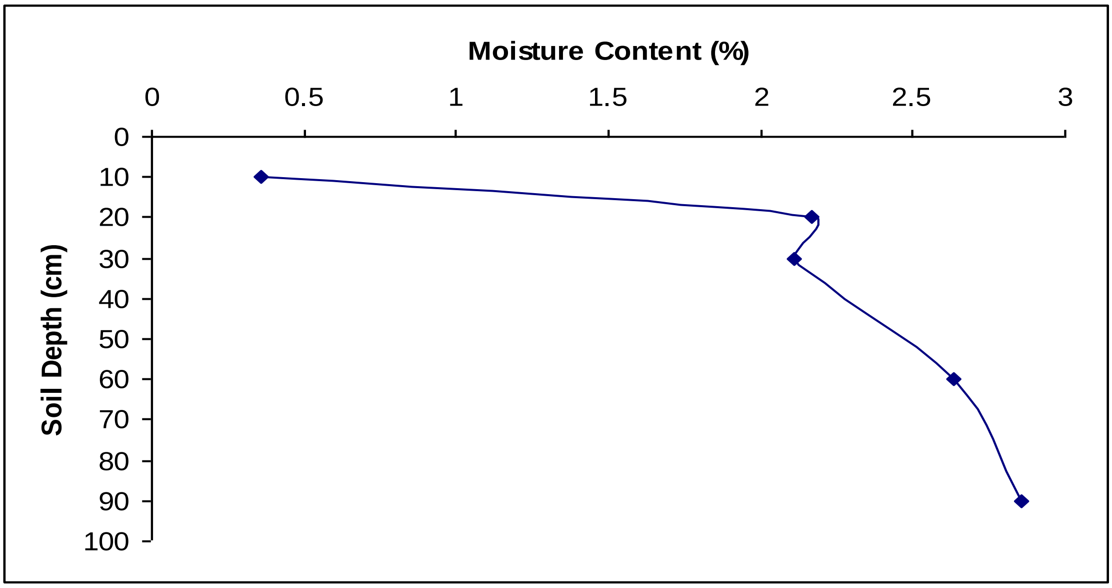


Figure 2: Gravimetric soil moisture (%) at five depths (0-10, 10-20, 20-30, 30-60, 60-90 cm) at four random sites across the Long Term Soil Biology Trial at time of harvest 2006.

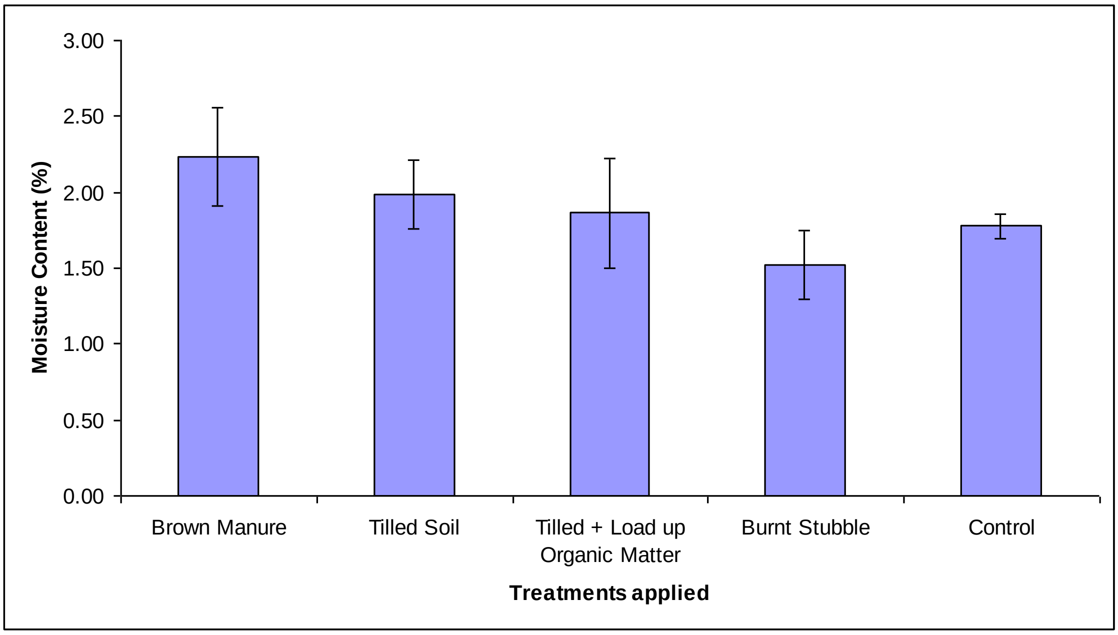


Figure 3: Gravimetric soil moisture content at 0-10 cm at time of sowing May 2006, showing means and ± standard error bars (LSD: 0.834).

Soil resistance results derived in 2005 indicated that the effect of deep ripping conducted in 2003 prior to the implementation of this trial has been short-lived with indications of a hard pan developing at 30cm. Thus root penetration to deeper soil layers (and associated water and nutrients) may have been constrained. With respect to this observation the soil biology trial site will be deep ripped prior to seeding in 2007. Soil resistance, when measured with a penetrometer is best collected when the soil profile is at its upper drained limit. Due to the dry July/August/September period experienced in 2006, resistance data was unattainable.

Table 4: Bulk density (0-10cm) of treatments sampled at seeding for the Long Term Soil Biology Trial in 2006.

Treatment	Bulk Density (g/cm3)
Burn Stubble	1.42a
Till + Decomposing Agent	1.38ab
Control	**1.38ab**
Western Mineral Fertiliser Package (Brown manure control)	1.38ab
Control +Microbe	1.36ab
Brown Manure + Microbe	1.36ab
Tilled Soil	1.36ab
Control + Humate	1.35ab
Brown manure (Control)	**1.34ab**
Till + Organic Matter + Decomposing Agent	1.33ab
Till + Organic Matter	1.33ab
Brown Manure + Zeolite	1.33ab
Tilled Soil + Organic Matter	1.33ab
Control+Humates+Zeolite+Microbes	1.32ab
Brown Manure + Humates + Zeolite + Microbes	1.30ab
Brown Manure + Humate	1.29b
Control + Zeolite	1.27b
LSD 5%	0.12

Bulk densities of all treatment plots were collected in 2006 and although there were are no consistent trends between treatments there are significant differences between the burnt stubble plots and Brown Manure + Humate and also Control + Zeolite (Table 4). Microbial data has been collected and once processed will be included in subsequent newsletters.

This trial was designed to improve long term yield increases through improved water storage and soil biology. As such, it will continue into the future with the ongoing collection of valuable data to assist in the evaluation of the treatments being trialed.

COMMENTS

- The Lupin phase is primarily a 'set up' rotation which continues evaluation of the soil resource. No yield results are obtained in the Lupin rotation.
- No significant differences have been found between treatments in relation to the soil resource.
- In 2007 the soil biology trial will be in a wheat rotation. Following the 2006 uncharacteristic seasonal conditions it is hoped that results in 2007 will be more responsive the soil biology treatments.

ACKNOWLEDGEMENTS

Liebe Group would like to acknowledge GRDC for funding the project and the assistance of the Dan Murphy, University of Western Australia and Fran Hoyle, Department of Agriculture WA. Thanks also to Stuart McAlpine and staff for conducting many of the paddock operations and also Mike Dodd and Rod Birch. Thank you to all sponsors and supporters of the Long Term Research Site.

PAPER REVIEWED BY: FRANCIS HOYLE

WIDE ROW SPACING IN ARRINO WHEAT

Emma Glasfurd, Project Coordinator, Liebe Group

AIM

To evaluate the effectiveness of wide row spacing in Arrino wheat in a low rainfall environment with limited inputs.

BACKGROUND

This trial is an On-farm demonstration for the Liebe Groups GRDC funded adoption project '**Growers critically analysing new technologies for improved farming systems**'. The site was randomly selected by the farmer late in the season for an opportunistic crop. The paddock had a good medic pasture history and considering the conditions at the start of the season and predictions for low rainfall, the grower decided to take advantage of the site and trial the potential for wide-row seeding on his property. The paddock was sown with a small budget, as the grower intended the crop to utilise the nitrogen supply from the previous medic pasture.

Very wide rows or skip rows in wheat is a concept that is being tested to reduce the level of screenings without a large sacrifice to yield in situations where a dry finish to the season is often experienced. On shallow soils that have limited rooting depth and relatively high fertility, wide rows have also resulted in significant yield improvements over standard row spacing. Improved grain size can be obtained from reduced tillering or greater tiller survival bought about by lower plant density and increased availability of stored soil moisture.

At crucial stages of crop growth, plants rely heavily on the availability of stored soil moisture. This can be a major issue on soils that have limited rooting depth through either physical or chemical constraints i.e. shallow rock or 'wodjil' soils, on soils with low water holding capacity and in situations where crops experience extended dry periods through the growing season.

Research conducted in 2006 by Paul Blackwell at Tardun indicated that the high competition between plants seeded in wide rows with narrow knife points impedes plant establishment and inevitably yields. Rows sown with narrow knife points, wide rows (600mm) yielded 3.7% lower than 300mm row spacing.

However, in the same study, implementing 'ribbon sowing' (increasing width of seeding within the row) in wide rows (600mm spacing) reduced crowding between cereal plants, therefore, minimising competition and increasing tiller survival of the crop. Ribbon sowing achieved 14% higher yields and 0.6% less screenings at the end of the season. The higher yield may have also been helped by higher soil disturbance, thus mineralization of nitrogen to assist tillering, by the wider winged point used for ribbon sowing. See report page (85-86):
Blackwell, P, Edgecombe, S and McKenna, I. (2007) Ribbon sowing helps wide rows of wheat, Liebe Group Research and Development Book 2007, 85-86.

In addition, a study conducted by Mohammad Amjad and Wal Anderson, namely 'Managing yield reductions from wide row spacing in wheat' observed similar responses to wide row sowing and the effectiveness of increasing seed width within a row. The study found that yield was increased at the widest row spacing (360mm) by using the wider row spreads of 50 or 75 mm. Another point the research identified was that yield reductions due to wide row spacing can be minimised by using a long season cultivar when sown in May, by using adequate N fertiliser and by increasing the spread of seed across the row. For more information please see the following journal article:
Amjad, M. and Anderson W. K. (2006) Managing yield reductions from wide row spacing in wheat. Australian Journal of Experimental Agriculture 46(10) 1313–1321.

TRIAL DETAILS

Property	Gary and Kerry Butcher, Pithara
Plot size & replication	Plots 0.593 ha x 5 reps
Soil type	Heavy Clay
Sowing date	29th June 2006
Seeding rate	40 kg/ha Arrino Wheat
Fertiliser (kg/ha)	Nil.
Paddock rotation	2002: Pasture Medic, 2003: Pasture Medic, 2004: Wheat, 2005: Pasture, 2006: Wheat.
Herbicides	2 L/ha Glyphosate
Growing Season Rainfall	111mm (April - October)

RESULTS

Table 1: Yield, quality, grain size and number of filled and unfilled heads for 250mm and 500mm sown Arrino wheat seeded on 29th June at Pithara on a heavy clay soil.

Row spacing	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g)	Small grain (<2.5mm) %	Filled Heads (m^2)	Unfilled heads (m^2)	Seed weight (g)
250mm	0.54a	14.9	10.15	376.0	79.8	188.0	6.2	0.423
500mm	0.45b	14.4	7.81	382.5	76.4	144.0	3.8	0.460
LSD (5%)	0.03							

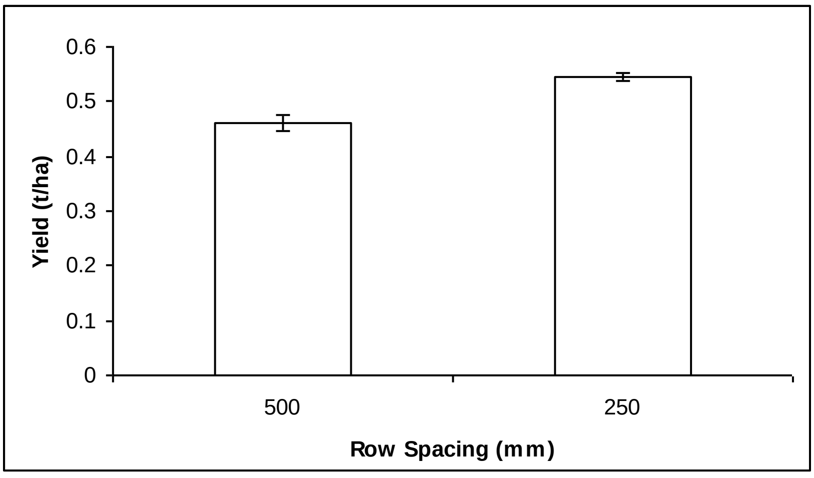


Figure 1: Mean yields and standard errors for 500mm row spacing compared to 250mm row spacing.

ECONOMIC ANALYSIS

Table 2: Economic Analysis ($/ha)

Treatment	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin	Payment Grade
250mm	0.55	85.84	63.6	22.24	AGP
500mm	0.46	77.57	63.6	13.97	ASW

Based on EPR for 21/12/2006 for AGP, base rate $167/tonne and ASW, base rate $172/ tonne

There is a significant difference ($P<0.05$) in yields between 250mm row spacing and 500mm row spacing (Table 1). The main difference in yield may have been due to poor tillering in the 500mm spaced crop. The entire crop was reliant on the soil nutrition from the pasture as no fertiliser was applied to the paddock prior to and following seeding. Subsequently, the plants on the 500mm rows are in a more competitive environment than the 250mm spacing for nutrient acquisition in the seedling stage, having to search for nitrogen in less soil volume than the same number of plants spread over the 250mm rows. Tiller survival therefore benefited in the 250mm rows and inevitably the number of filled heads and yield also benefited by 44g and 15.8% respectively (Table 1).

The 250mm rows had 2.3% more screenings than the 500mm rows, 3.4% more small grain between the 2 and 2.5mm sieve than the 250mm crop and double the amount of unfilled heads as the 500mm rows. The improved grain size in the 500mm crop may therefore reflect the better water supply available to the wide row plants. However, it is important to note, there was a significant rainfall event in September 2006 which allowed grain in the 250mm crop to fill, thus reducing screenings. Without the September rainfall event, screenings and unfilled heads may have been considerably greater than that found in the 500mm rows. In addition, if nutrition was not more limiting in the 500mm crop, the water supply from the wide row may have increased yield to similar or better than the 250mm crop.

One theory is that wide rows significantly benefit from early seeding rather than later, as competition in wide rows have a significant impact on tillering in the initial crop growth phases. These reductions in tillering can cause substantial determent to the yield of a crop, another potential reason for the lower yield found in the 500mm rows.

In addition to early sowing time and adequate nutrient supply at seeding time, another way to reduce the effects of competition within wide rows may by implementing ‘ribbon sowing’ as discussed previously, where increasing width of seeding within the row can significantly reduce crowding and therefore competition for soil resources.

COMMENTS

- The main difference in yield may have been due to poor tillering in the 500mm spaced crop.
- The entire crop was reliant on the soil nutrition from the pasture as no fertiliser was applied to the paddock prior to and following seeding.
- Later sowing of the trial may have jeopardised the wide row’s yield capacity therefore it would be encouraged that when considering sowing in wide rows early seeding is preferable.
- It may be noted that if nutrition was not a limiting factor for the 500mm crop, the water supply from the wide row may have increased yield to similar or better than that of the 250mm crop.

ACKNOWLEDGEMENTS

Liebe Group would like to acknowledge GRDC for funding the project. Thanks also to Gary and James Butcher for hosting the trial site and assistance with implementing the trial. Also to Paul Blackwell for conducting harvest cuts for the trial.

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PAPER REVIEWED BY: BRIANNA PEAKE AND PAUL BLACKWELL

COMPARISON OF N/S AND E/W DIRECTIONAL SEEDING

Emma Glasfurd, Project Coordinator, Liebe Group

AIM
To determine if yield differences can be achieved between a crop seeded in a north-south direction compared to an east-west direction.

BACKGROUND
This trial is an on-farm demonstration for the Liebe Group's GRDC funded adoption project '**Growers critically analysing new technologies for improved farming systems**'. The site was selected by the farmer as it was reasonably flat and was generally a well performing paddock with few soil constraints, these characteristics were thought to enhance any differences which may be achieved between east-west and north-south seeding orientations.

Crop row orientation is an important factor in regulating crop/weed competitive relationships for water, nutrients and sunlight, factors which directly affect crop growth and yield. Trials conducted in Merredin and Avondale by Dr Shahab Pathan (DAFWA, Merredin) and Dr Abul Hashem (DAFWA, Northam) have suggested that an east-west wheat crop orientation has the potential to yield up to 0.8 t/ha greater than a north-south orientation in Northam and 0.5 t/ha in Merredin. The results presented from Merredin were produced from weed free conditions, which suggest that there was a higher percent of soil water available to plants in an east west crop orientation.

Crop rows orientated at a near right angle to the sun direction may suppress weed growth by creating a partial shade for weeds, however such effects have rarely been observed in many parts of the world. In some parts of the Western Australian wheatbelt the sun angle goes as low as 35° during winter time, reducing the amount of shade weeds would receive throughout the growing season.

In another study on seeding direction conducted in the eastern states by Minnipa Agricultural Centre, results found some evidence of soil evaporation being greater in the east-west crop orientation. However, no significant treatment differences were found in the yields between both orientations.

TRIAL DETAILS

Property	Keith and Rosemary Carter, Wubin
Plot size & replication	26m x 130m plots, 4 replicates
Soil type	Sand over gravel (Sugar bush and tamat tussock vegetation)
Sowing date	23/5/06
Seeding rate	60 kg/ha, Calingiri Wheat

Fertiliser (kg/ha)	100 kg/ha Macro-pro Plus
Paddock rotation	2003 lupins, 2004 wheat, 2005 lupins and 2006 wheat.
Herbicides	Herbicides are the same for all plots. Specific details unknown at time of reporting.
Growing Season Rainfall	115mm (April – October)

RESULTS

Table 1: Yield and quality of Calingiri wheat sown on 23/5/06 in north/south and east/west directions.

Variety	**Yield (t/ha)**	**Protein (%)**	**Moisture**	**Weight (g)**	**Screenings (%)**	**Payment Grade**
East-West	0.84a	11.2	9.60	82.53	1.50	ASWN
North-South	0.79a	11.2	9.58	82.53	1.73	ASWN
LSD (5%)	0.18	0.37	0.12	0.67	1.50	

There are no significant differences in yields between east-west crop orientation and north-south crop orientations (Table 1). As the paddock had good weed control, the results were primarily influenced by water availability and evaporation within the crop. High evaporation rates and low water availability subsequent of the drought meant that any yield differences which may have been present in a season with higher rainfall were suppressed in the 2006 trial.

The trial will be run again in 2007 to further investigate any potential yield differences between north-south and east-west crop orientations.

ACKNOWLEDGEMENTS

Liebe Group would like to acknowledge GRDC for funding the project. Thanks also to Keith and Boyde Carter and staff for hosting the trial site and assistance with implementing the trial.

PAPER REVIEWED BY: BRIANNA PEAKE

Comparison of Pre-seeding Applications of Gypsum/Dolomite, High-cal and Lime

Emma Glasfurd, Project Coordinator, Liebe Group

Aim

To investigate the effect on wheat yield between applications of a gypsum/dolomite mix, high-cal product and lime, and also to compare the long term effects the three products have on soil acidity.

Background

This trial is a grower demonstration for the Liebe Group's GRDC funded adoption project '**Growers critically analysing new technologies for improved farming systems**'. The site is a typical 'wodjil' soil with inherent subsurface acidity. In WA soils, subsurface acidity results in aluminum toxicity often occurring in the 10-35cm zone of soil. The site was chosen for its soil characteristics, as they are thought to have the greatest response to the three products being trialed, namely lime, gypsum/dolomite and hi-cal products, all of which aim to increase soil pH. This demonstration was designed and implemented by the grower as lime, gypsum/dolomite and hi-cal products had been purchased to apply to other areas throughout his farming enterprise. The grower therefore, wanted to determine if there were significant differences between the products for improving subsoil and surface acidity and also whether the differences persisted over a long term period.

Acidification and degraded structure of agricultural soils in the Western Australian wheatbelt are ongoing problems for growers. Products used to improve soil composition within this trial are lime, gypsum/dolomite and hi-cal products all of which will be evaluated over a long-term period to accurately record the potential for each treatment in a wodjil soil. Set rates have been allocated according to the recommended rates associated with individual products within this trial.

Liming is a management practice commonly adopted to reduce soil acidity in many agricultural soil types. Lime is also thought to increase fertiliser efficiency. When an acid soil is limed, the soil pH is raised, the levels of calcium and magnesium are raised, micro-biological activity is accelerated and the rate of release from the soil of organic matter and nutrient elements is increased, therefore increasing production (Gazey *et al*, 1998). Generally, unless large amounts of lime are applied, rainfall is high (> 750 mm/p.a.), soil textures are light and considerable time is allowed for neutralization of soil acidity, surface application of lime will have little benefit (Vimpany, 1981).

Dolomite is effective on acid soils where supplies of calcium and magnesium are low, however if used continuously may cause a nutrient imbalance, because the mix is two parts calcium to one part magnesium (2:1), whereas the soil ratio should be around 5:1 (this ratio can be achieved by mixing dolomite with other substances such as lime and gypsum) (Anon, 2002). Gypsum is classified by the Fertiliser Act as a liming material, but is commonly not considered significant by farmers as it does not reduce soil acidity. It is used mainly to improve the structure of sodic clay soils. Gypsum is used as a soil amendment or for an economical source of calcium and sulphur (Anon, 2002).

Hi-Cal is a blend of BioLime (crushed limestone), calcium hydroxide and calcium solubilising agents. It is designed for use where soil pH management is needed with the added benefit of plant-available calcium. As quoted by Optima Agriculture, producers of Hi-Cal; the calcium hydroxide in Hi-Cal has a higher neutralising value than calcium carbonate and can therefore change pH faster. The calcium hydroxide and calcium carbonate are mixed with a solubilising agent which enhances the plant-available calcium. Calcium will replace excess hydrogen ions on the cation exchange complex and assist in reducing soil acidity (Optima Agriculture, brochure 2006). Hi-Cal is not tested under the Lime WA inc guidelines.

TRIAL DETAILS

Property	Brian and Rowan McCreery
Plot size & replication	20m x 100m plot size, 3 replicates
Soil type	Wodjil
Sowing date	Spreading of treatments 6/4/06, seeding 29/5/06
Seeding rate	55 kg/ha Wyalkatchem wheat
Fertiliser (kg/ha)	Legume special 80 kg/ha, 35 kg/ha Urea banded
Paddock rotation	2003 Wheat, 2004 Pasture, 2005 Pasture, 2006 Wheat.
Herbicides	1.2 L/ha Treflan, 800 mL/ha Roundup Powermax, 15g Logran, and 20g Logran B.
Growing Season Rainfall	146mm (April–October)

RESULTS

Table 1: Yield, quality and gross income of Wyalkatchem wheat sown on 29/5/06.

Treatment	Yield (t/ha)	Protein (%)	Screenings (%)	Hectolitre (g)	Grade
Lime (1.5 t/ha)	0.60a	12.6	4.62	400.01	APW
Gypsum/Dolomite mix (1 t/ha)	0.82a	12.2	5.35	404.18	APW
Control	**0.76a**	**12.5**	**5.98**	**405.92**	**APW**
High Cal (600 kg/ha)	0.75a	12.6	4.32	405.32	APW
LSD (5%)	0.29				

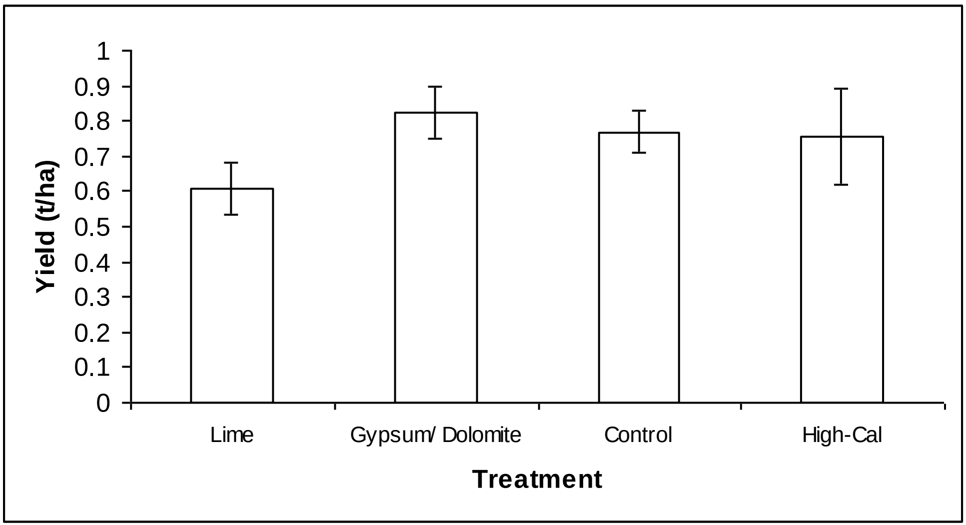

Figure 1: Mean yield and standard errors of each soil additive treatment.

ECONOMIC ANALYSIS

Table 2: Economic Analysis ($/ha)

Treatment	Yield (t/ha)	Gross Return	Variable Costs	Gross Margin
Lime (1.5 t/ha)	0.60	185.8	137.52	48.28
Gypsum/Dolomite mix (1 t/ha)	0.82	189.5	140.52	48.98
Control	0.76	190.0	125.52	65.05
High Cal (600 kg/ha)	0.75	185.8	135.12	50.68

Based on EPR for 21/12/2006 APW Base Price $191/tonne

It is too early to see any benefits from the associated products, however at this stage the control treatment is the most cost effective management practice, with Hi-Cal being $2.40/ha cheaper than lime and $1.70/ha cheaper than Gypsum/dolomite.

There are no significant differences in yield between all the treatments, however the trial will continue in 2007 and the following years to further investigate any potential yield differences between treatments.

To observe noticeable effects of lime through yield responses or increased soil pH is a slow process. This may be the most obvious reason for the lack of responsiveness between treatments. Application of lime sand with particles too large for rapid dissolution is perhaps the most common reason for failure to obtain the expected response to liming the effectiveness of lime depends on reaction with acid components in the soil to make the lime soluble. The low rainfall season for 2006 may have also influenced the low responsiveness observed from all treatments.

ACKNOWLEDGEMENTS

Liebe Group would like to acknowledge GRDC for funding the project. Thanks also to Brian & Rowan McCreery for hosting the trial site and assistance with implementing the trial.

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PAPER REVIEWED BY: BRIANNA PEAKE

PRE & POST-EMERGENT HERBICIDE TRIAL ON SLENDER ICEPLANT *(MESEMBRYANTHEMUM NODIFLORUM)*

Lorinda Hunt and John Borger, DAFWA, Three Springs

AIM

To investigate chemical control options of 'slender iceplant' *(Mesembryanthemum nodiflorum)* with commonly used crop herbicides. The focus was to find suitable pre and post emergent options, in legume crops and pastures.

BACKGROUND

Slender Iceplant (*Mesembryanthemum nodiflorum*) has traditionally been viewed as a plant of saline environments and a good indicator of saline soils. Since 1999 iceplant has spread rapidly from saline valley floors into productive paddocks in many areas of the Northern Agricultural Region. This spread has been facilitated by soil disturbance events such as flooding and our lack of understanding of the biology of iceplant resulting in inappropriate management practices.

Once the iceplant has established, it creates its own favorable environment by accumulating salt from depth in the soil and depositing it in its succulent tissues. This storage of salt in the iceplant stubble is then leached with summer and breaking rains, creating a stressful osmotic environment in the topsoil for winter annuals to germinate. The iceplant waits until flushing rains have leached salts from the topsoil to germinate, which is usually after good opening rains or late winter and spring.

Department trials in 2004 and 2005 showed effective control of iceplant with simazine 500 g/L at 2 L/ha, atrazine 500 g/L at 1 L/ha, chlorsulfuron 750 g/kg at 15 g/ha and metsulfuron-methyl 600 g/kg at 5 g/ha. These options are however not registered, and do not cater for legume pasture situations. Trials performed by South Australian Research & Development Institute (SARDI) in 2005 showed effective control of the closely related 'common iceplant' (*Mesembryanthemum crystallinum*), with a mixture of Diuron & Broadstrike®. This mixture was applied post-emergent with minimal damage to medics.

Dicamba in a mix with 2,4-D amine is the only fully registered option in Western Australia for the control of slender iceplant. As this option is not suitable in legumes, replicated trial work was performed this year to obtain data necessary for permanent registration of herbicides for slender iceplant control.

TRIAL DETAILS

	Site 1	**Site 2**
Property	Brian McAlpine - Maya	Damian Ryan - Morawa
Soil type	Red-brown loam over brown clay-loam	Red clay-loam over red-brown hardpan at 20cm & ferruginous layer at 1m
Sowing date	1/7/06 – Yagan Barley	Not sown
Pre-emergent Spraying date	3/7/06	4/7/06
Post-emergent Spraying date	10/10/06	9-10/10/06
Paddock rotation	2005 Yagan Barley	2004 & 2005 Beecher barley
Growing Season Rainfall	May – Oct 105mm	May – Oct 99mm

RESULTS

Table 1: Percentage Iceplant control, visually rated on 30/11/06, for a range of herbicide treatments.

Pre-emergent Treatments	**Maya % Iceplant kill**	**Morawa % Iceplant kill**

25g Broadstrike	98	99
50g Broadstrike	100	100
500mL Diuron + 25g Broadstrike	81	97
500mL Diuron + 10g Chorsulfuron	100	100
500mL Diuron + 5g Chlorsulfuron	95	99
150mL Diflufenican	95	94
500mL Diuron 50%	3	9
1000mL Diuron 50%	50	50
500mL Diuron + 100mL Diflufenican	86	92
1000mL Diuron + 100mL Diflufenican	97	91

Post-emergent Treatments	Maya % Iceplant kill	Morawa % Iceplant kill
25g Broadstrike + wetter	0	0
50g Broadstrike + wetter	0	0
500mL Diuron + 25g Broadstrike	0	0
500mL Diuron + 10g Chorsulfuron	100	100
500mL Diuron + 5g Chlorsulfuron	90	99
150mL Diflufenican	0	0
500mL Diuron 50%	0	0
1000mL Diuron 50%	0	0
500mL Diuron + 100mL Diflufenican	0	0
1000mL Diuron + 100mL Diflufenican	0	0
Post-emergent Treatments	**Maya % Iceplant kill**	**Morawa % Iceplant kill**
800mL Gramoxone + oil		99
1L Spray Seed + oil		99
320mL Dicamba + 640ml 2,4-D amine + oil		95
15g Logran + oil		90
1L Reglone + oil		80
25g Raptor + 750mL Bromoxynil		75
1L Glyphosate + oil		10
320mL Dicamba (500g/L) + oil		0
320mL 2,4-D amine (625) + oil		0
640mL 2,4-D amine (625) + oil		0
500mL MCPA LVE + oil		0

Comments

Slender iceplant exhibits a germination quality that increases its chance of survival. Three sets of seeds are released from capsules on three separate occasions following rain. Seeds maturing in the terminal part of the capsule germinate to a high percentage during the winter months. Whereas, seeds maturing in the lower part of the capsule exhibit some level of dormancy and has a low percentage of germination in the winter months. This mechanism spreads the risk of germination failure and increases the chances of species survival. When looking at control options for iceplant, it is therefore necessary to consider cost effective, pre-emergent herbicide options to control iceplant with the emerging pasture in autumn, as well as post emergent control in pastures for late winter or spring.

Pre-emergent
Good ice-plant control results were achieved with Broadstrike®, diflufenican and diuron in various mixes in these trials. Broadstrike® in particular performed well, however in the extreme, dry conditions of 2006 both diflufenican and diuron were perhaps not fairly tested. The use of diuron or diflufenican in mixtures with Broadstrike® is desirable given the reported SU resistance found in a related species (*Mesembryanthemum crystallinum)* in South Australia.
These results would indicate that there may well be scope to reduce the rates of Broadstrike®, if used pre-emergent. This trial will be repeated in 2007, along with reduced rates in an endeavor to find an economic option for pre-emergent ice-plant control.
Post -emergent
Chlorsulfuron and metsulfuron methyl gave good results in controlling iceplant. The registered option of Dicamba + 2,4-D has also performed well this year. This is consistent with results achieved in 2004 and 2005.
Under the drought conditions of 2006 glyphosate did not perform well, in relation to Spray Seed®. This can be expected for a translocated herbicide which performs better in moist conditions. Previous trial work has indicated glyphosate and Spray Seed® to normally be, both equally effective.
The better results achieved with Gramoxone® as opposed to Reglone® indicate that the paraquat fraction of Spray Seed® is more active than the diquat fraction, in controlling ice-plant. If this is confirmed in future trial work, this fact may well be useful in minimising legume and broadleaf damage, whilst controlling grasses and ice-plant in a knockdown application.
The diuron treatments alone, or in mixes did not appear effective this year. This is perhaps not surprising given the nature of diuron activity and the drought conditions of 2006. Further work with diuron will occur in hopefully a more normal season in 2007.

ACKNOWLEDGEMENTS
- NLP for funding of the project.
- John Borger, Dave Nicholson, Andrew Blake and Peter Newman for technical advice and support.
- Brian McAlpine & Damian Ryan for providing suitable sites.

PAPER REVIEWED BY: JOHN MOORE & ANDREW BLAKE

CROP & PASTURE DEMONSTRATIONS ON PERIODICALLY & MILDLY AFFECTED SALINE LAND

Lorinda Hunt, DAFWA, Three Springs

AIM

To investigate and find productive cropping and pasture options for periodically and mildly affected saline land, in conjunction with alternative agronomic options to control iceplant.

BACKGROUND

There is approximately 190,000ha of salt affected land in the shires of Morawa, Perenjori and Dalwallinu, which is regarded as poor grazing land due to high infestations of slender iceplant. Some of this land is perceived as being unproductive land. Due to our lack of knowledge and any cropping or pasture management practices, these areas have been rapidly colonized with iceplant. The iceplant is believed to be a major constraint to stabilizing or returning these degraded sites to some production as it is highly competitive and allows little else to grow near it.

TRIAL DETAILS

Property	Gary Collins (West Gutha)	James Rd. (West Morawa)	Chris King (Perenjori)	Jeff Smith (Perenjori)	Mel Shaw (East Buntine)
Plot size & replication	3 x 50m x 21 varieties	3 x 50m x 21 varieties	3 x 50m x 21 varieties	3 x 50m x 21 varieties	3 x 50m x 21 varieties
Soil type	Red loam over brown-grey clay, ferruginous layer at 65cm	Red loam over brown hardpan, ferruginous layer at 50cm	Red clay-loam over red-brown clay	Brown sandy duplex	Red sandy-loam over red-brown clay-loam
Soil EM-38 range (mS/m^2)	55 - 185	140 - 259	159 - 349	18 - 56	167 - 329
Sowing date	4th July 2006	4th July 2006	5th July 2006	5th July 2006	6th July 2006
Paddock rotation	2005 Wheat	Regenerating	Regenerating	2005	2005 Wheat

		saltbush & bluebush	saltbush & bluebush	Lucerne & Oats	& regenerating bluebush
Growing Season Rainfall (May – Oct)	126mm	99mm	89mm	106mm	110mm

Property	Wes Morcombe (East Coorow)	Michael O'Callaghan (East Marchagee)	Graeme Maley (South Marchagee)	Rob Nankivell (East Maya)
Plot size & replication	3 x 40m x 21 varieties	3 x 50m x 21 varieties	3 x 50m x 21 varieties	15 x 200m x 6 varieties
Soil type	Red clay-loam over red-brown hardpan	Red loam over brown hardpan	Sand over grey clay and gravel	Red clay loam over brown clay
Soil EM-38 range (mS/m^2)	159 - 349	40 - 163	29 - 61	48 - 493
Sowing date	29th June 2006	28th June 2006	27th June 2006	1st May 2006
Paddock rotation	2005 Pasture	2005 Wheat	2005 Barley	2005 Wheat
Growing Season Rainfall (May – Oct)	92mm	126mm	138mm	92mm

Demonstration strips of 21 different pasture and cropping varieties were sown in 3 x 50m strips, using DAFWA's cone-seeder. Rob Nankivell sowed his six varieties in 200m strips using a 15m wide air-seeder bar. The trial strips generally ran along a transect from low-lying, visibly saline affected and iceplant infested soil, graduating uphill into normal productive cropping areas.

The intention was to measure biomass production for each crop and pasture variety at 10 regular intervals along the transect, to see the effect soil salinity had on yields. However, given the poor growing conditions experienced throughout 2006, most of the trials were not worth harvesting. Instead, observations were made at 5m intervals along each transect, at each trial site. A yield rating was estimated by eye, giving values from 0 – 10. A rating of 0 meant there was no germination in the area of a $1m^2$ quadrat. A rating of 10, meant there was normal germination and the crop would be worth harvesting. A rating of 5, estimates the yield to be 50% of a rating 10 and so on.

RESULTS

Table 1: Soil salinity analysis and corresponding yield observations at Michael O'Callaghan's trial plot for a range of species. The table reflects the layout of the trial site with the drainage line on the left and the order of treatments listed down the table. Readings were taken at 5m intervals out to 50m.
a) Salinity Levels, EM-38 readings, as an average of soil salinity resonance in the top 0.5m of soil (vertical, denoted **V** in column 2) and top 1.5m of soil (horizontal, denoted **H** in column 2).
b) Yields, estimated yield as a rating from 0-10

a) Salinity Levels
Key

0 - 60 mS/m^2	Mild	100-140 mS/m	Mod - Severe
61 - 100mS/m^2	Mild - Mod	>140 mS/m^2	Severe

Distance along transect (m)

b) Yields
Key

9 - 10	No Yield Reduction	4 - 6	Moderate Yield Reduction
7 - 8	Some Yield Reduction	0 - 2	Severe Yield Reduction

Distance along transect (m)

		5	10	15	20	25	30	35	40	45	50
Lucerne	V	52		43		41				48	
	H	39		32		32				36	
Cadiz French Serradella	V				40						
	H				28						
Erica French Serradella	V				41					37	
	H				28					24	
Charano Yellow Serradella	V	58						40			
	H	45						27			
Yelbini Yellow Serradella	V	60			44		44			40	
	H	43			30		29			27	
Santorini Yellow Serradella	V										
	H										
Frontier Balansa Clover	V	57			48						
	H	41			35						
Prima Gland Clover	V				56					41	
	H				43					30	
Santiago Burr Medic	V	65					41			43	
	H	50					30			30	
Herald Strand Medic	V	72									
	H	52									
Safeguard Ryegrass	V				44		56			37	
	H				38		50			25	
Tetraploid Ryegrass	V	76			87						
	H	69			85						
Graza 51 Oats	V	67					59				
	H	43					46				
Pallinup Oats	V				71						
	H				92						
Cereal Rye	V	55			92					50	
	H	45			82					31	
Triticale	V						83				
	H						82				
Eagle Rock Wheat	V										
	H										
Yagan Barley	V	67		126			88				70
	H	42		150			62				54
Puccinellia	V				154		131				
	H				156		129				
Tall Wheat Grass	V	118		163			145			85	132
	H	131		166			111			58	90
Saltland Evergreen Mix	V										
	H										

	5	10	15	20	25	30	35	40	45	50
Lucerne	3	5	10	10	10	10	8	5	2	1
Cadiz Serradella	1	3	7	6	7	8	9	9	10	10
Erica Serradella	1	2	4	5	6	7	8	8	9	9
Charano Serradella	2	4	7	8	9	10	10	10	9	9
Yelbini Serradella	0	1	2	3	6	8	9	9	9	9
Santorini Serradella	0	1	2	3	6	8	9	9	9	9
Frontier Balansa Clover	0	2	3	6	9	8	8	9	10	10
Prima Gland Clover	0	0	0	0	1	7	8	7	8	9
Santiago Burr Medic	0	0	0	0	4	5	7	8	10	10
Herald Strand Medic	0	0	2	2	4	4	8	10	9	10
Safeguard Ryegrass	2	2	5	8	10	0	8	9	9	10
Tetraploid Ryegrass	2	1	5	4	4	3	8	9	9	10
Graza 51 Oats	6	2	2	3	7	8	7	9	10	10
Pallinup Oats	5	2	5	0	4	0	3	10	10	10
Cereal Rye	9	6	4	4	4	0	3	8	10	10
Triticale	8	3	1	3	8	0	5	5	8	10
Eagle Rock Wheat	6	2	2	1	6	1	2	3	10	10
Yagan Barley	8	4	2	2	2	3	8	7	9	10
Puccinellia	Not sown									
Tall Wheat Grass	0	0	0	1	0	4	0	2	10	10
Saltland Evergreen Mix	No germination so far									

COMMENTS

Michael O'Callaghan's site demonstrated a typical situation of mildly affected saline land. The EM-38 readings indicated the soil to be only mildly affected by salinity over most of the site (EM-38 readings shown in Table 1a, below 60 mS/m^2). Crop and pasture yields generally appeared to be much lower nearer the drainage line and increased away from the drainage line. (Table 1b, dark zones, indicate low yields near the drainage line). However, the area of yield reduction didn't precisely reflect the area of soil mostly affected by salt.

Photos of the site taken prior to sowing indicated the pattern follows closely an area infested by iceplant from the previous year. It is known that slender iceplant accumulates and deposits salt in its tissues throughout the growing season (Dale N., 1986). The salt is locked up in its stubble, until leaching rains wash it back into the soil. This mechanism maintains salt in the topsoil creating a stressful osmotic environment for winter annuals to germinate.

It is important to be able to control the iceplant early and throughout the year prior to sowing a crop. This would prevent the upward movement of salt through accumulation in the iceplant and deposition on the topsoil. Herbicide trials carried out during 2006 have provided us with some promising results that will help manage mildly saline sites.

In general, four of the eight trial sites had consistently high salinity levels, exceeding 140 mS/m^2 at the surface over most of the site. However, reasonable yields of ryegrass and cereals were observed in patches on soil reading high in salinity levels. These patches were also free of iceplant residue and retained organic matter on the surface from the previous year. These sites may have the potential to produce cereal crops or ryegrass pastures with the help of soil amelioration methods including lime or gypsum applications, deep-ripping or addition of soil organic matter. These methods are based on the theory of reducing salinity in the topsoil to allow germination of annuals, which will be investigated throughout 2007.

ACKNOWLEDGEMENTS

- NACC and the National Landcare Programme for funding of the project.
- Garry Collins, Chris King, Jeff Smith, Mel Shaw, Rob Nankivell, Wes Morcombe, Mike O'Callaghan and Graeme Maley for providing suitable trial sites.
- Geraldton Research Support Unit for use of equipment and trial support.
- John Borger and Andrew Blake for technical advice and support.

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PAPER REVIEWED BY: PAUL FINDLATER

WHEEL SALTLAND PASTURE TRIAL (SGSL WA2 RESEARCH PROJECT)

Ed Barrett-Lennard & Meir Altman, DAFWA, South Perth

AIM

To determine whether rows of old man saltbush can act as 'biological drains' lowering water-tables and ensuring the growth of high quality under-storey plants

BACKGROUND

Western Australian farmers have now constructed more than 11,000km of deep open drains (Trewin, 2002)[2] at costs of \$5–10/m. Can belts of vegetation also have similar water-table lowering effects?

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[2] **REFERENCES**

Research by the Department of Agriculture suggests that belts of trees are strongly constrained by saline groundwater; there is very little drawdown of water-tables at salinities greater than ~5,000 mg/L (George *et al*., 1999). How are we therefore to lower water-tables where the salinity is that of seawater (~32,000 mg/L)? One solution may be to use belts of saltbushes to use the water.

An experiment in small plots at Kellerberrin suggests that saltbushes can use 60–100mm of groundwater over two years (Barrett-Lennard and Malcolm, 1999). There is also farmer evidence that saltbushes can use enough water to 'freshen' sites enabling the growth of higher quality balansa and subterranean clover (Barrett-Lennard, 2002).

TRIAL DETAILS

Property	The Wheel experiment has been planted at four locations: Wubin (property of Keith Carter), Meckering (property of Colin Pearce), Yealering (property of Chris Walton) and Pingaring (property of Michael Lloyd).
Plot size & replication	At each site, the old man saltbush clone 'Eyres Green' (gift of the Topline Plant Company in South Australia) was planted in rows intersecting each other (like the spokes of a wheel) at 30 degree angles. Plants were 2m apart in the rows. Each row is 75m long
Sowing date	Early September 2003
Fertiliser (kg/ha)	Half the rows were fertilised in August 2005 and again in 2006 with NPK Blue at the rate of 500 kg/ha.

At monthly intervals we are measuring the effects of the plants at 0, 3, 6 and 12m distance from the saltbush on groundwater levels (measured with 3m deep pietzometers) and soil moisture (measured using the neutron moisture meter). In addition, we are measuring plant volumes because as water becomes more limiting on the site, the plants at the centre of the wheel will grow slower than those at the margins.

RESULTS

Rainfall. The amounts of rain that fell at each site during the period June 2004 to October 2006 decreased in the order Yealering (953mm) > Meckering (840mm) > Pingaring (800mm) > Wubin (666mm). A substantial proportion (47-58%) of this fell in the months of June to September. However at each site there was an especially wet period in the summer of 2005/2006. About 150–180mm of rain (17-23% of the total) fell in the months of January and February 2006.

Growth. The growth of this saltbush clone has been strongly affected by the soil conditions (Figure 1). The differences in growth between the sites appear to be primarily due to differences in soil texture (Table 1). Canopy volumes expanded faster with time at Meckering than at any other site, and by the end of the experiment volumes at Meckering were about twice those at Wubin and Pingaring, and these were about twice those at Yealering.

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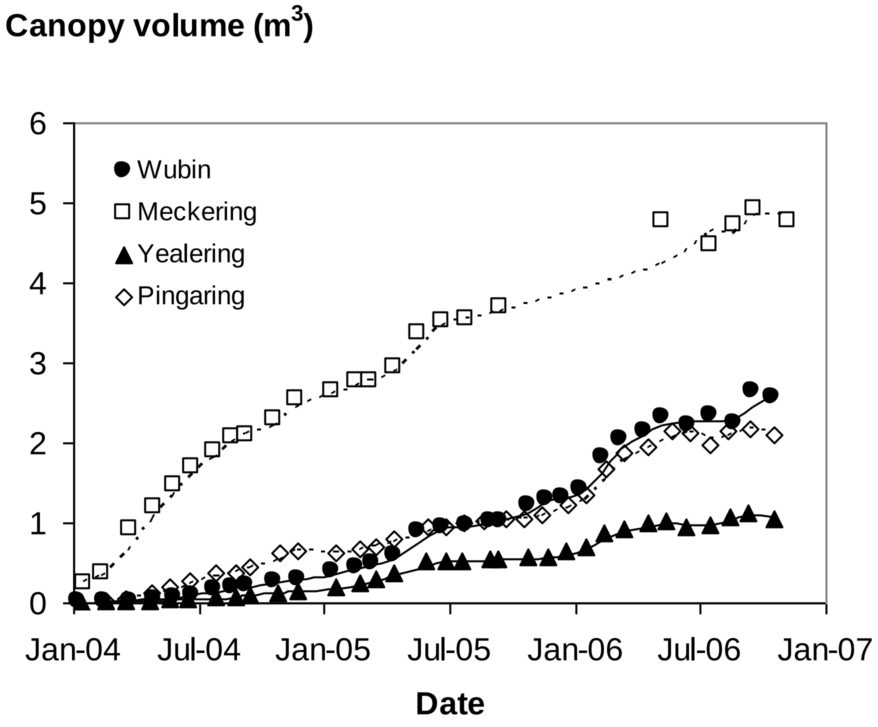


Figure 1: Change in geometric mean canopy volume with time. Each point is the geometric mean of 144 plants. Lines of best fit are two period moving averages.

Table 1: Summary of site conditions at the four locations of the Wheel experiment.

Site	Water-table depth median (m)	Salinity of groundwater (% seawater)	Texture
Meckering	1.0	31	Deep duplex
Pingaring	2.0	96	Loam
Wubin	1.8	89	Shallow duplex
Yealering	0.9	27	Clay

Water use by single rows of saltbushes

We are considering four proofs that saltbushes use groundwater, and because of the greater density of plants, this use is greater at the centre than the periphery of the wheels.

- *Soil beneath rows of saltbushes has lower moisture contents than adjacent soil away from the saltbush rows*. Figures 2 and 3 show the pattern of difference in neutron counts and total stored water over the upper 2m of the soil profile between saltbush rows and 6m away. These data show that to some degree, the soils beneath rows of saltbush became drier at all sites in summer compared to winter (Figure 2). However, the effect only persisted at Wubin (Figures 2a, 3), the site with the combination of most drying conditions in summer (data not presented) and deepest water-tables (Table 1). In the summer of 2004/05, soils were up to 100mm drier at Wubin, but only 25-31mm drier at the other three sites. In the summer of 2005/06, the maximum effects were no greater (23–99mm), presumably because of the high rainfall in Jan-Feb 2006.

- *Soil beneath rows of saltbushes has deeper water-tables than adjacent soil away from the saltbush rows*. Effects of the single rows of saltbush on stored soil moisture were quite subtle and clearest in summer. In Jan-Feb 2005, the average differences in the depths of water-table beneath the single rows of saltbushes compared to 6m away were: 3.4cm (Wubin), 1.3cm (Yealering), 2.3cm (Meckering) and 3.1cm (Pingaring). Although all our plants were larger in Jan-Feb 2006, we were not able to detect greater effects because of the exceptionally high rainfall that occurred in those months. Further measurements of water-table difference will be made over the coming summer.

- *Salt accumulates in the root-zone beneath the rows of saltbushes*. All plants (including halophytes) take up water faster than salt; this leads to an accumulation of salt in the root-zone. We have now completed the first round of drilling (August/September 2006) for the calibration of our neutron moisture meter data. Our analysis of the collected soil samples shows clear evidence of salt accumulation in the root-zone at the two sites with the less saline shallow groundwater (Table 1), Meckering and Yealering (Figure 4). Salt concentrations ($EC_{1:5}$) increased beneath the saltbush rows at depths less than 100cm. At Yealering the greatest increases (0.3–0.6 dS/m) occurred at 0–60cm, whereas at Meckering greatest increases in salinity (0.5 dS/m) occurred at 40–80cm depth (Figure 4). We expect greater differences in salt concentration to develop over the coming summer.

- *Plants have greater water deficits at the centre than at the periphery of the wheel*. One way of determining the water relations of plants is to measure the delta ^{13}C fractionation in the tissues. In January and July 2005 we measured this fractionation in 45mm long segments of shoot tissue. Composites of 12 samples were established from plants 2, 3, 4, 5, 6, 8, 10 in each wheel. Their delta ^{13}C signatures were then correlated with their distance from the centre of the wheel. Delta ^{13}C signatures were higher (less negative) in winter than summer, and in summer, were lowest at Wubin, increasing in the order Wubin < Meckering < Pingaring < Yealering (Figure 5a, b). In summer, there was a strong effect of distance from the centre of the wheel on delta 13C signature at Wubin suggesting that the plants were more limited by the availability of water at the centre than the periphery of the wheel (Figure 5a). It was not possible to make further meaningful measurements of these signatures in the summer of 2005/06 because of the exceptionally high summer rainfall that occurred.

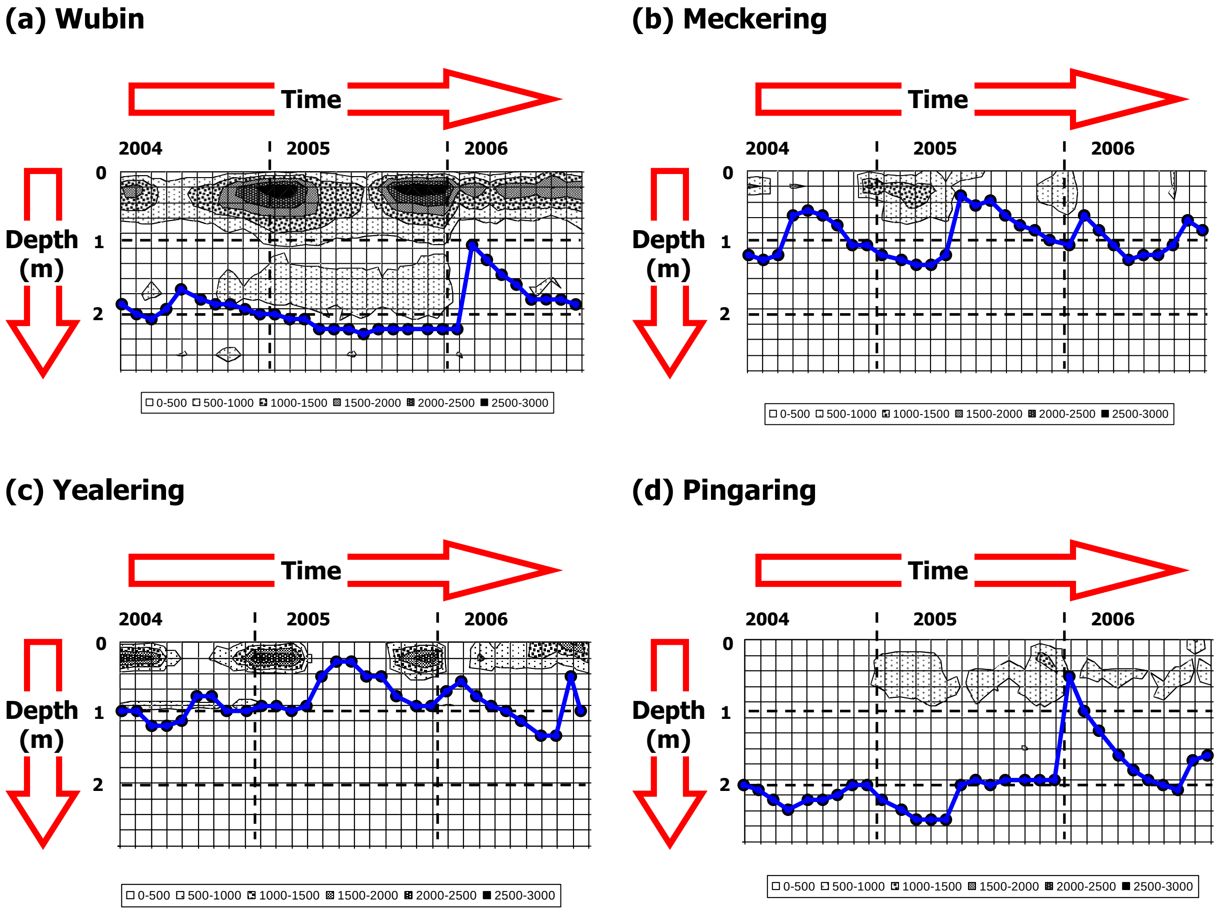


Figure 2. Difference in soil moisture (neutron counts) between single rows of saltbush (Location 2) and adjacent areas 6m away (Location 4).

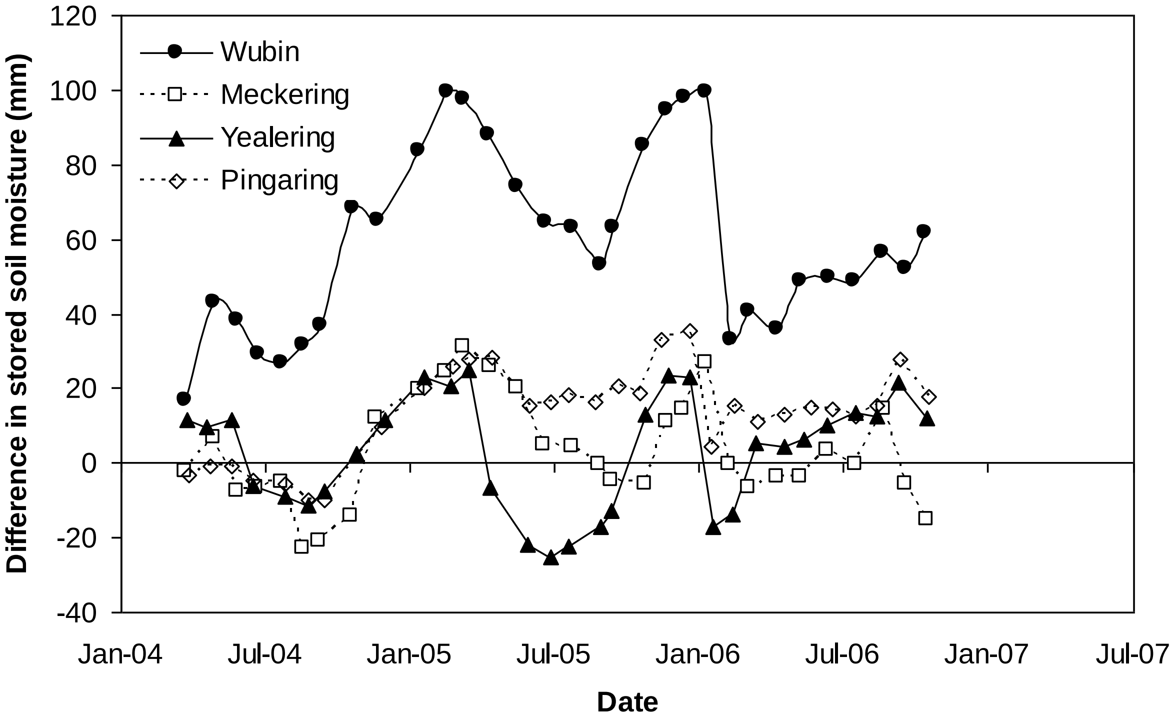


Figure 3: Estimated differences in stored soil moisture between saltbush rows and adjacent areas 6m away. Each point is the mean of six replicates.

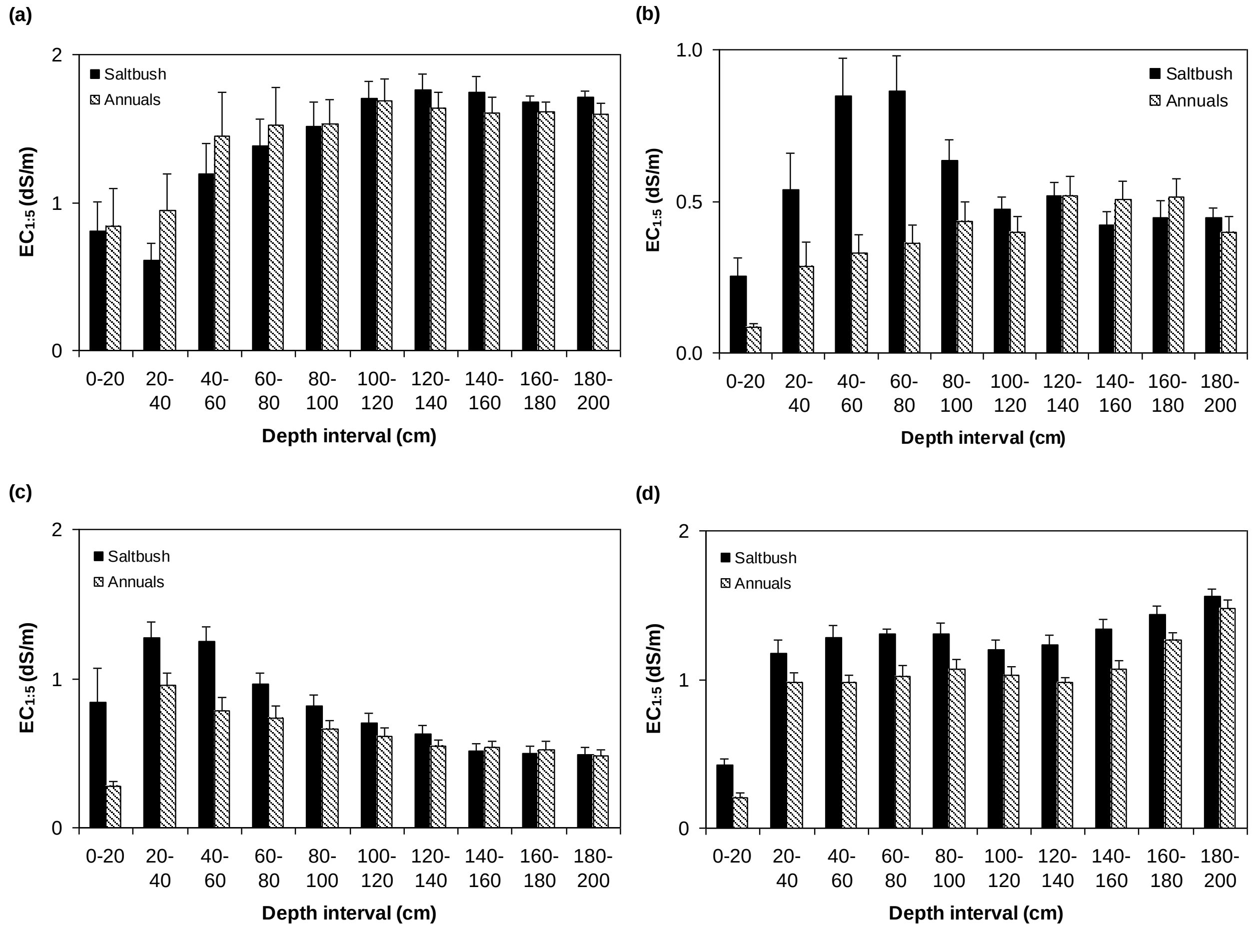


Figure 4: Salt concentrations ($EC_{1:5}$ values) in the winter of 2006 down the soil profile at: (a) Wubin, (b) Meckering, (c) Yealering, and (d) Pingaring. Soil cores were taken either in the saltbush row ("saltbush") or 6m away ("annuals"). Each value is the mean $\pm$ se of 12 values (6 locations, 2 replicates per bore).

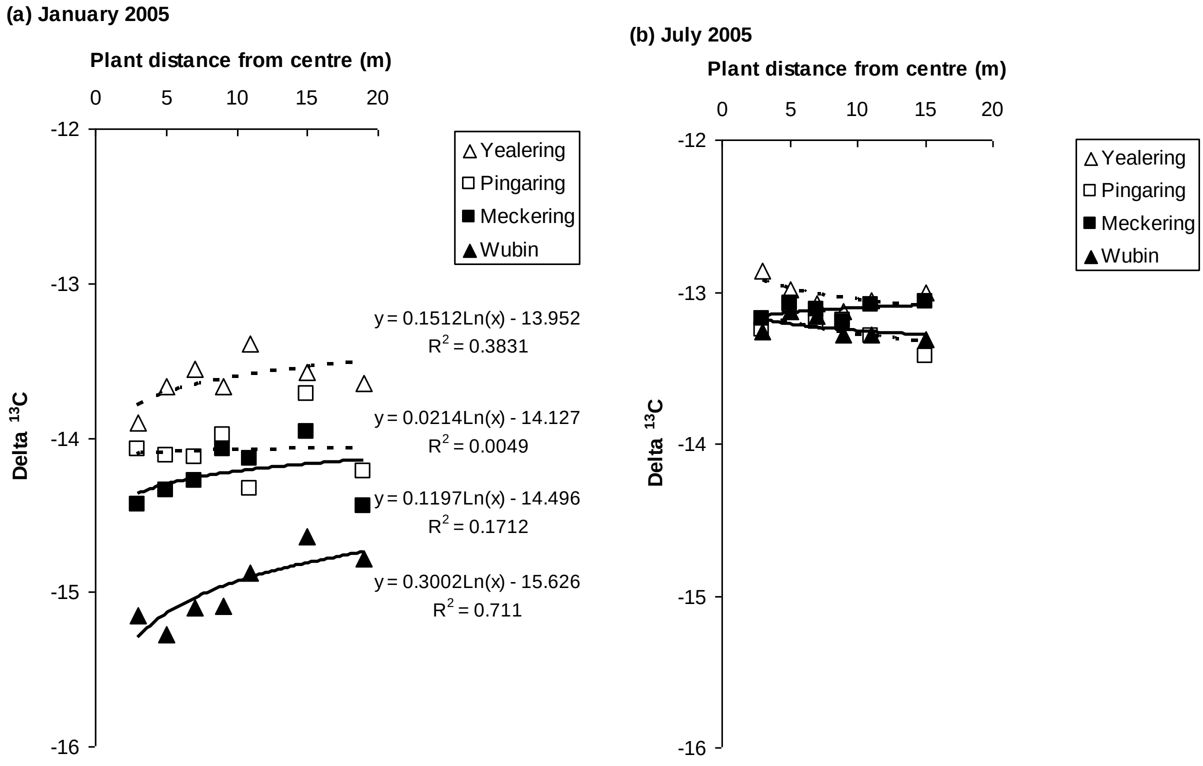


Figure 5: Delta ^{13}C signatures from shoot segments at the four wheel sites: (a) January 2005; (b) July 2005. Logarithmic trend lines have been fitted to the data. Each point is derived from a composite sample of the 12 plants at that location, measured twice.

COMMENTS

These data show that even single rows of saltbush are able to use soil moisture and at least partly control groundwater. The level of water use beneath single rows of saltbush after two years is relatively slight (30–100mm). However, there may be further use of groundwater as the saltbushes continue to grow. (We have observed about 200mm of dryness beneath denser commercially managed stands of saltbush in the Lake Grace area.)

The ability of plants to dry out soil profiles will depend on the depth of the water-table (upper soil profiles can be dried if water-tables are around 2m deep), the salinity of the groundwater (water use will decrease as groundwater salinity exceeds that of seawater), and the dryness of the weather in summer.

The water use by the saltbush system could be very substantial when bulked up over large areas. For example 100mm of water use over a hectare amounts to one million liters of water. Water use on this scale should help to decrease the severity of waterlogging, and lower water-tables enough to grow less salt and waterlogging tolerant annual legumes (like burr medic and balansa clover) as higher value under-storey species to the saltbush.

A final word of warning needs to be given to farmers seeking to use saltbush stands as an alternative to drainage. The saltbushes mainly use groundwater during summer. They may therefore need to be combined with surface water management structures (like W-drains) if waterlogging and flooding is to be avoided in winter.

ACKNOWLEDGEMENTS

This trial is part of the Sustainable Grazing on Saline Lands (SGSL) WA2 project and has been supported by Australian Wool Innovation Ltd. We are deeply indebted to our host farmers - Keith Cater (Wubin), Colin Pearce (Meckering), Chris Walton (Yealering) and Michael Lloyd (Pingaring).

PAPER REVIEWED BY: BRIANNA PEAKE

RIBBON SOWING HELPS WIDE ROWS OF WHEAT

Paul Blackwell & Stewart Edgecombe, DAFWA, Geraldton
Richard & Ian McKenna, Tardun

AIM

Test benefits of ribbon sowing to improve yield of very wide rows in a dry season when sowing onto deep moisture.

BACKGROUND

Wide rows of wheat have been developed to reduce drought risk on shallow soils in the region. Amjad and Anderson (2006) showed a clear trend for cereal yields to increase on wider rows as band width within the row increased from 25 to 75mm on a soil with shallow rooting depth in the dry season of 2002. Benefits of ribbon sowing have also been seen in South Australia and the Victorian Mallee. This encouraged us to test this idea when sowing onto deep moisture at Tardun in 2006. The main role of ribbon sowing could be to improve yield when wide rows are used to allow shield spraying and provide a more profitable alternative to chemical fallow for grass control.

Amjad, M. and Anderson W. K. (2006) Managing yield reductions from wide row spacing in wheat. Australian Journal of Experimental Agriculture 46(10) 1313–1321.

TRIAL DETAILS

<table>
<tr><td>Property</td><td colspan="2">Richard and Ian McKenna, Dean Road, Tardun</td></tr>
<tr><td>Plot size & replication</td><td colspan="2">4m wide and 75m long sown with a research airseeder; four replications</td></tr>
<tr><td>Soil type</td><td colspan="2">Sand over loamy sand with gravel at 500- 700mm</td></tr>
<tr><td>Sowing date</td><td colspan="2">9/6/06 onto moisture at 100-120mm. Variety; Westonia</td></tr>
<tr><td>Seeding rate</td><td>40 kg/ha (low) or 50 kg/ha (high)</td><td rowspan="3">The trial was sown with tines at 300mm for all crop row spacings. This provides a guide furrow for self steering spray shields between the rows of the wide spaced crop; see photos in figure 2.</td></tr>
<tr><td>Fertiliser (kg/ha)</td><td>50 kg/ha DAP deep banded</td></tr>
<tr><td>Paddock rotation</td><td>2005 Canola</td></tr>
<tr><td>Herbicides</td><td colspan="2">Early knockdown and esters for summer weed control, no further weed control needed.</td></tr>
<tr><td>Growing Season Rainfall</td><td colspan="2">77mm (May 2, June 4, September 30); 217 January-April.</td></tr>
</table>

Ribbon sowing was with a Primary Sales winged knife point, splitter boot and a 100mm wide flat presswheel. Normal sowing was with a knife point, 50mm wide presswheel and no splitter. A snake chain effect was made with a spring loaded stiff rubber flap behind the 100mm wide press wheel.

RESULTS

The variation in the analysis of the trial site was reduced by using a covariate analysis with the farm sown crop between the blocks of the trial. The average yield of the farm crop sown in 375mm row spacing with DBS openers using Westonia at 40 kg/ha and 50 kg/ha of deep banded DAP was 0.92 t/ha with 12.4% protein and 1.45% screenings.

Table 1: Yield, quality and gross income of Westonia wheat (APW) after normalizing the data with the farm crop.

Treatment Row spacing; seed rate; presswheel width **BOLD= ribbon sown**	**Yield (t/ha)**	**Heads (/m^2)**	**Protein (%)**	**Screenings (%)**	**Small grain (<2.5mm) %**	**Gross Income $/ha**

300mm rows high (H)	0.99	99	13.1#	1.17	11.5 #	262
300mm rows low (L)	0.96	95	12.7	1.17	11.7 #	253
600mm rows H narrow	0.95	91	11.8	1.07	8.0	250
600mm rows H wide	***1.09***	***105***	12.0	**0.47**	7.5	285
600mm rows L narrow	0.94	73	12.3	0.99	9.8	247
600mm rows L wide	***1.07***	***89***	12.5	**0.51**	7.9	282
	Bold Italics = significantly more/less than narrow presswheels. # = sig. more than wide rows					
$LSD_{0.05}$	0.09	13	0.47	0.47	1.2	

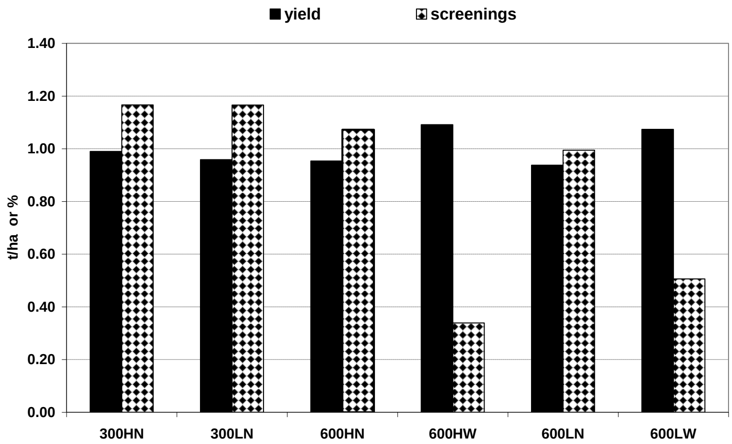


Figure 1: Results summarised.

Figure 2: 600mm rows in plots with ribbon sowing (left) and normal sowing (right); both with the higher seed rate.

COMMENTS

1. The ribbon sowing provided about 137 kg/ha more yield (14%), 0.6% less screenings and an average improvement to income of $35/ha ($248/ha without and $283/ha with ribbon sowing on 600mm rows); this will be a useful benefit when the system is used for shield spraying for grass.

2. The 20% more heads/m^2 from ribbon sowing was due to more tiller survival. This may have been helped by more soil disturbance, thus mineralisation of nitrogen to assist tillering, by the wider winged point used for ribbon sowing.
3. Ribbon sowing and twin rows (easier with disc seeders) probably play an important role in wide row agronomy by reducing cereal plant crowding in the sowing zone. This may be easily visualised by imagining placing two normal rows alongside each other to make a wide row.
4. Ribbon sowing should also benefit cereals at 300mm and 250mm row spacing if soil throw is not a problem.

ACKNOWLEDGEMENTS
Bruce, the Lloyd family, Lindsay Olman and Peter Smallwood for the use of their sheds and workshops. Liebe Group for support and the National landcare Program for funding project "Downhill Tramline farming and very wide rows of wheat".

PAPER REVIEWED BY: STEVE DAVIES

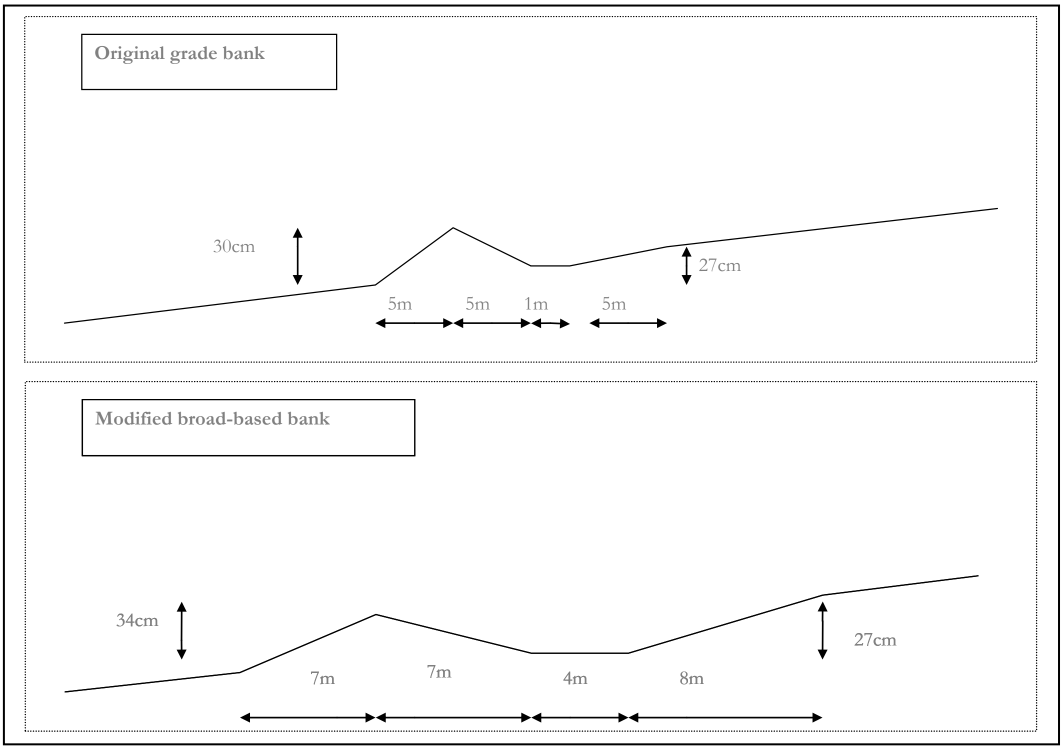
ROLL-OVER BANKS CAN WORK!

Lyle Mildenhall & Peter Whale, DAFWA, Geraldton.
Ross Fitzsimons, Liebe member, Buntine

AIM
To demonstrate and test broad-based rollover banks for control of overland flow and less interference with cropping operations in controlled traffic or tramline farming.

BACKGROUND
Common designs of earthworks to control overland flow cannot be traversed by cropping machinery without extreme risks of damage to the equipment and challenges to the safety of the operator. More growers are adopting at least autosteer and parallel working, if not traffic control too. This obliges most paddocks to be sown in one direction, often the longest run, or north-south; depending on grower preferences and the landscape. Soil conservation earthworks can become an obstacle to this development. Despite practicing no-till and improvements to soil infiltration capacity for rain, there can still be induced runoff from heavy storms; especially if the paddock gets grazed. Broad-based rollover banks are a technical option to help control any runoff, yet still allow passage of cropping machinery. There is little current development of these designs in WA and there are some challenges to machinery design to help traverse them safely, especially at approach angles less than 90 degrees. We established a small demonstration broad based rollover bank at Ross's farm in early 2007.

EARTHWORK DETAILS



RESULTS

Comments by Ross

1. Seeder (DBS) went over safely, but some tynes came out of the ground; a flexibar would have been better.
2. Sprayer went over OK at right angles to the bank, but had to slow down to half speed, off right angles would have been a problem, a suspended boom would probably have been better than a rigid boom.
3. The header was used along the bank and over it; there was too much elevation to harvest when going over.

Ross has made a DVD of the seeder and header negotiating the broad-based roll over bank; please contact him to see it.

We have successfully established this broad based roll over bank and tested if in the 2006 cropping season. There is some interest in further evaluation of different machinery designs for ease and safety of negotiating the structure.
It will be important to observe the integrity of the structure as it ages. We suspect there will be some 'notching', of the crest of the bank by the sprayer traffic on more permanent tramlines. Observations will continue with Ross in 2007.

Figure 1: The broad based rollover bank being seeded in June.

Figure 2: The broad based rollover bank in August. Poor establishment is attributed to sour soil exposed by the re-grading and poor seed depth control with the extreme movement of the seeder.

ACKNOWLEDGEMENTS
Liebe Group for support and the National Landcare Program for funding project "Downhill Tramline farming and very wide rows of wheat".

PAPER REVIEWED BY: STEVE DAVIES

SEASONAL RISK MANAGEMENT PROJECT
YIELD PROPHET AND PYCAL SIMULATIONS FOR WHEAT PRACTICE FOR PROFIT TRIAL

Brianna Peake, Liebe Group

Australian Government
Department of Agriculture, Fisheries and Forestry
National Landcare Program

LIEBE GROUP
Working together in Agriculture

AIM
To determine the effectiveness of yield forecasting tools Potential Yield Calculator (PYCAL) and Yield Prophet (A commercialised version of Agricultural Production Systems Simulator (APSIM)) in predicting wheat yields for different varieties and input treatments in the Wheat Practice for Profit trial.

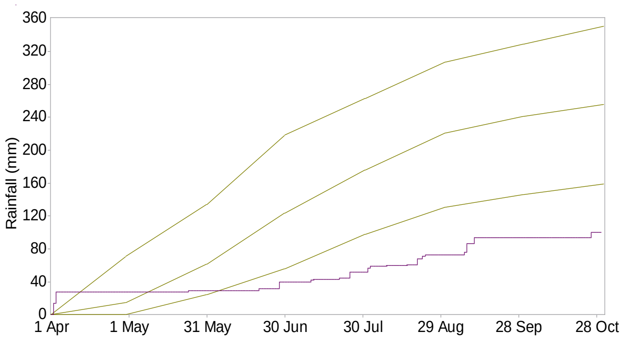
BACKGROUND

The aim of this project is to evaluate the performance of yield prediction tools PYCAL and Yield Prophet and if satisfactory, can they be used as a future tool to help with seeding and nutrition application decision making.

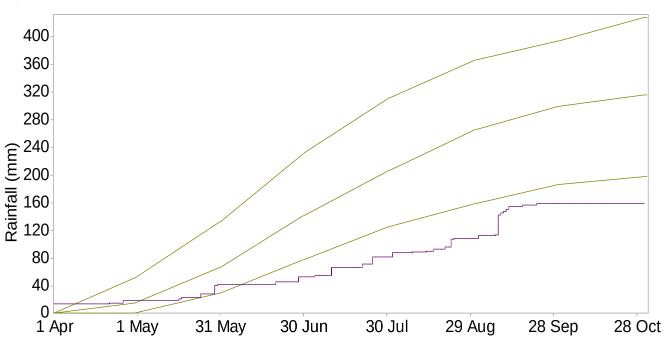
Yield Prophet – is the commercialised version of the APSIM model (Agricultural Production Systems sIMulator), available on the web. APSIM uses site specific soil characterisation data along with water and N content at sowing, crop variety, time of sowing and applied N. This information and the growing season conditions to date are then coupled with historic rainfall to produce a probability curve of likely yield outcomes.

PYCAL – gives an indication of water limited **POTENTIAL** yield based on the French Schultz equation. Which is calculated as: Potential Yield (kg/ha) = Crop Water Use (mm) – Evaporation (110mm) x Water Use Efficiency (WUE). Crop water use is estimated as the sum of plant available water at the start of growing season (April 1) and the growing season rainfall. The model uses a standard WUE of 15 kg/mm/ha, although WUE in this case was calibrated for individual paddocks using five years of past yields and rainfall data. It does not account for N or sowing date effects on yield.

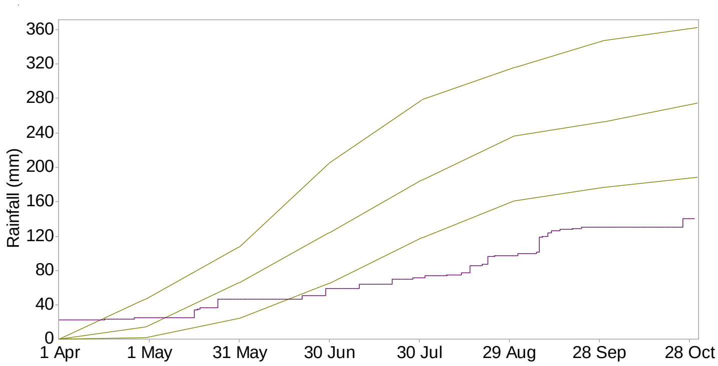
Figure 1: Rainfall received in 2006 in comparison to historical rainfall deciles 1, 5 and 9 for the Dalwallinu, Coorow and Perenjori shires.



Perenjori



Coorow



Dalwallinu

TRIAL DETAILS

The Wheat Practice for Profit trial is designed to investigate the yield obtained for different wheat varieties with low, district, high and seasonally active input treatments. Yield Prophet and PYCAL outputs were obtained for this trial in order to assist the R&D Committee with decision making about the seasonally active input treatment. As well as this, the Practice for Profit trial is a good test for the accuracy of the yield prediction/potential models.

The Liebe Group did not have the capacity to characterise the soil type at the Main Trial Site for Yield Prophet therefore a similar soil type, characterised previously, was used to determine soil parameters. In

2003 Neal Dalgliesh and Peter Carberry of CSIRO, Toowoomba came to WA to initiate 'Soil Matters' workshops throughout the state. At this time six soil types within the region were characterised. Mel and Mark Shaw had a sand over gravel soil type characterised in 2003. The soil parameters from this characterisation were input into Yield Prophet and used for the predictions for the Main Trial Site.

Yield forecasts were recorded from PYCAL and Yield Prophet throughout the growing season and presented in Climate Risk Bulletins for members.

In terms of fertiliser impacts on yield, Yield Prophet only takes into account nitrogen availability. The units of nitrogen applied for each Input Treatment for the Practice for Profit trial were:
Low: 9 kg/ha
District: 37 kg/ha
High: 57 kg/ha
Active: 6 kg/ha

As Yield Prophet accounts for different varieties these were simulated separately.
PYCAL used a WUE of 12 kg/ha/mm, based on calibrations of past yields at the site.
Sowing date was 27/5/06 and the trial germinated evenly due to a 5mm rainfall event two days prior to sowing and an 8mm rainfall event two days after sowing.

RESULTS

Table 1: Median yields (t/ha) predicted on two dates during the growing season using Decile 1 rainfall finish, the final predicted yield (using growing season rainfall), and actual harvested yield for each input treatment (L=low, D=district, H=high and SA= seasonally Active) in 2006.

Treatment	Yield Forecast (decile 1) 28th July		Yield Forecast (decile 1) 22nd Sept		Final Yield		Actual Yield			
	PYCAL	Yield Prophet	PYCAL	Yield Prophet	PYCAL	Yield Prophet	L	D	H	SA
Calingiri	0.5	0.5	0.5	0.8	**0.5**	**0.8**	**0.5**	**0.6**	**0.5**	**0.6**
Arrino	0.5	0.5	0.5	1.0	**0.5**	**1.0**	**0.4**	**0.4**	**0.7**	**0.5**
Wyalkatchem	0.5	0.5	0.5	1.0	**0.5**	**1.0**	**0.5**	**0.4**	**0.5**	**0.4**
Bonnie Rock	0.5	0.5	0.5	1.0	**0.5**	**1.0**	**0.5**	**0.4**	**0.5**	**0.5**

COMMENTS

Before conclusions are drawn from the results it is most important to remember this is the second year that these models have been validated on farm in the Liebe region, and also that the soil at the site was not individually characterised. The main purpose was to determine if these tools were able to simulate yield in realistic vicinity and to adjust the way the tools are operated if required for better yield forecasting in the future.

- The results show that the early season predictions for both Yield Prophet and PYCAL were close to the final yields, however when simulations were conducted later in the season (after the significant rainfall event (17mm) in early September) Yield Prophet predictions had increased.
- At the end of the season using final growing season rainfall figures Yield Prophet was predicting approximately 500 kg/ha over the actual yield for most varieties. While large in percent terms, this is not a large error in absolute terms. More specific information on the soil at the site may have improved the model accuracy.
- There was no real or simulated difference in yield between varieties and input treatment, except for the 700 kg/ha achieved by Arrino at the high input treatment.

- Yield Prophet is able to give a measure of soil nitrogen content throughout the growing season, taking into account starting soil nitrogen, applied nitrogen and nitrogen use by the crop. The trial site soil type had approximately 150 kgN/ha of soil nitrate-N at seeding, which was enough nitrogen to reach well over the yield potential for that soil type for the 2006 growing season rainfall.
- Due to this high level of nitrogen in the soil there was no significant difference in yield predicted by the model for the different input treatments. There was enough nitrogen in the soil to achieve maximum yield without the large applications of the district and high input treatments.
- When it came time to assess whether the seasonally active treatment would require extra nitrogen throughout the season the model indicated that there was still enough nitrogen to produce the potential yield and therefore no further nitrogen was applied. This was borne out by the harvested yields.
- PYCAL is a simple tool that managed to predict relatively accurately in a dry year, however does lack the detail of Yield Prophet which would become more evident in a higher rainfall year.

Conclusions

- Measuring soil nitrogen content before seeding is beneficial as it gives an accurate indication of soil nitrogen content and what is required to reach a target yield. This is extremely important in a dry year.
- Yield Prophet helps track the nitrogen use by the plant during the season and therefore assists with nitrogen application decision making.
- The complexities and ability of Yield Prophet were not highlighted due to the poor season and the high starting soil nitrogen.

Acknowledgements

Thankyou to the following people for their assistance with this project:
Michael Robertson and Kathy Wittwer CSIRO precision agriculture project and Kelley Whisson, CSIRO, Plant Industries.
Meredith Fairbanks and David Tennant of the Climate Risks and Opportunities group, Department of Agriculture.
Peter Carberry and Neal Dalgliesh, CSIRO, Toowoomba.

Paper reviewed by: Michael Robertson

BankWest Benchmarks From The Dalwallinu And Carnamah Area in 2005/06

The BankWest Benchmarks are a survey of the financial and production performance of WA farm businesses.

BankWest Benchmarks allow farm businesses to quantify their performance in comparison to other farmers in their district and region. Farmers can identify the strengths and weaknesses of their operations and look at the factors that help lift the top performing farms above the others.

Definition of terms

Capital Expenditure ($/Eff Hectare) – Expenditure on any capital items including land purchases with respect to the area farmed.

Crop Insurance ($/Eff Hectare) – Cost of crop insurance with respect to the area farmed.

Crop Insurance ($/Crop Hectare) – Cost of crop insurance with respect to the area cropped.

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.

Farm Income – All income produced from farm related activities. Includes proceeds from the sales of all produce, CBH and diesel fuel rebates and receipts from contracting farm equipment.

General Insurance ($/Eff Hectare) – Insurance costs on buildings and vehicles etc. excluding crop insurance costs with respect to the area farmed.

Long Term Debt ($/Eff Hectare) – Equals liabilities less seasonal or short term liabilities such as funds drawn on an overdraft account and hire purchase expense, with respect to the area farmed.

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

Overhead Cost Subtotal ($/Eff Hectare) – Total of all indirect costs incurred by the farm business.

Paid Labour ($/Eff Hectare) – Payments made to any person for working on the farm business with the exception of the partners, family labour and work undertaken by contractors with respect to the area farmed.

Rainfall (mm) – Growing season rainfall (May-Oct). Bureau of Meteorology averages for each district.

Repairs Buildings, Fence & Water ($/Eff Hectare) – Cost of repairs and maintenance on buildings, fences and water supplies with respect to the area farmed.

Tax Liability ($/Eff Hectare) – Measures the provisional tax payable with respect to the area farmed.

Term Debt Repayment ($/Eff Hectare) – Principal repayments on long term debt with respect to the area farmed.

Total Income – Includes all farm income plus interest received, funds from sale of capital items, any loan funds advanced and any income derived from off-farm investments or other activity.

Total Personal (Inc. Super) ($/Eff Hectare) – All personal expenses incurred by the principals of the farm business including contributions to superannuation with respect to the area farmed.

Total Cash Outgoings – All expenses incurred by the farm business including all operating costs as well as capital, finance and personal expenditures.

Total Sheep Income ($/WGHa) – Income derived from sheep and wool sales with respect to winter grazed area.

Winter Grazed Hectares – Total effective area less the area cropped.

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

Equity (%) – The % of owned assets. Calculated as total assets less total liabilities divided by total assets.

Low 25% - The average of the low 25% of farms in the group surveyed ranked by operating profit.

Other 75% - The average of the farms surveyed in each group, excluding the top 25% of farms ranked by operating profit.

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

DALWALLINU – COMPARATIVE ANALYSIS OF DISTRICT PERFORMANCE

	Average	**Top 25%**	**Other 75%**	**Bottom 25%**	**Region Average**
Rainfall (mm)	243	259	239	224	251
Capital Analysis					
Effective Area (Ha)	4,034	5,083	3,676	3,047	3,937
Assets ($/Eff Ha)	1,356	1,335	1,353	1,255	1,274
Debt ($/Eff Ha)	171	167	169	226	193
Long Term Debt ($/Eff Ha)	85	97	84	96	101
Equity (%)	86%	84%	87%	81%	83%
Long Term Debt to Income (%)	30%	27%	32%	44%	34%
Return to Capital (%)	3.1%	10.7%	0.7%	-3.1%	4.0%
Farmland as % of Total Assets	57%	51%	59%	58%	56%
Tax Liability ($/Eff Ha)	5	2	5	7	5
Machinery Value ($/Eff Ha)	221	232	215	194	206
Machinery Value ($/Crop Ha)	324	345	314	319	300
Machinery Value as % of Farm Income (%)	78%	60%	83%	94%	72%
Operating Analysis					
Grain % of Farm Income	85%	84%	86%	85%	85%
Sheep & Wool % of Farm Income	9%	11%	9%	9%	10%
Farm Income ($/Eff Ha)	247	322	224	161	247
Operating Costs ($/Eff Ha)	168	174	168	142	164
Operating Return ($/Eff Ha)	78	148	56	19	83
Operating Profit ($/Eff Ha)	56	124	34	(1)	63
Operating Cost/Farm Income (%)	72%	57%	77%	88%	70%
Cost Analysis ($ / Effective Ha)					
Seed & Treatments ($/Eff Ha)	6	5	7	4	5
Crop Insurance ($/Eff Ha)	1	1	1	1	1
Pesticides/Herbicides ($/Eff Ha)	28	27	28	22	26
Fertiliser ($/Eff Ha)	45	50	44	36	44
Contract ($/Eff Ha)	6	4	7	10	6

Fuel & Oil ($/Eff Ha)	19	18	19	16	18
Repairs & Maintenance ($/Eff Ha)	14	17	13	12	14
Conservation ($/Eff Ha)	0	0	1	1	0
Repairs BFW ($/Eff Ha)	3	2	3	3	2
Paid Labour ($/Eff Ha)	9	8	10	6	8
Rates ($/Eff Ha)	4	4	4	4	4
Licences ($/Eff Ha)	2	1	2	2	1
General Insurances ($/Eff Ha)	4	5	4	4	4
Professional Fees ($/Eff Ha)	3	1	3	3	2
Telephone & Electricity ($/Eff Ha)	1	1	1	2	1
Overhead Costs Sub Total **($/Eff Ha)**	19	20	18	16	18
Total Personal Expenditure ($/Eff Ha)	25	31	23	18	25
Taxation ($/Eff Ha)	3	2	3	1	4
Loan Repayments ($/Eff Ha)	27	44	22	31	28
Hire Purchase & Lease ($/Eff Ha)	12	12	12	9	12
Capital Expenditure ($/Eff Ha)	47	70	29	55	41
Interest on Loans ($/Eff Ha)	12	13	12	14	12
Cropping Analysis					
Total Crop Area (Ha)	2,799	3,409	2,591	1,928	2,867
Crop % of Effective Area (%)	69%	69%	68%	61%	69%
Wheat (T/Ha)	1.82	1.89	1.79	1.69	1.87
Barley (T/Ha)	1.91	2.10	1.83	1.63	1.98
Lupins (T/Ha)	1.30	1.16	1.34	1.37	1.30
Canola (T/Ha)	1.23	1.28	1.15	-	1.33
Cropping Analysis ($/Cropped Ha)					
Seed & Treatment ($/Crop Ha)	9	6	10	9	7
Crop Insurance ($/Crop Ha)	1	1	1	1	1
Pesticides and Herbicides ($/Crop Ha)	39	39	40	34	37
Fertiliser ($/Crop Ha)	65	71	64	58	64
Fuel & Oil ($/Crop Ha)	27	26	27	26	26
Repairs & Maintenance ($/Crop Ha)	20	24	19	19	20
Paid Labour ($/Crop Ha)	13	11	13	9	11
Total Crop Costs ($/Crop Ha)	146	145	147	127	140
Sheep Analysis					
Total Sheep Shorn (Head)	2,315	3,572	2,009	1,398	2,173
Winter Grazed Hectares (Ha)	1,235	1,674	1,085	1,119	1,218
Total Sheep Income ($/WGHa)	72	105	65	33	74
Sheep Costs ($/WGHa)	56	66	56	31	57
Wool Cut (Kg/Head)	4.33	4.41	4.34	4.42	4.32
Wool Cut (Kg/WGHa)	9.59	12.63	9.18	6.94	9.79
Wool Price ($/Kg)	4.49	4.44	4.53	4.67	4.88
Average Sheep Sale Price ($/Head)	54	63	51	51	80
Lambing Rate %	91%	86%	92%	92%	91%

CARNAMAH – COMPARATIVE ANALYSIS OF DISTRICT PERFORMANCE

	Average	Top 25%	Other 75%	Bottom 25%	Region Average
Rainfall (mm)	343	323	352	358	318
Capital Analysis					
Effective Area (Ha)	3,105	3,978	2,925	3,259	2,887
Assets ($/Eff Ha)	2,111	1,671	2,257	2,035	2,209
Debt ($/Eff Ha)	276	208	298	334	335
Long Term Debt ($/Eff Ha)	137	87	154	207	158
Equity (%)	86%	85%	87%	82%	84%
Long Term Debt to Income (%)	36%	25%	39%	61%	39%
Return to Capital (%)	4.7%	10.9%	2.6%	-1.9%	4.5%
Farmland as % of Total Assets	68%	42%	77%	62%	77%
Tax Liability ($/Eff Ha)	14	17	13	5	12
Machinery Value ($/Eff Ha)	297	210	326	375	286
Machinery Value ($/Crop Ha)	375	263	412	473	421
Machinery Value as % of Farm Income (%)	85%	52%	98%	107%	85%
Operating Analysis					
Grain % of Farm Income	86%	88%	85%	79%	85%
Sheep & Wool % of Farm Income	10%	8%	11%	17%	10%
Farm Income ($/Eff Ha)	351	401	334	268	247
Operating Costs ($/Eff Ha)	227	227	228	221	164
Operating Return ($/Eff Ha)	123	174	107	47	83
Operating Profit ($/Eff Ha)	94	153	74	9	63
Operating Cost/Farm Income (%)	67%	56%	71%	87%	70%
Cost Analysis ($ / Effective Ha)					
Seed & Treatments ($/Eff Ha)	9	19	5	4	5
Crop Insurance ($/Eff Ha)	2	2	2	2	1
Pesticides/Herbicides ($/Eff Ha)	36	26	40	34	26
Fertiliser ($/Eff Ha)	66	72	63	63	44
Contract ($/Eff Ha)	4	1	5	2	6
Fuel & Oil ($/Eff Ha)	23	21	24	23	18
Repairs & Maintenance ($/Eff Ha)	18	16	18	16	14
Conservation ($/Eff Ha)	1	1	1	1	0
Repairs BFW ($/Eff Ha)	3	3	3	4	2
Paid Labour ($/Eff Ha)	12	9	13	14	8
Rates ($/Eff Ha)	4	3	5	5	4
Licences ($/Eff Ha)	2	2	2	2	1
General Insurances ($/Eff Ha)	5	4	5	5	4
Professional Fees ($/Eff Ha)	3	3	4	3	2
Telephone & Electricity ($/Eff Ha)	1	1	1	1	1
Overhead Costs Sub Total ($/Eff Ha)	22	20	22	22	18
Total Personal Expenditure ($/Eff Ha)	40	38	41	34	25
Taxation ($/Eff Ha)	14	17	13	5	4

Loan Repayments ($/Eff Ha)	36	57	29	26	28
Hire Purchase & Lease ($/Eff Ha)	21	28	18	26	12
Capital Expenditure ($/Eff Ha)	79	47	89	149	41
Interest on Loans ($/Eff Ha)	9	9	10	14	12
Cropping Analysis					
Total Crop Area (Ha)	2,384	2,920	2,205	2,569	2,719
Crop % of Effective Area (%)	77%	74%	79%	79%	69%
Wheat (T/Ha)	2.45	2.60	2.40	2.32	1.87
Barley (T/Ha)	2.44	2.64	2.34	2.36	1.98
Lupins (T/Ha)	2.07	2.31	2.00	2.04	1.30
Canola (T/Ha)	1.49	1.25	1.54	1.40	1.33
Cropping Analysis ($/Cropped Ha)					
Seed & Treatment ($/Crop Ha)	11	25	7	7	7
Crop Insurance ($/Crop Ha)	2	2	2	3	1
Pesticides and Herbicides ($/Crop Ha)	47	36	51	43	37
Fertiliser ($/Crop Ha)	85	97	80	78	64
Fuel & Oil ($/Crop Ha)	30	28	31	29	26
Repairs & Maintenance ($/Crop Ha)	22	22	23	20	20
Paid Labour ($/Crop Ha)	15	13	16	18	11
Total Crop Costs ($/Crop Ha)	184	182	186	167	179
Sheep Analysis					
Total Sheep Shorn (Head)	2,153	2,103	2,170	3,397	2,173
Winter Grazed Hectares (Ha)	722	1,058	610	690	1,218
Total Sheep Income ($/WGHa)	155	115	168	236	74
Sheep Costs ($/WGHa)	129	78	146	251	57
Wool Cut (Kg/Head)	4.53	4.79	4.45	4.43	4.32
Wool Cut (Kg/WGHa)	20.00	14.00	21.00	28.00	10.00
Wool Price ($/Kg)	3.81	4.56	3.59	3.28	4.13
Average Sheep Sale Price ($/Head)	58	70	55	51	49
Lambing Rate %	93%	106%	89%	90%	91%

Comments: ***These results have been extracted from the 'BankWest Benchmarks 2005/2006' report.*** For more information please contact the BankWest Agribusiness Centre on (08) 9420 5174 or Mark Norton, BankWest Manager Dalwallinu on (08) 9661 1101.

Also, if anyone who has not previously participated and would like to, please contact Mark for details. This enables the database to be expanded improving the accuracy of the information. You will also receive a report comparing your own data to the district data as soon as it is extracted.

2006 RAINFALL REPORT

	Perenjori mm	Latham mm	Coorow mm	Wubin mm	Dalwallinu mm	Goodlands mm	Kalannie mm
Jan 06	127.0	89.4	56.6	114.6	84.6	135.2	96.3
Jan ave	13.9	13.3	12.4	13.2	14.6	17.3	14.6
Feb 06	6.8	26.5	35.7	2.0	17.3	3.8	43.4
Feb ave	17.0	14.8	15.0	14.3	16.4	16.3	16.2
Mar 06	0.8	1.3	1.3	4.4	3.3	9.0	8.3
Mar ave	22.9	19.5	21.1	21.4	24.2	25.0	23.5
Apr 06	28	22.5	18.7	24.6	28.0	54.0	33.5
Apr ave	24.4	24.8	24.1	21.0	21.2	23.1	23.5
May 06	1.6	11.7	22.4	15.2	28.2	15.8	16.2
May ave	47.1	42.5	51.7	43.8	46.8	46.2	42.9
Jun 06	10.0	6.9	12.2	11.6	12.7	4.6	8.6
Jun ave	60.2	54.8	76.6	59.8	65.3	51.8	55.5
Jul 06	12.7	24.6	28.6	19.9	22.0	19.0	19.6
Jul ave	51.6	50.8	68.1	52.4	59.4	45.8	48.5
Aug 06	20.3	18.0	26.6	19.4	27.3	18.8	26.2
Aug ave	40.7	38.9	53.6	41.1	45.8	36.0	37.9
Sep 06	20.8	27.0	49.7	30.8	33.6	47.2	37.7
Sep ave	19.9	18.8	30.2	20.3	25.1	21.1	19.1
Oct 06	0.0	0.0	0.0	6.0	8.2	5.8	6.9
Oct ave	13.2	11.0	18.6	13.3	16.9	12.1	13.1
Nov 06	0.4	2.6	2.8	12.0	16.7	13.0	20.1
Nov ave	9.9	9.7	9.9	9.7	12.0	11.1	9.5
Dec 06	N/A	16.4	22.0	14.0	12.9	5.2	16.0
Dec ave	8.4	8.5	8.3	8.7	10.4	11.5	10.0
2006 TOTAL	**228.4**	**246.9**	**276.6**	**274.5**	**294.8**	**331.4**	**332.8**
Average TOTAL	333.0	308.5	389.8	314.3	358.0	318.0	312.0

Total of 42 surveys received from survey presentation at Liebe Group Spring Field Day.

Q1: What are the major problems on your farm?

Agronomic	
Herbicide-resistant weeds	14
Weeds/weed management	10
Inputs- pre or post?	
Suitable cropping varieties	
Wild oats on heavy land in cont. crop	
Lupin yields	
Seasonal variation/low rainfall options	
Lack of rain	10
Climate variation	3
Climate broadcasting- weather	3
Poor performance in dry/drying conditions	
Pastures and Livestock	
Improving pastures	2
Pasture & palatability	2
Suitable grazing options- rotation	2
Dual purpose cropping	
Increase carrying capacity/new pasture mixes & rotational grazing	
Early pasture growth varieties- cadiz too late	
ARGT	
Sheep lice control	
Cost/Profit/Financial	
Managing increasing input costs	9
Profitability	5
High fertiliser costs	
Money for produce	
Falling terms of trade	
Potential expansion opportunities	
Crop type diversification – alternatives – profit/risk variables	
Adaptability of legumes to environment- money wise	
Commodity prices dropping	
Grain marketing	
Viability	
Soil Health	
Soil constraints	4
Soil acidity	4
OM v. humus + nutrition	
Shallow soil/acid & soil depth	
Soil variability- types, pH, organic matter	
Moisture conservation	
Salinity	
Salinity/salt affected land usage	6
Nature conservation- protecting natural areas	
Systems	
Integrating stock & crop	
Social	
Labour (shortage of workers available, increasing amount of work to be done)	6
Father-son relationship (or lack of)	
Farm size- not enough land	
Increasing problems with running sheep- lack of quality shearers & mulesers	

Isolation
Labour v. machinery (buying bigger, more efficient machinery v. getting an extra person to help)
Too much work/maintenance and not enough time to do it
Influence government to protect future of broadacre farming communities
Access to new technologies

<u>Q2: What sort of workshops or training courses would you like the Liebe Group to run in 2007?</u>

Stock	
Comparing different stock regimes	
Feed alternatives for stock	
Stock health & management- care, disease, injury prevention	
Rotational grazing	
Low stress stock handling	
Sheepdog training	
Water supply- types, best value	
Animal nutrition (practical) course	
Cropping	
Chemical Accreditation- ChemCert	5
Precision Ag.	3
Controlled traffic farm planning	2
Best use of variable rate tech. – ie what gets more or less inputs	
Grain marketing	
Marketing – Not AWB – training & relationship extension	
Alternative marketers and development of relationships at a local level	
QA	
Plant disease ID course	
System	
Biofuels	2
Electric fencing- how, what, why	2
Salinity management options	
Use of climate risk tools	
Soil characterisation for PAWC	
Identification of all farm investment	
GPS update	
Seasonal risk	
Drought management	
Soil improvement information	
Social & Skills	
Communication strategies	3
Employment issues	3
Welding/electrical, etc	3
Auto electrical	3
OHAS	2
More skills-based workshops (repeat some)	2
Succession planning	2
Farm financial planning	2
People skills- ie “reading people” for labour management	
Farm purchase	
Basic business management	
Battery-maintenance	
ifarm/ silverfox- getting information to make better management decisions	
Office management- organising an office	

Q3: Are you interested in certain concepts/products/practices that you would like to test on farm with the assistance of Liebe Group staff?

Cropping

Herbicide & fungicide options	4
Canola & wheat varieties	3
Row spacing/wide row spacing- 10” to 20”	2
Guidance, systems evaluation ie: IT components	2

Zone management
Potash rates
Permanent site for zero-tillage
No-tilling
Set up tramlines in paddocks
Tactical management of fertilisers
Seed rate v. N timing
Press-wheel evaluation
Discs v. tynes
Deep banding lime
Deep banding
Barley & oats varieties
Tramlining v. circular
Look at GPS base station for small groups amongst Liebe members
Integrating stubble retention & mulching with current seeding machinery to increase organic matter & moisture retention
Cheap methods of spraying, seeding & other farm practices
Chickpea trial

Livestock/Pastures

Pastures/pasture species	3

Perennial pastures
Grazing of grasses & legumes rotationally
Rotational grazing/fodder mixes
Grazing concepts- eg Rappa fencing
Trialling tetraploid/safe-guard on paddock scale
Saltland pastures
Grazing trials/pasture options
Salt-tolerant legume varieties
Saltbush alleys
Electronic livestock ID- software
Pasture growth rates
Livestock stocking rates
Sowing legume pastures in the inter-row with cereals or grass pasture in the row

Systems

Trialling plants for mildly saline soil
How to grow more on less rainfall
Grower experiences on the ground with systems
Soil fertility
Timber production systems for low rainfall
Deep drainage v. shallow drainage

STRATEGIC PLAN

Updated: October 2006

<u>Vision</u>

VIBRANCE AND INNOVATION FOR RURAL PROSPERITY

<u>Mission Statement</u>

A progressive group working together to sustain and enhance the rural environment through a whole systems approach to Agriculture.

Core functions

- Research, development & validation
- Education
- Member-driven
- Focusing on profit for our members

<u>Our 2010 targets</u>

- Maintain relevance & value to members
- Greater involvement & broader base of members
- Delivered benefits to members in terms of profit & innovation
- Promotion & support for community leadership
- Leading farming research, development & extension
- A strong group able to address sustainability issues

<u>Objectives</u>

1. Conduct high-priority, quality research and development.
2. Educate and encourage local farmers towards a more profitable and sustainable environment.
3. Encourage rural people to reach their potential.
4. Encourage cooperation and facilitate relevant information transfer between Liebe Group members and agricultural industries.
5. Maintain sound financial base of the Liebe Group
6. Support and maintain high performing staff.
7. Support and encourage members to realize opportunities within the Liebe Group and to become more involved.
8. Foster an environment of fun and participation in all Liebe Group events.
9. Maintain a vibrant group with healthy group process.

Key: **EO**- Executive Officer; **EAC**- Employment Advisory Committee; **Admin**- Administration
PC-Project Coordinator; **R&D (Com)**-Research & Development (Committee); **TC**- Trials Committee
GGA- Grower Group Alliance

OBJECTIVE 1
Conduct high-priority, quality research and development.

STRATEGIES	WHO	WHEN
1. Attract & form partnerships with research organisations.		
• Key organisations on Liebe newsletter mailing list.	Admin	Ongoing
• Bi-annual meeting with Department of Agriculture Regional Manager.	EO	Nov & June
• Keep abreast of GRDC research priorities.	PC & Staff	Ongoing
• Invite key personal to R&D planning meeting.	EO	Feb
• Distribute Liebe R&D priorities to major research organizations.	EO	Mar
2. Develop trials & demonstrations to address local priorities at MTS, satellite sites & on-farm.		
• Determine research & development priorities, primarily from annual member survey and contact with local growers.	R&D Com, GB	Oct
• Discuss Strategic R&D priorities at general meeting.	Com	Dec
• Conduct farm demonstrations and coordinate plot research based on priorities.	EO & PC	Ongoing
3. Alleviating production constraints within the soil resource.		
• Benchmark (through grid sampling) LTRS	PC	Feb/March 2004
• Conduct trials and demonstrations at LTRS to address soil health priorities.	PC	2004 onwards
• Benchmark soil quality indicators at 8 satellite sites throughout the Liebe area.	PC	December 2003
• Conduct demonstrations at these satellite sites to alleviate soil constraints.	PC	2004 onwards
• Increase member's knowledge in soil health with newsletter articles, workshops	PC	Ongoing
• Refer to GRDC Soil Health project • (LIE 00003) for more information.		

OBJECTIVE 2
Educate and encourage local farmers towards a more profitable and sustainable environment.

STRATEGIES	WHO	WHEN
1. Encourage the adoption of new technology.		
• Refer to Objective 1, Strategy 2.		
• Conduct a quality Spring Field Day at the Main Trial Site.	TC & EO	Sept
• Field walk at the Satellite Trial Sites.		Post seeding
• Promote results in R&D Results Book and review priority research at Trials Review day.	EO	Feb
• Extend R&D and trial results effectively eg: monthly newsletter, fax outs, meetings, PAR-relationships	EO & PC	Ongoing

between growers and researchers.		
• Intra or Interstate tours, visiting innovative, interesting and sustainable farming systems.	EO	Annually or on demand
• Conduct Crop Update to prepare growers for the coming season.	EO & Staff	March
2. Workshops.		
• Conduct high priority workshops annually (e.g. Accounting Course, Marketing) as determined by annual survey or general meeting.	Admin Officer	As required
3. Newsletters.		
• Members informed of local, relevant and timely information in monthly newsletters.	Staff	Monthly
• Promote great achievements and case studies in Liebe newsletters.	Staff	Ongoing
• Promote opportunities for members.	Staff	Ongoing
4. Increase NRM capabilities for the group as part of a sustainable farming system.		
• Identify and document local sustainable farming system case studies and landcare activities.	Staff	Ongoing
• Keep abreast of funding opportunities.	**Staff/ Contract**	As required
5. Value Adding and Diversification.		
• Identify value adding and diversification opportunities that create a sustainable and profitable environment.	EO & Members	Ongoing
• Prioritise opportunities through Liebe survey.	Staff	Ongoing
• Facilitate studies on priorities and distribute results.	Members & New Enterprise Committee	As required

OBJECTIVE 3.
Encourage rural people to reach their potential.

STRATEGIES	**WHO**	**WHEN**
1. Nominate for awards.		
• Keep abreast of awards.	Members &Staff	Ongoing
• Nominate appropriate members / group.	Members & others (eg Shire)	As required
2. Encourage and promote leadership courses and other self-development opportunities to members.		
• Members and staff seek opportunities and keep the office informed of them.	Members & staff	Ongoing
• Advertise in Liebe newsletter and personally encourage specific members.	Management & staff	As required
3. Encourage & empower women, young & older people to attend Liebe Group activities.		
• Brief relevant committees to consider this in their event planning	Committee Chairperson	As required
• Target this group for case studies in the newsletter	Staff	As required
• Conduct events specifically designed for young farmers.	Staff	As required
• Encourage mentorship within the Liebe Group through newsletter article.	Staff & Committee	Ongoing
• Cater for the interests of women, young and older members at all Liebe events.	Relevant Committees	Ongoing

• Encourage cross-generational attachment at events using management committee as examples.	Relevant Committee	Ongoing
• Target this group to have input at the management and sub committee level.	Committee	Ongoing

OBJECTIVE 4.
Encourage cooperation and facilitate relevant information transfer between Liebe Group members and Agricultural industries.

STRATEGIES	WHO	WHEN
1. Develop & maintain linkages with Agribusiness, Government Agencies and Tertiary Institutions.		
• Have access to database containing research & relevant expertise.	GGA	Ongoing
• The prospectus to be made available to sponsors, potential sponsors and partners, with an update occurring when necessary	Admin & Sponsorship Coordinator	Ongoing
• Encourage industry to attend Committee Meetings.	Committee	As required
• Attend an Agricultural Industry Workshop developed by GGA.	Committee & EO	Oct- Annually
• Refer to Objective 1, Strategy 1.		

OBJECTIVE 5.
Maintain sound financial base of the Liebe Group.

STRATEGIES	WHO	WHEN
1. Finance Committee to oversee Liebe finances and budget.		
• Review project funding timeline	Finance Com	Ongoing
• Prepare budget and allocations to subcommittees.	Finance Com	As required
• Committee meets regularly and when necessary.	Finance Com	Quarterly
•		
2. Seek funding.		
• Review sponsorship guidelines and return on investment for each sponsor.	Sponsorship Coordinator	Ongoing
• Identify & target high-return sources of funding (sponsors, programs, membership and subcontracting).	Finance Com & staff	Ongoing
• Educate members to increase knowledge and experience to seek additional funding opportunities.	Interested members	As required
3. Commercial services.		
• Identify options & demand for provision of commercial services	Committee	As required
• Evaluate & prioritise at general meeting	Committee	As required
4. Develop membership contributions.		
• Review stability of membership numbers and avenues to attract new members	Finance Committee	Prior to AGM
• Recommendation of fees and value of membership.	Finance Committee	AGM
• Use member survey & feedback to identify member requirements of group	Staff	Oct
• Current Liebe members to promote membership value	Members	Ongoing
5. Promotion of Liebe Group.		

• Produce press releases and/or invite media to main Liebe Group events.	EO & Staff	For events
• Arrange meetings with Sponsors and Partners	Sponsor Co-ord	Bi-Annually
• Maintain website.	EO & staff	As required
• Hold an annual Liebe Dinner	Members/staff	Oct
• Invite sponsors, partners and local agribusiness to main Liebe Group events.	EO & Staff	For events

OBJECTIVE 6.
Support and maintain high performing staff.

STRATEGIES	WHO	WHEN
1. Support and develop Liebe Group employees each year.		
• Review performance appraisal document.	EAC	Annually
• Review performance, salary, goals and objectives taking care to enhance employee's areas of special interest.	EAC	Dec
• Conduct annual performance appraisals. Include self and team assessment process (SWOT).	President & Staff	Nov
• Introduce 360 degree feedback process.	EAC & staff	Ongoing
• Review new employee induction program. Include community introductions, accommodation and mentorship.	EAC & Executive Officer	As required
• Review mentor program for employees	Executive Officer	Ongoing
2. Maintain and increase employment base in order to meet group requirements.		
• Review list of all roles and responsibilities, delegating a staff member to each role.	President & staff	Oct
• Identify "gaps" in roles and skills, and investigate employment options.	President & EO	Oct
• Investigate contracting funding specialist	EO	As required
• Provide employees with comfortable working environment.	Committee	Ongoing

OBJECTIVE 7.
Support & encourage members to realise opportunities within the Liebe Group to become more involved.

STRATEGIES	WHO	WHEN
1. Committee Development.		
• Analyse resources, skills and interests required for successful Liebe Group sub committees.	Committee	Feb
• Identify training and educational opportunities for Liebe Group (sub) Committee Members.	Committee / Staff	Ongoing
• Distribute folder for subcommittee members and include guidelines for effective committee meetings.	Ethics Committee	AGM
• Review committee and sub committee involvement & responsibility.	Committee	Pre AGM
• Individually approach members to be involved in various committees.	Committee/ Staff	As required
• Identify options for succession planning to increase member involvement on sub committees.	Committee	As required

2. Member Development.		
• Encourage greater input from non-involved members in decision making of the group. Bring a buddy philosophy.	Committee	Ongoing
• Survey member interest areas for development opportunities.	Administration	Annual survey
3. Financial assistance.		
• Identify high priority development opportunities. Input for Liebe Group members, which the Liebe Group may provide financial assistance if required.	Committee	Ongoing
• Identify new funding and sponsorship sources that enable opportunities to be developed and remuneration to be received.	Members & Sponsorship coordinator	Ongoing
• Review standard proposal for members to receive remuneration for voluntary time (e.g. $/hr and travel cost).	Ethics Committee	Prior to AGM
• Allocate funding in budget for members to develop Liebe Group opportunities.	Finance and Ethics Committee	Feb
• Promote financial assistance & opportunities in newsletter (eg travel reimbursement)	Administration	Whenever appropriate

OBJECTIVE 8.
Foster an environment of fun and participation in all Liebe Group events.

STRATEGIES	WHO	WHEN
1. Celebrate achievements.		
• Acknowledgment of success of members and the Liebe Group	Members & Staff	Ongoing
• Cater for post event celebrations.	Members & Staff (or outsourced)	At events
2. Encourage family and community involvement.		
• Early notification of dates.	Admin	Always
• Conduct regular intra and inter state trips	Staff	Sept
• Invite high profile and other interesting guest speakers to main events (eg: comedians, clowns, Brian Bush, crocodile handlers).	Event organiser	As required
• Identify opportunities for social interaction (eg: Liebe Dinner).	Members & Staff	Ongoing
3. Maintain and develop Liebe identity.		
• Promote sale of Liebe Shirts & Jumpers on membership flyer.	Committee	Feb
• Encourage "bring a buddy" to meetings & events.	Members	Ongoing
• *Refer to Objective 1:* "Conduct high-priority, quality research and development."		
4. Increase profile of the Liebe Group.		
• *Refer to Objective 6:* "Support and maintain high performing staff."		

OBJECTIVE 9.
Maintain a vibrant group with healthy group process.

STRATEGIES	**WHO**	**WHEN**
1. Planning.		
• Conduct 5 yearly strategic plan & review objectives annually as a working document.	Staff, committee & members	Annually
• Review of relevant Strategic Plan objectives.	Members at Management meetings	Annually
• Plan annual budget & recommend to management committee.	Budget Committee	Annually
• Conduct regular budget reviews	Budget Committee	Quarterly
• Implement succession strategy protocol for committees.	Committee	Ongoing
2. Group Process.		
• Ensure inclusive processes are adopted in the group.	All	Always
• Maintain transparency in processes.	All	Always
• Develop written protocols on Liebe Group process to aid in transition of staff and group positions.	Staff & Chairs of Committees	Ongoing
3. Meetings.		
• Monthly meetings of general committee	Administration	Monthly
• Sub committees make recommendations to the Management Committee	Sub Committees	As required
• Ensure effective meeting processes are adhered to.	Administration	Always
• Hold relevant sub-committee meetings	All	As required
4. Code of Ethics.		
• Apply & review Liebe Group Code of Ethics.	Ethics Committee	Annually

LIEBE GROUP CALENDAR OF EVENTS 2007

DATE	EVENT	PLACE	CONTACT
13th February	Liebe AGM & General Meeting	Buntine Bowling Club	Brianna Peake 9664 2030
26th – 27th February	Ballidu Woolpro Group Autumn Feedgap Tour	Darkan	Merrie Carlshausen 9664 1050
1st (dinner). 2nd March	Strategic Review	Buntine Bowling Club	Brianna Peake 9664 2030
7th March	Liebe Crop Updates	Buntine Hall	Brianna Peake 9664 2030
13th March	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
21st (half day) – 23rd March	Management Skills Development Course with Helen McAuliffe	Wubin Combined Sports Club	Sophie Keogh 9664 2030
27th – 28th March	Low Stress Stock Handling Course	Sheoak Springs, Wongan Hills	Sophie Keogh 9664 2030
11th April	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
12th June	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
20th June	Women's Field Day	Buntine Hall	Sophie Keogh 9664 2030
10th July	Pizza 'n' Port night & Liebe General Meeting	TBC	Chris O'Callaghan 9664 2030
14th August	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
11th September	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
13th September	Spring Field Day	Main Trial Site	Brianna Peake 9664 2030
9th October	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030
20th October	Liebe Annual Dinner	TBC	Sophie Keogh 9664 2030
11th December	Liebe General Meeting	Liebe Office	Brianna Peake 9664 2030

Other proposed events for 2007:

- International South East Asia tour (late September early October).

LANDMARK

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