LEADA Lower Eyre Agricultural Development Association

Spring Field Walk

1st September 2015

Celebrating 10 years supporting the development of agriculture on lower Eyre Peninsula

Time	Place	Presenter	Topic
8.30am	Back of Cummins Hotel		Meet and arrange bus travel
9.30am	Ungarra	John Richardson (Chair)	Welcome and Opening
		Blake Gontar	Stubble management trials
		Jamie Phillis	Tynes vs Discs – look at machinery and demonstration
		Alan McKay	Rhizoctonia – what is happening
11.30am	Justin Modras	Andrew Ware	Wheat variety trials
		AGT	New Mace
12.30pm	Ungarra Football Clubrooms		LUNCH
		Brett Masters	Managing acidity Video case studies on managing low pH soils
		Kym Ianson	Farmer speaker on variable rate and managing acidity
2.30pm	Mark Modras - Cummins	Andrew Ware	Canola – time of sowing trials
4.00pm	Return to Cummins Hotel Carpark		

This day would not be possible without the valued support of all our sponsors and funders.

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EARLY IMPROVING PRE-EMERGENT HERBICIDE EFFICACY IN RETAINED STUBBLE THROUGH INCREASED APPLICATION VOLUME

Blake Gontar, SARDI

Decades of research has demonstrated the value of retaining stubble in continuously cropped paddocks. Significant benefits include retaining nutrients such as nitrogen, improving soil structure through the addition of organic carbon, increased infiltration and moisture conservation as well as erosion control. However, maintain stubble cover also necessitates a substantially greater reliance on herbicides for weed control, as herbicides take the place of traditional methods of weed control such as burning, tillage and grazing. With a shift towards earlier sowing (resulting in reduced opportunity for pre-sowing knockdown herbicide application) and a better understanding of the need to rotate herbicide mode of action (MOA) groups, there has been widespread uptake of pre-emergent herbicides for weed control. However, efficacy of pre-emergent herbicides is reliant on soil contact and, ultimately, contact with the emerging root and/or shoot of the target weed. In stubble-retained farming, this soil contact may be impeded by direct interception by surface stubbles. There is evidence to suggest that this problem may be overcome by increasing the carrier volume (water rate) during normal spraying applications. In early 2015, as part of GRDC-funded project aimed at improving profitability in retained-stubble systems, SARDI conducted a trial seeking to evaluate and quantify a) the effect of varying stubble treatments on pre-emergent herbicide efficacy, b) the impact of water rate on herbicide efficacy and c) any specific interactions between common pre-emergent herbicides with either stubble or water rate.

Trial Details

The trial was located 5 km southeast of Ungarra, on South Australia's Lower Eyre Peninsula. The site comprises a 'red-brown earth' consisting of clay-loam topsoil to a depth of approximately 15-20 cm, with red medium clay below. Partially weathered calcrete 'outcrops' ae common in this soil type. The site was selected based on relative homogeneity of soil and slope (level), as well as having tall (300-450 mm) standing retained stubble (2014 wheat stubble from a 3.65 t crop) and known low pre-existing densities of ryegrass, an important agricultural weed in southern Australia and the focus of this trial. An early break in April followed by delayed seeding of the trial ensured that pre-existing ryegrass seed in the soil had an opportunity to germinate, be assessed (< 0.1 plants/m^2) and be sprayed with a knockdown herbicide prior to seeding the trial, in order to limit its influence.

In March of 2015, prior to seeding, replicated 18 m x 20 m blocks of stubble were prepared by either retaining tall standing stubble, slashing to standard harvest height ('beer can height', 200 mm) and spreading the straw/chaff (representing standard district practice) or burning to remove stubble completely. The burn was successfully carried out under optimal conditions, resulting in very little stubble residue in these blocks (Figure 1a). In both the 'slashed' and 'tall standing' blocks, the retained stubble averaged 6.9 t/Ha. However, the nature of the two retained stubble treatments varied greatly with respect to percent cover, with the slashed stubble approaching 85-95 % cover (Figure 1b) and the tall standing stubble covering around 40 % of the soil surface (Figure 1c).

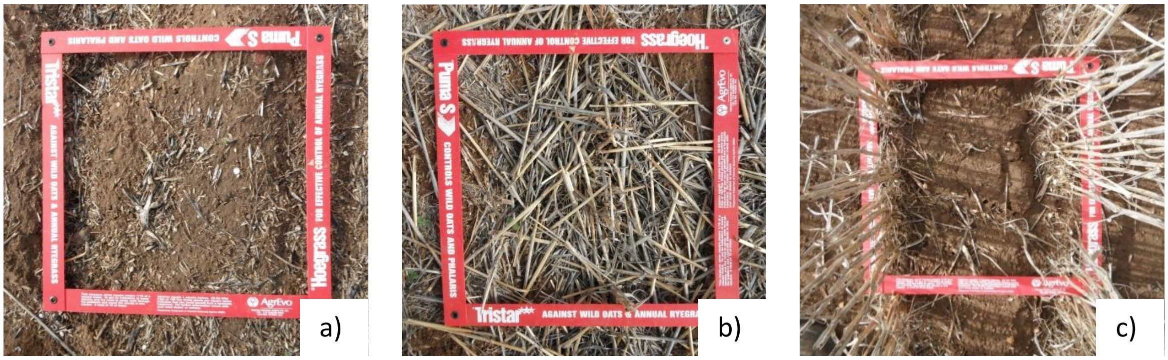


Figure 1 – example cover of the three stubble treatments a) stubble removed (burnt), b) stubble harvested low and spread, c) stubble harvested high and left standing

On the 21st May, Following good April rainfall of 71 mm and May rainfall (up to sowing) of 14.4 mm (including 7.7 mm on the 19th of May), trial plots were spread with Wimmera ryegrass at a rate of 50 plants/m^2 using a plot seeder with the seeding tubes disconnected from the tines and elevated approximately 450 mm above ground level. Visual inspection confirmed that the ryegrass distributed from the seeding tubes established a reasonably even pattern, rather than an 'unnatural' straight sown distribution, as would have been achieved through the boots. This was intended to mimic a natural population of wind-dispersed ryegrass, whilst ensuring a known and relatively consistent number of ryegrass plants per square meter.

Trial plots were then sprayed with combinations of three herbicides – pyroxasulfone (as Sakura™ @ 118 g/ha), prosulfocarb + S-metolachlor (as BoxerGold™ @ 2.5 L/ha) and a mixture of trifluralin and tri-allate (as Trilogy™ @ 1 L/ha and Avadex Xtra™ @ 1.6 L/ha) – at three different water rates, 50 L/ha, 100 L/ha and 150 L/ha. Plots were sprayed using a shrouded four-nozzle spray rig mounted on a Polaris ATV. Each block of stubble contained each of the nine chemical/water rate treatment combinations as 20 m x 1.5 m plots.

Figure 2 – Trial site prior to seeding

Immediately following the application of chemicals, trial plots were sown with wheat (cv Mace) sown at 180 pl/ha using a six tine plot seeder with knife points on 225 mm row spacings. Follow up rainfall of 2.2 mm on the 31st of May was below ideal, however this was backed up by 19 mm on 13th and 25 mm on the 17th of June.

Ryegrass control was evaluated on the 2nd July (6 weeks after sowing) by repeated sampling of ryegrass numbers within each plot (15 per plot, with the average used as a plot estimate). Untreated control plots at the end of the trial site were also evaluated in order to establish a baseline of ryegrass germination.

Results

Ryegrass germination in the untreated control plots averaged 44.3 pl/m^2 (± 5.7), representing nearly 90 per cent germination in the absence of herbicides. These plots had either slashed or tall standing stubble at sowing.

There was a significant difference in ryegrass control between the 27 treatment combinations ($P < 0.0001$). Table 1 (below) summarises the average ryegrass density.

Table 1 - Ryegrass density (plants/m^2) for pre-emergent herbicides under varying application volume and stubble characteristics. Figures represent mean density across four replicates with each plot (sub-sampled 15 times). Means followed by the same letter are not significantly different at P = 0.05.

Herbicide mix	Stubble	50 L/ha	100 L/ha	150 L/ha
Prosulfocarb + S-metolachlor	Removed	14^{efghi}	11^{fghi}	8^{hi}
	Tall standing	17^{defg}	10^{fghi}	7^{hi}
	Slashed	26^{bc}	10^{fghi}	6^{i}
Trifluralin + tri-allate	Removed	15^{defgh}	13^{efghi}	7^{hi}
	Tall standing	18^{cdef}	14^{efghi}	13^{efghi}
	Slashed	14^{efghi}	10^{ghi}	13^{efghi}
Pyroxasulfone	Removed	23^{bcd}	15^{defgh}	12^{efghi}
	Tall standing	36^{a}	13^{efghi}	19^{cde}
	Slashed	28^{ab}	15^{efghi}	11^{efghi}

Over all herbicide types and stubble treatments, increasing the water rate above 50 L/ha had a significant effect on ryegrass control ($P < 0.0001$). Ryegrass density averaged 21.2, 11.83 and 10.87 pl/m^2 for each of the 50, 100 and 150 L/ha treatments. However, the small difference in ryegrass density between 100 and 150 L/ha was not significant (across all stubble/chemical treatments).

Table 2 – Ryegrass density across all herbicides/all stubble types for the three application volumes, with average control given as a percentage reduction from control.

Water Rate (L)	Ryegrass (plants/m^2)	Reduction from control (%)
50	21^{a}	52
100	12^{b}	73
150	11^{b}	75

Over all herbicide types and water application rates, no significant differences were found between the three stubble treatments (P = 0.215). However, at the low application volume (50 L/ha), there were some differences in the prosulfocarb + s-metolachlor treatment where slashed stubble reduced efficacy, and in the pyroxasulfone treatment where tall standing stubble reduced efficacy. However, it is important to note that these stubble/herbicide interactions were only evident at the low application volume – increasing the application volume to 100 L/ha completely negated any stubble or herbicide type effect.

Discussion

The results of this trial clearly demonstrate the value of adopting higher application volumes when applying pre-emergent herbicides and that this factor alone is more critical than stubble characteristics for the herbicides examined. Whilst an application rate of 50 L/ha is below the generally accepted standard of 70-80 L/ha, anecdotal reports indicate that lowering the application rate in order to complete spraying more quickly is reasonably common. However, this trial clearly highlights the sacrifice being made in doing so – no combination of herbicide or stubble treatment resulted in better than 69 % control of ryegrass when sprayed at an application rate of only 50 L/ha. And whilst increasing from 100 to 150 L/ha did not result in significantly better ryegrass control to the 95 % confidence level, there is a reasonably good correlation between higher water rates (> 100 L/ha) and continued increase in ryegrass control.

Interestingly, stubble treatment was not a significant influence on herbicide efficacy in any of the herbicide combinations at or above 100 L/ha. Furthermore, there were quite variable and inconsistent results at the 50 L/ha. However, the level of ryegrass control achieved by removing stubble and lowering application rate was not significantly better (and in the case of pyroxasulfone, was significantly worse) than simply increasing the water rate to 100 L/ha and maintaining standard industry practice harvesting low and spreading straw/chaff evenly. In terms of improving profitability, it is unlikely that removing stubble in order to lower water rate and speed up spray application could prove more beneficial than maintaining full stubble cover and increasing water application to 100 L/ha.

No conclusive evidence of specific interactions between certain herbicides and stubble were obvious in this trial and it is seems likely that ensuring high application rates and appropriate spray quality (coarse-very coarse) is far more influential than the amount of stubble covering the soil. At higher application rates and with good incorporation, adequate ryegrass control should be economically viable even within reasonable heavy spread stubble.

Long-lasting protection to maximise yield potential

Amistar Xtra®

syngenta

AMISTAR XTRA® is a cereal fungicide that contains AMISTAR Technology and is renowned for its length of protection. It is very broad spectrum and protects cereal crops from all key foliar diseases including Stripe Rust, Barley Leaf Rust and Powdery Mildew.

Summary

AMISTAR XTRA is a full-rate Strobilurin (Group K) product that is cost competitive with other cereal fungicides, but delivers significant benefits over low active ingredient (AI) loading Strobilurin competitors. AMISTAR XTRA also contains a second Mode of Action (MOA), Cyproconazole (Group C), which delivers rapid curative activity and more options for fungicide resistance management.

Strengths of AMISTAR XTRA

- AMISTAR XTRA delivers long lasting foliar protection, rate-for-rate outlasting key competitor products
- The Cyproconazole in AMISTAR XTRA delivers the fastest moving foliar curative activity on rusts and Powdery Mildew
- With two MOAs it provides activity on all key stages of disease development
- AMISTAR XTRA has a full dose of Strobilurin active unlike low AI loading competitor products
- Unlike triazole-only fungicides, it stops disease before it attacks the plant, maximising yield potential
- AMISTAR XTRA is rainfast within two hours of application
- Compatible with a wide range of herbicides, insecticides and PGR's

How AMISTAR XTRA works differently than triazole fungicides

To get the the best out of AMISTAR XTRA, it is important to understand the key differences of how it works when compared with triazole fungicides including tebuconazole and Prosaro*.

AMISTAR XTRA

- Works primarily on the leaf surface
- Provides a protectant shield around the outside of the leaf
- Stops the disease entering the leaf
- Provides limited control of established disease, limited curative ability
- Is applied to disease free leaves for maximum benefit

Triazoles (e.g. tebuconazole and Prosaro)

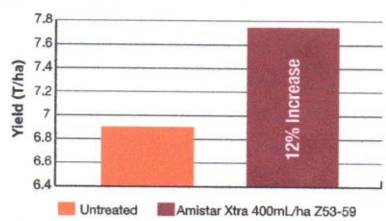
- Works primarily within the leaf tissue
- Allows the disease to penetrate into the leaf
- Disease control during the early stages of leaf infection
- Does provide some curative activity

While AMISTAR XTRA contains a curative MOA with Cyproconazole, to get the best value out of the long lasting protection it is recommended to apply it in situations where there is no or low disease establishment.

Application timing

Given the long length of protection that AMISTAR XTRA provides, application timing is an important consideration.

AMISTAR XTRA's length of protection benefit



Wheat cv. Mitre, Winchelsea, VIC 2003. Key disease(s) present: Stripe Rust. Sprayed at first sign of infection - 0.15% flag leaf area infected at application. Source: AUV00F0062003

Apply during Stem elongation (GS30-33):

- In regions where conditions do not favour disease development for extended periods beyond flag leaf emergence
- Maximises value gained from the long lasting protection
- Can be applied prior to significant disease pressure development

Apply during Flag leaf (GS39-49):

- In long grain filling regions coinciding with environmental conditions favouring continued disease development
- Protects key yield determining leaves for the longest possible period

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PHILLIS FARMING DISC VS DEEP BLADE SYSTEM SOWING TRIAL

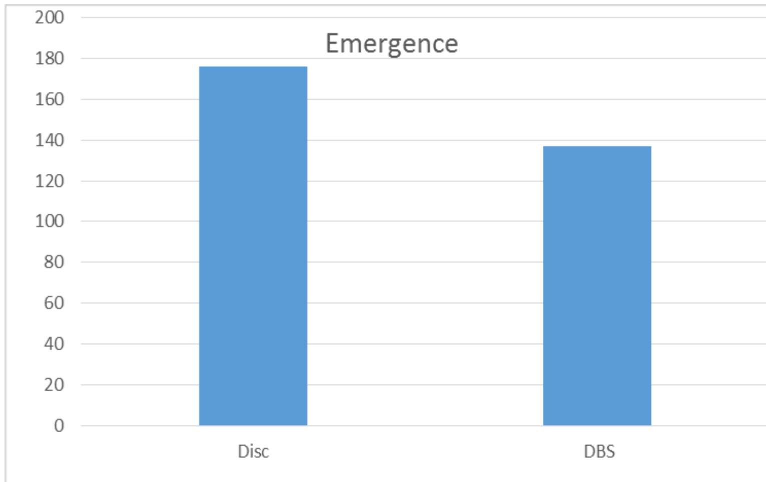
Sown on the 12/5/15

DBS spacing 12 inches

Disc spacing 7.5 inches

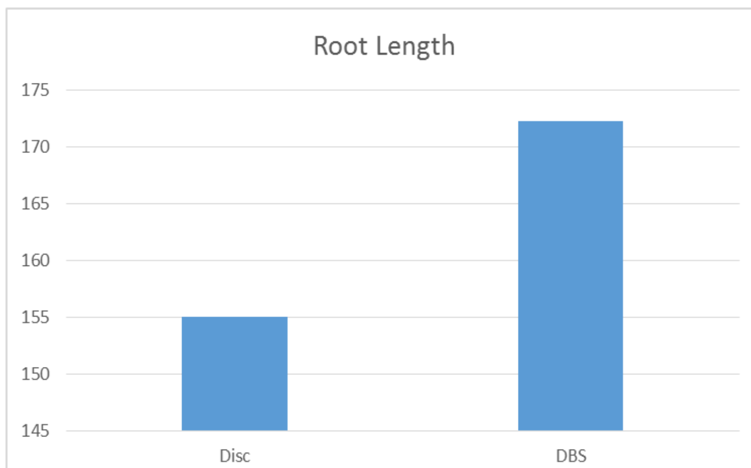
DBS average emergence - 137 plants/m^2

Disc average emergence - 176 plants/m^2



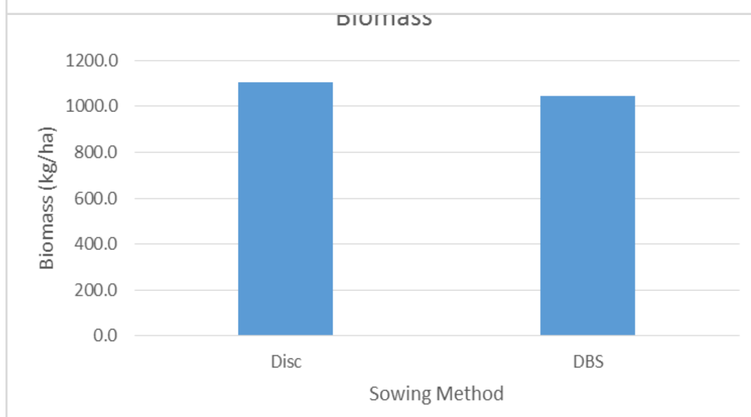
DBS average longest root length - 172.25mm

Disc average longest root length - 155.06mm



DBS above ground biomass - 1046.5 kg/ha

Disc above ground biomass – 1105.3 kg/ha



PHILLIS TRIAL SITE

Background

This project is an initiative of the Eyre Peninsula Natural Resource Management Board and is funded through the Australian Government Carbon Farming Initiative. The objective of the project is to improve soil carbon levels by trialling a range of soil modification practices to ameliorate soil constraints to production that limit soil organic carbon levels. Four trial sites have been established (Ungarra, Butler, Cockaleechie, Crossville) and three demonstration sites (Mangalo, Lock and Louth Bay). Sites were established in 2014 and results will be monitored up to and including the 2018 season. This report provides a summary of treatments (Table 1), soil data and 2014 crop results at the Phyllis site.

Table 1. Site and Treatment Details

Site	Soil type	Crop	Measurements	Treatments
Phillis, (JP) Ungarra	Red sodosol (red brown earth)	Barley	Soil density, nutrition, salinity, organic carbon Plant emergence, Dry matter, Crop yield	1. Untreated 2. Surface applied gypsum (5 t/ha) 3. Surface applied gypsum (10 t/ha) 4. Ripping + 10 t/ha gypsum 5. Ripping + 10 t/ha gypsum + 10 t/ha organic matter (vetch hay).

The soil profile has a very shallow A horizon (less than 12 cm) over a sodic, poorly structured red clay with calcium carbonate increasing with depth. Soil organic carbon levels are comparatively low in the A horizon for this soil type and decrease with depth. High CEC figures indicate high nutrient storage capacity however, the landholder considers that this site is not highly productive. Exchangeable sodium percentages (ESP) figures are very high, (partly due to the presence of some sodium chloride), and the high potassium levels would further increase the potential for dispersion of the clay.

Salinity levels in the subsoil layers (12-50 cm) were at levels that may impact on crop growth. There was also an increasing level of boron in the B horizon suggesting water infiltration to depth is limited.

Figure 1. Phyllis soil profile (Unmodified)

Table 2: Mean Soil Organic carbon and structural properties.

Depth (cm)	Field Texture	Soil Organic Carbon (SOC) %	Bulk Density (g/cm3)	CEC (cmol/100mg)	ESP (%)	Soil pH (CaCl2)	Conductivity
0-10	Sandy Loam	1.04	1.42	15	16	7.6	0.291
10-20	Medium clay	0.6	1.51	29	21	8.0	0.423
20-30	Medium clay	0.52	1.33	33	26	8.2	0.635
30-50	Medium clay	0.42	1.27	30	28	8.2	0.707

Table 3: Major Nutrients.

Depth (cm)	Phosphorus Colwell	Potassium Colwell	Sulphur	Ammonium Nitrogen	Nitrate Nitrogen
	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg
0-10	32	325	5.3	1	6
10-20	9	506	7.2	2	4
20-30	11	486	21.4	< 1	4
30-50	11	476	59.8	< 1	3

Nitrogen values at the time of sampling were low but the soil was very dry pre- sampling with very little if any mineralisation of N (Table 3). Phosphorus levels are considered to be good, with potassium levels high.

Treatments were applied in May with ripping and organic matter incorporation applied using a DMR plough. The site was farmer sown to Fathom barley on 30 May 2014 and managed per the rest of the paddock. Grain yields (t/ha) were extrapolated from the landholder's harvester yield monitor data.

Results.

Heavy rains prior to ripping resulted in the development of deep wheel ruts on ripped treatments which were affected by waterlogging. The wet conditions also resulted in some nitrogen deficiency with some in-crop nitrogen being applied across all treatments.

Plant counts taken in mid-June showed a variable response to both the ripping and the gypsum treatments. The surface applied gypsum appeared to have some benefit in increasing crop emergence with the incorporation of organic matter giving a further benefit. There appeared to be reduced crop establishment where sodic clay was brought to the surface by ripping however, for all treatments plant numbers are considered adequate. Wet conditions to the end of July resulted in some variable waterlogging on the site.

Dry matter data showed that the ripping, gypsum and organic matter treatment produced almost twice the dry matter of the other treatments (Figure2).

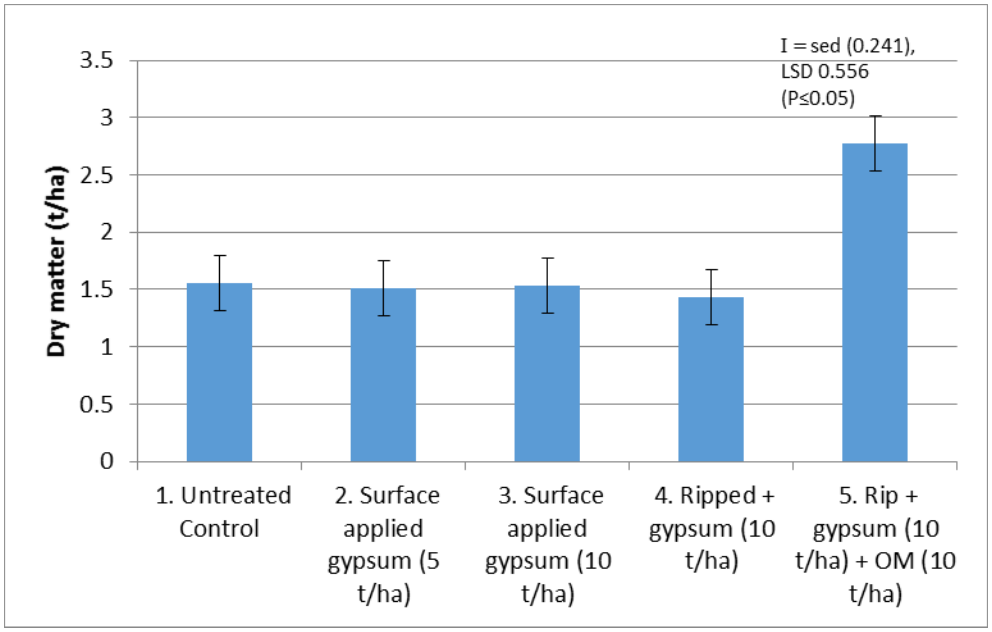


Figure 2. Crop biomass August 2014

Yield data (Figure 3) shows high variability (large error bars) that make interpretation difficult. This may be due to extrapolation of data from the header and/or high site variability. The data does indicate that the higher dry matter levels did not translate to higher yields. Given the extremely dry finish to the season, this may not be a surprising result as the high biomass treatments would have used more soil moisture.

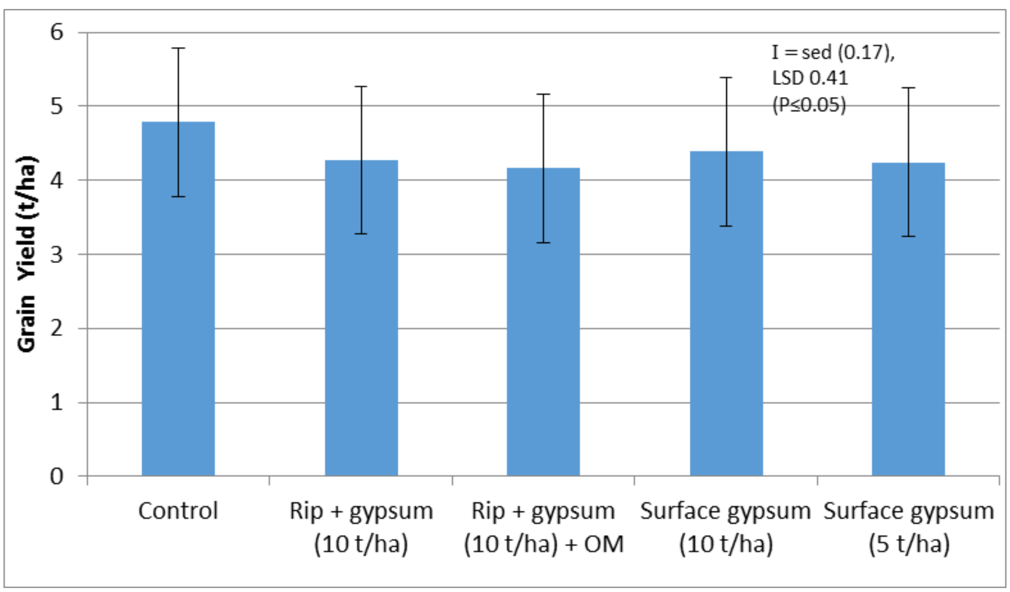


Figure 3. Wheat yield, December 2014

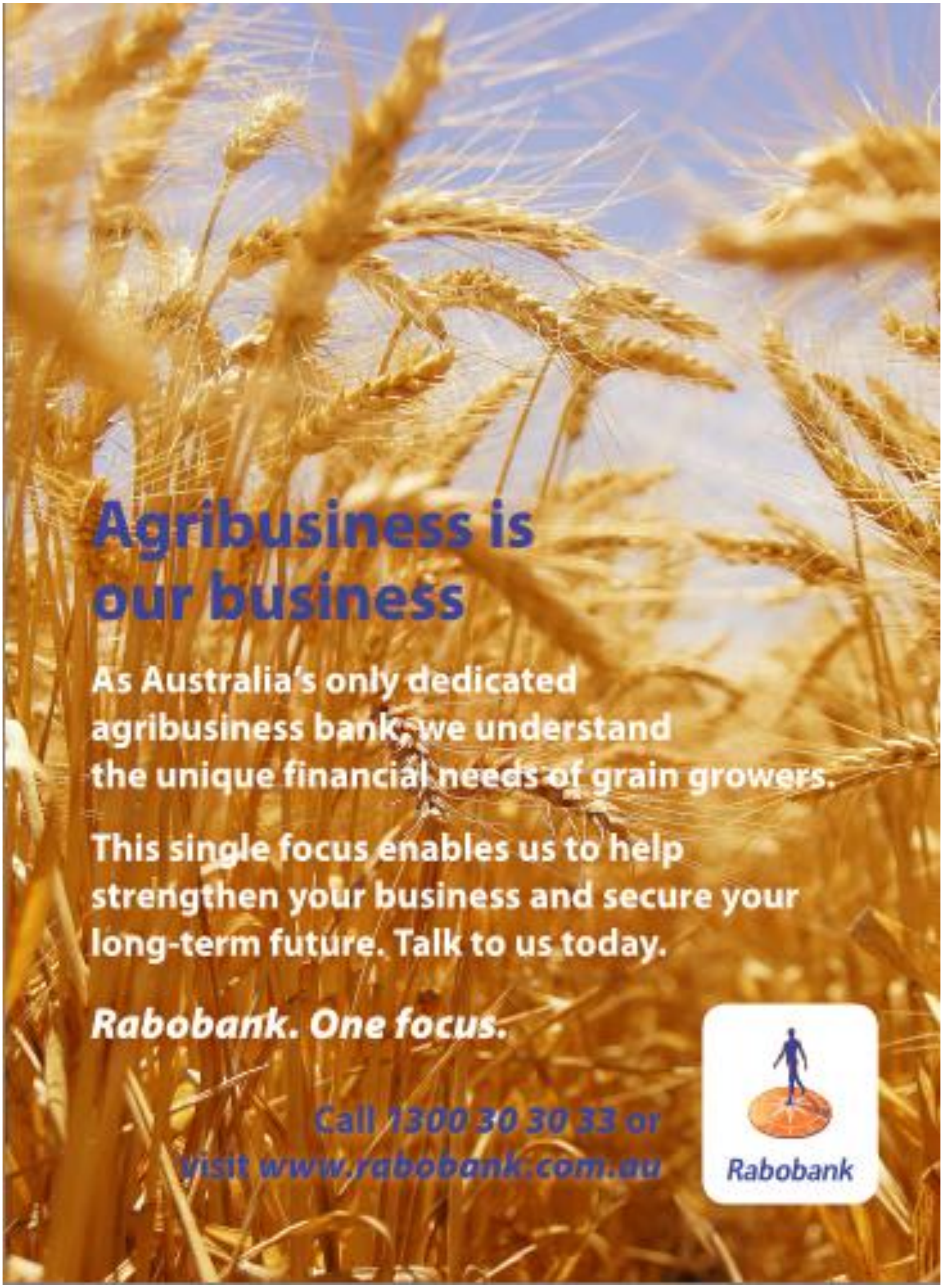
Discussion

This data is from one, highly variable season and therefore needs to be treated with caution. It could also be expected that treatments will take more than one season to deliver maximum results. Initial results support earlier demonstrations conducted at Butler and elsewhere that suggested that there is little benefit to applying gypsum to the surface on soils with sodic subsoil layers. The addition of organic matter also appears to have increased growth but seasonal factors may have affected translation to yield.

Despite the limited impact on yield, the additional above ground biomass of some treatments could be expected to be associated with an increase in root growth. This would result in more carbon being transported into the subsoil, supporting the hypothesis underlying these trials that SOC can be increased if subsoil constraints are overcome. This site will continue to be monitored in 2015 with initial results showing noticeable differences in growth between treatments (Figures 4 and 5).

Figure 4. chickpea growth August 2015 “Control”

Figure 5. Chickpea growth August 2015 Gypsum + OM + rip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WHEAT VARIETY UPDATE

Prepared by Rob Wheeler
New Variety Agronomy, Waite Precinct, SARDI

TAKE HOME MESSAGES

- Most new varieties exhibit test weights well above the new milling wheat minimum of 76kg/hl but significant variation exists for grain protein, test weight and screenings.

- The regular use of fungicides for stripe rust control within wheat NVT has reduced the impact of disease on grain yield performance, hence placing greater importance on the use of disease guides for varietal choice. This is a further reminder of the need to minimise or avoid sowing of susceptible varieties which do not meet minimum disease standards unless a vigilant and successful disease control strategy is in place.

COMMENTS ON SELECTED NEWER WHEAT VARIETIES IN 2015

(Note: quality classification based on max. eligibility for SA grades, stripe rust ratings generally refer to reaction to WA+Yr17 strain, leaf rust ratings refer to provisional rating for new exotic strain identified in 2014)

Cosmick (IGW3423)
A broadly adapted early to mid season flowering, AH quality wheat suited to low to medium rainfall districts. Cosmick has good resistance to stem rust and yellow leaf spot but is moderately susceptible to stripe rust and susceptible to leaf rust and CCN. Seed from Intergrain affiliates in 2015.

Corack
Corack is an early maturing, APW quality wheat. It has CCN resistance and good yellow leaf spot resistance but is moderately susceptible to stripe rust and very susceptible to leaf rust and powdery mildew. Corack shows high yield potential, particularly in low to medium rainfall situations, with good grain quality. Seed from AGT (conditional Seed Sharing allowed).

Emu Rock
Emu Rock is an early maturing, AH quality variety. It has large grain, is susceptible to CCN but has moderate resistance to stem and stripe rust and yellow leaf spot but is MSS to leaf rust. Emu Rock shows high yield potential, particularly in low to medium rainfall situations. Seed from Intergrain (conditional Seed Sharing allowed).

Estoc
Estoc is a mid to late maturing, moderate yielding, APW quality wheat. Estoc is moderately resistant to CCN, SVS to *P. thornei*, with good levels of resistance to all rusts, low yellow leaf spot resistance but good physical grain quality and sprouting tolerance. Seed from AGT (conditional Seed Sharing allowed).

Grenade CL Plus

Grenade is an imidazolinone herbicide tolerant replacement for Justica CLPLUS. It is early to mid season flowering with moderate resistance to CCN, useful rust resistance and susceptible to yellow leaf spot. It has improved test weight and sprouting tolerance over Justica and an AH classification. Seed from AGT.

Hatchet CL Plus

Hatchet CL Plus was tested as RAC1843 and is a Clearfield® variety derived from the very early maturing variety Axe. Hatchet CL Plus has an adaptation pattern very similar to its parent Axe, as well as offering higher grain yield, CCN resistance, better stem rust resistance, and imidazolinone tolerance, but is also susceptible to yellow leaf spot and has sprouting susceptibility like Axe. Hatchet CL Plus tends to perform best relative to other varieties in years which experience droughts, in shorter season environments, or in later sowing situations. Seed from AGT.

Longreach Cobra

Cobra is an early maturing, AH quality variety with high yield potential, particularly in medium to high rainfall districts. Cobra has good resistance to yellow leaf spot and stem and leaf rust but is rated MSS to stripe rust and MRMS to CCN. Cobra has good grain size and moderate test weight and is moderately susceptible to pre-harvest sprouting. Seed from Pacific Seeds.

Longreach Phantom

Phantom is a mid to late flowering, AH quality variety with some resistance to CCN (MRMS), good resistance to powdery mildew and Stem and Stripe Rust but rated SVS to yellow leaf spot and shows mid-season "yellowing" similar to Yitpi. Phantom has good black point tolerance and boron tolerance and moderate screenings and test weight. Seed from Pacific Seeds.

Longreach Trojan

Trojan is a mid to late maturing, AH quality variety with high yield potential, particularly in medium to high rainfall districts. It is moderately susceptible to CCN, moderately resistance to all rusts and is MSS to yellow spot. Trojan has moderate boron tolerance and grain is large with low screenings and high test weight and acceptable black point resistance. Seed from Pacific Seeds.

Longreach Scout

Scout is a mid-season flowering, AH quality variety with high yield potential, particularly in medium to high rainfall districts. It has good resistance to CCN, stem and leaf rust and powdery mildew but is moderately susceptible to stripe rust and SVS to yellow leaf spot. Scout has good physical grain quality and sprouting tolerance but is susceptible to black point. Seed from Pacific Seeds (conditional Seed Sharing allowed).

Mace

Mace is an early flowering AH variety with high yield potential in a broad range of environments. Mace has good resistance to stem rust, CCN and yellow leaf spot but is rated SVS to stripe rust and if grown, must be carefully monitored and best avoided in districts prone to stripe rust unless a fungicide regime is in place. Mace has good grain quality albeit shows low protein and is suitable for wheat on wheat application. Seed from AGT (conditional Seed Sharing allowed).

Shield

Shield is an early to mid-season flowering, moderate yielding AH milling wheat. Shield has some resistance to CCN (MRMS), good resistance to all rusts and powdery mildew and rated MSS to yellow spot. Shield has moderate test weight and plumpness and a low sprouting risk. Seed available from AGT.

Wallup ^{A}

Wallup is an early to mid season flowering AH quality wheat with moderate yield more suited to medium to higher rainfall environments. Wallup has CCN resistance, acceptable stem, stripe and leaf rust resistance, moderate (MSS) levels of yellow leaf spot resistance and good black point resistance. It has useful resistance to root lesion nematodes. Seed available through AGT (conditional Seed Sharing allowed).

NEW VARIETIES FOR 2016

RAC2069

RAC2069 is a mid to late maturing, photoperiod sensitive wheat, which may be used as a management tool for frost avoidance (like Yitpi and Estoc). RAC2069 is suitable as an earlier sowing compliment to Mace; or an alternative to Yitpi, Estoc, Trojan and Magenta. RAC2069 is CCN resistant, Boron tolerant, has good rust resistance and is less susceptible to yellow leaf spot that Yitpi.

RAC2182

Derived from leading variety Mace, RAC2182 shares a similar adaptation profile to Mace, but offers increased yield and improved stripe rust resistance (in SA, Vic and NSW). RAC2182 may also be suitable for wheat on wheat situations due to YLS and CCN resistance.

Acknowledgements

-GRDC and NVT management for use of data from trials throughout SA

-Hugh Wallwork for the use of his "Cereal Variety Disease Guide" varietal disease ratings

Research Program Leader

Rob Wheeler

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LEP Wheat Variety NVT Trial Yield Performance
(2014, and Long Term 2010-14, expressed as % of site average yield)

	LEP Ave. 2014 Grain Quality			Long Term 2010-14	
	Test Weight	Protein	Screenings	(% Site mean)	
Variety Name	kg/hl	(%)	(% <2.2mm)	%	# trials
AGT Katana	84.4	11.5	1.9	102	15
Axe	81.8	11.5	2.0	98	15
Bremer	82.7	11.4	2.1	103	3
Cobra	81.8	11.7	2.3	106	12
Corack	82.6	10.5	2.5	109	15
Correll	79.9	11.2	4.6	98	15
Cosmick	81.7	11.1	2.9	110	6
Emu Rock	82.2	11.5	3.9	103	15
Espada	80.6	11.4	2.8	101	15
Estoc	84.6	11.4	2.2	101	15
Gladius	81.0	11.3	3.9	98	15
Grenade $^{CL\ Plus}$	82.0	11.1	2.2	96	12
Harper	82.8	11.6	3.9	99	8
Hatchet $^{CL\ Plus}$				95	9
Justica $^{CL\ Plus}$	80.5	11.4	1.7	97	15
Kord $^{CL\ Plus}$	81.0	11.2	3.6	97	12
Mace	82.4	10.4	2.1	107	15
Phantom	81.7	10.8	2.6	100	15
Scout	83.6	10.6	3.2	105	15
Shield	81.3	11.3	4.4	100	12
Supreme	82.6	10.6	2.8	103	5
Trojan	83.3	10.9	2.6	110	12
Viking	83.8	11.2	2.0	102	10
Wyalkatchem	82.6	11.4	1.2	104	15
Yitpi	82.7	11.2	4.4	97	11
Zen	82.2	10.8	1.3	107	5
Site Mean (t/ha)				4.31	

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Since the recent rains there has been a new germination of broadleaf weeds including prickly lettuce, milk thistle, bifora, fumitory ar bedstraw.

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Hotshot™	1st node	GS31
Stinger™	1st node	GS31
LVE600MCPA	Flag emergence	GS37
Paradigm™	Full Flag	GS39
Starane™ Advanced	Full Flag	GS39
Statesman™ 720		
WA	Jointing	GS33
other states	Pre-boot	GS42
Esteron™ LV		
SA, Tas	To early Jointing	GS33
Other states	Pre-boot	GS42
Lontrel™ Advanced rates up to 150mL/ha	Booting Do not apply later than 10 weeks prior to harvest	GS44

Harvest with-holding periods are not required when the products are used prior to these crop stages.
Using products beyond these application timings may result in unacceptable crop injury or herbicide residues may exceed acceptable MRL's.
When using these products in mixture with other inputs, please also observe the crop timing restrictions of the partner product(s).

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Case studies of successful management of soil acidity on Lower Eyre Peninsula.

Brett Masters, PIRSA Rural Solutions SA

Soil acidity affects agricultural production on large areas of Lower Eyre Peninsula, with an estimated 178, 000 ha of predominately ironstone soils south of Cummins, and coarse shallow sands on clay in the Ungarra/Cockaleechie districts, prone to acidification. Surveillance sampling undertaken in the region through DEWNR and EPNRM funded projects in recent years identified surface soil pH decreases of between 0.2 and 1.5 pH units with average pH decrease of 0.4 units on Lower Eyre sites over a 4-5 year timeframe.

If farming practices remain the same and these areas are not ameliorated by the application of a liming product at an appropriate rate over the coming decades, indications are that the area affected by acidity will increase. Previous estimates of soil acidification under earlier agricultural systems for this region have been in the order of 80 to 150 kg/lime equivalent/ha/year. With higher frequency of cropping and increased use of nitrogen fertiliser in recent years it has been suggested that this figure might be in the order of 200 to 250 kg/lime equivalent/ha/year with the higher values in this range pertaining to continuous cropping systems with high N fertiliser inputs. On loamy textured soils the pH changes measured on Lower Eyre surveillance sites represent an average acidification rate of around 250 kg/ha/year, with cropping paddocks acidifying at an average lime equivalent rate of 350 kg lime/ha/year and some sites well in excess of 400 kg lime/ha/year.

Some factors which may have contributed to such high acidification rates include;

- Wet winters leading to a high amount of nitrate leaching and poor N uptake by plants.
- Above average yields resulting in the removal of high amounts of alkaline cations in produce.
- Increased application of acidifying N fertilisers to increase production and grain quality

A target surface pH value of 5.5 ($CaCl_2$) is recommended to reduce the risk of acidification of subsoil layers.

LEADA's National Landcare Program (NLP) funded project "Lower Eyre Peninsula Case studying the successful treatment of low pH soils" enabled the study of two sites to record management practices undertaken by the landholders to improve soil pH , identify any changes to production as a result of the treatments, and document future management strategies for the site. This has been done by reviewing historical data, interviewing landholders, soil sampling across production zones to ground truth yield maps and "real time" pH mapping of paddocks. The two sites are an ironstone loamy soil at Mark and Tamara Modra's property at Edillilie and a coarse shallow sand over clay on Ben and Brooke Pugsley's property at Ungarra. Both sites have previously been two separate paddocks with only part of the site treated with a lime application. The limed area of Modra's paddock is the eastern half with the northern half of Pugsley's site having been limed.

Previous soil sampling data from Modra's site showed acidification under farming systems and the impact of lime applications over a 40 year timespan (Figure 1). Sampling in 1970 showed surface pH values of 5.1 $CaCl_2$ with pH 5.0 $CaCl_2$ in the 10-20 cm layer and 5.4 $CaCl_2$ in the 20-30 cm layer. With agricultural production on the site between 1970 and 1993, the soil acidified to 4.2 at the surface, and 4.7 in the 10-20 cm layer. Lime was applied to the eastern half of the site in 1995 (2.5 t/ha). Results from 2010 indicate that although this application may have intially increased the pH at the surface, acidification over the 15 year period since resulted in surface pH levels returning to about the same as in 1993. This lime application appeared however to have some benefit in the subsurface layer, increasing the pH in the 10-20 cm layer to around the 1970 levels and above the baseline in deeper layers of the soil profile. Lime was applied to the site again in 2012 with sampling in December 2013 showing that these applications had lifted surface pH to 4.6 $CaCl_2$. Further sampling of the site in Februrary 2015 showed that although these lime applications had some effect in arresting further pH decline, they were only enough to combat annual acidification and that the surface pH was still below the level of 1970. These observations are supported by the EPNRM surveillance sampling where lime applications at less than 2.0 t/ha have shown little impact on soil pH, while those applied at more than 2.5 tonne per hectare have resulted in surface pH increase but further acidification of subsurface layers where surface pH is below the target value of 5.5 ($CaCl_2$).

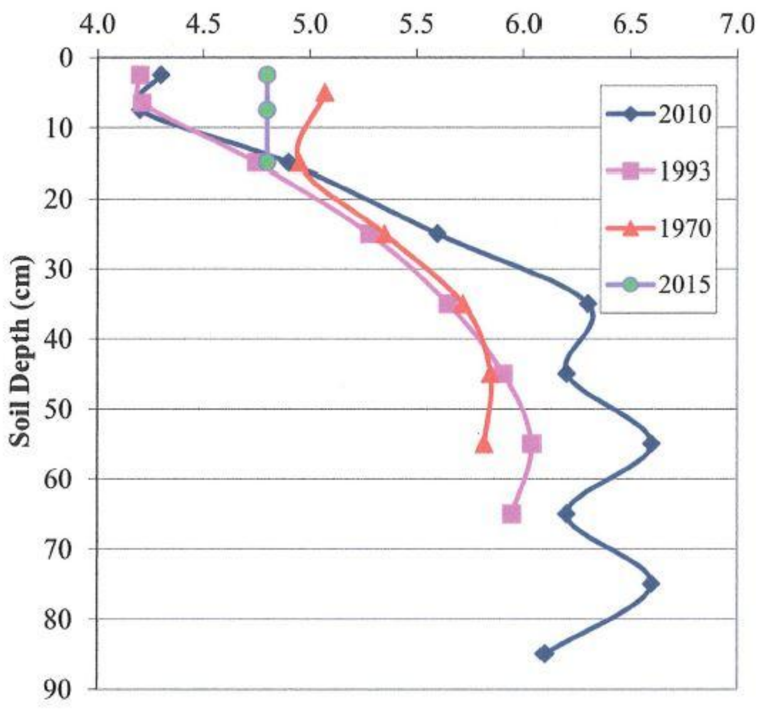


Figure 1. Change in soil pH over time at Modra's monitoring site.

Composites of harvester grain yield maps spanning a number of years were used to identify low, medium and high production zones within the paddocks. Soil sampling transects (Figure 2 and 3) helped to ground truth the production zones highlighted on the yield maps against key soil types. On Modra's paddock the low production zones (MML) were generally shallow coarse sand over clay and the high production zones (MMH) were alkaline red brown earths. The western (unlimed) medium production zone (MMLW), a gravelly red brown earth, was a different soil type to the ironstone loam of the eastern (limed) medium production zone (MMLE).

Soil analysis results identified the impact of surface lime applications at Modra's site, with pH ($CaCl_2$) figures in the highly leaching sandy soils on the unlimed area (MMLW) generally lower than those of the limed area both at the surface and in the 10-20 cm layer. However soil sampling results also reflect the presence of soft carbonate layers at the site, particularly in the western portion, with pH in the western medium and high production zones (red brown earths) being higher than those in the corresponding eastern (limed) production zones.

Soil test data from the area also shows surface pH levels approaching the critical value (4.8 $CaCl_2$) at which aluminium is released into soil solution in the unlimed low production zone, at this level aluminium may impact wheat root development. Given the acidification rates described above, soil pH might drop below this critical value within 1-2 years, with a dramatic increase in aluminium if the soil is left untreated.

The risk of surface soils acidifying further and the potential impacts on crop production including aluminium toxicity, poor crop competition and poor legume nodulation, is the key driver for Mark's decision to counteract soil acidity. He is also concerned about the potential for acidification of deeper soil layers and the difficulty and cost of addressing this should it occur. Although not able to directly correlate yield to lime applications, Mark is implementing recommended practices on paddocks with soils that are prone to acidification to remove soil acidity from the list of factors potentially limiting production. He feels that his "blind faith" in combatting soil acidity is starting to bear fruit with observations of better crop growth on limed areas compared to unlimed ones. However, he has found that there is not an immediate yield response to lime application with benefits realised some years afterwards.

At Pugsley's site, the low production zone (ZN1) in the northern half of the paddock consists of a coarse sand over clay with the high production zone (ZN2) being a loam to clay loam surface soil. The medium production zone (ZN3) is a shallow loamy rise with coarse quartzite gravel in the southern half of the site. There has been little historical testing for soil acidity at the site. Investigations into the impact of soil pH began about 5 years ago when Ben was curious as to why crops were not performing as well as expected on a leased property. He used a pH field kit to test the pH on paddocks on this farm with results ranging from 4.6 to 4.8 (3.8 to 4.0 $CaCl_2$). Soil analysis results in 2009 showed a pH value of 4.9 $CaCl_2$ on the case study site. Ben applied 2-3 t/ha of lime to the northern area of the paddock in 2011. Soil analysis results in 2014 indicated that this lime application had increased the surface soil pH to 5.6 ($CaCl_2$) on the best areas (Z1) and 5.8 on the low production areas (Z2).

After applying 3 t/ha of lime to one of the tested paddocks Ben was impressed with the effectiveness of the weed control on the limed areas compared to the unlimed areas in the following canola crop. The interaction between soil pH and weed control has been a key driver for Ben to investigate managing soil pH across the property and he now uses weed competition, herbicide effectiveness and crop performance as indicators of low soil pH. Ben considers that the key factor in the profitability of his system is the cost of weed control, particularly ryegrass. His view is that given the relatively low cost of lime compared to herbicide per hectare, lime is worth applying even if it is just increasing the effectiveness of his herbicide applications and the competitiveness of the crop.

Both sites were mapped under the Australian Government funded State-wide "Innovative technologies for managing soil acidity" project supported by the Agricultural Bureau of South Australia. Sites were mapped using a Veris pH probe mounted to a quadbike with these maps adding another layer of information to the site, helping to support information from soil sampling and grain yield data. The pH maps indicated the variation in soil types identified through the soil sampling and were a good reflection of the composite grain yield map across season. The pH maps also seemed to reflect the liming history of the paddock with the pH mapping results generally being higher and less variable on the limed areas than the unlimed, taking into account soil types (Figures 2 and 3).

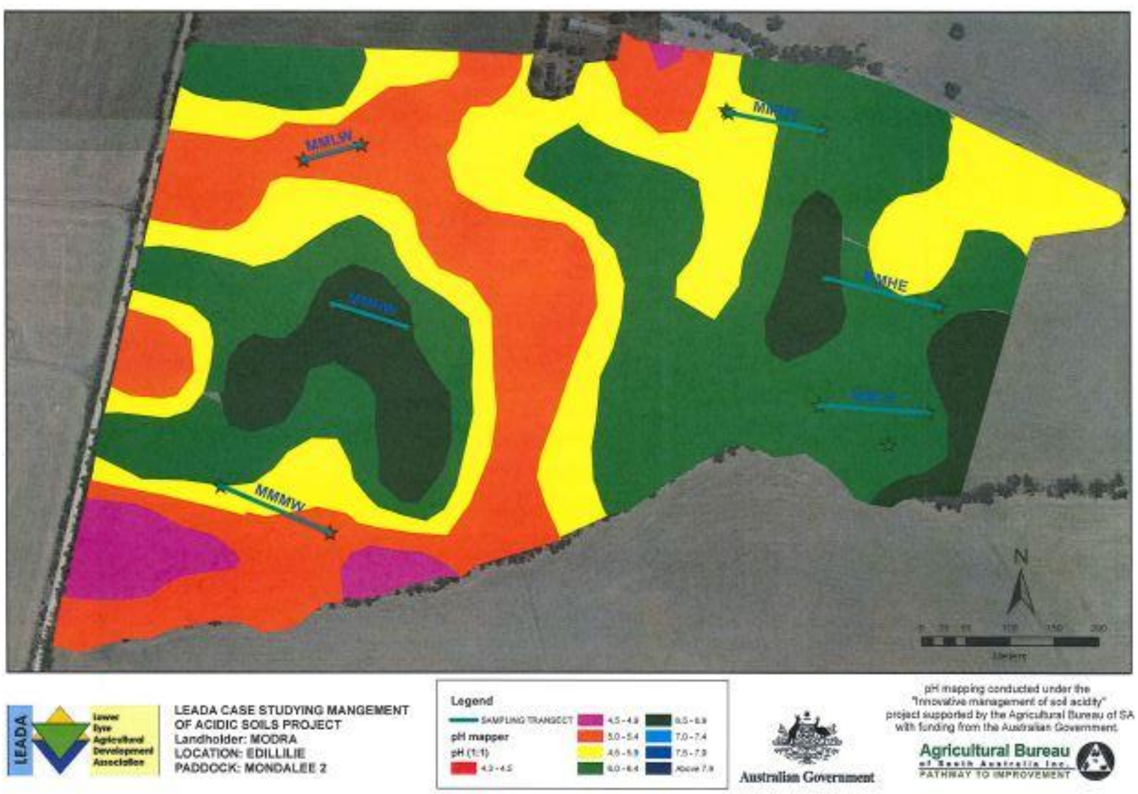


Figure 2. Modra pH map and soil sampling transects (Western half unlimed, eastern half limed).

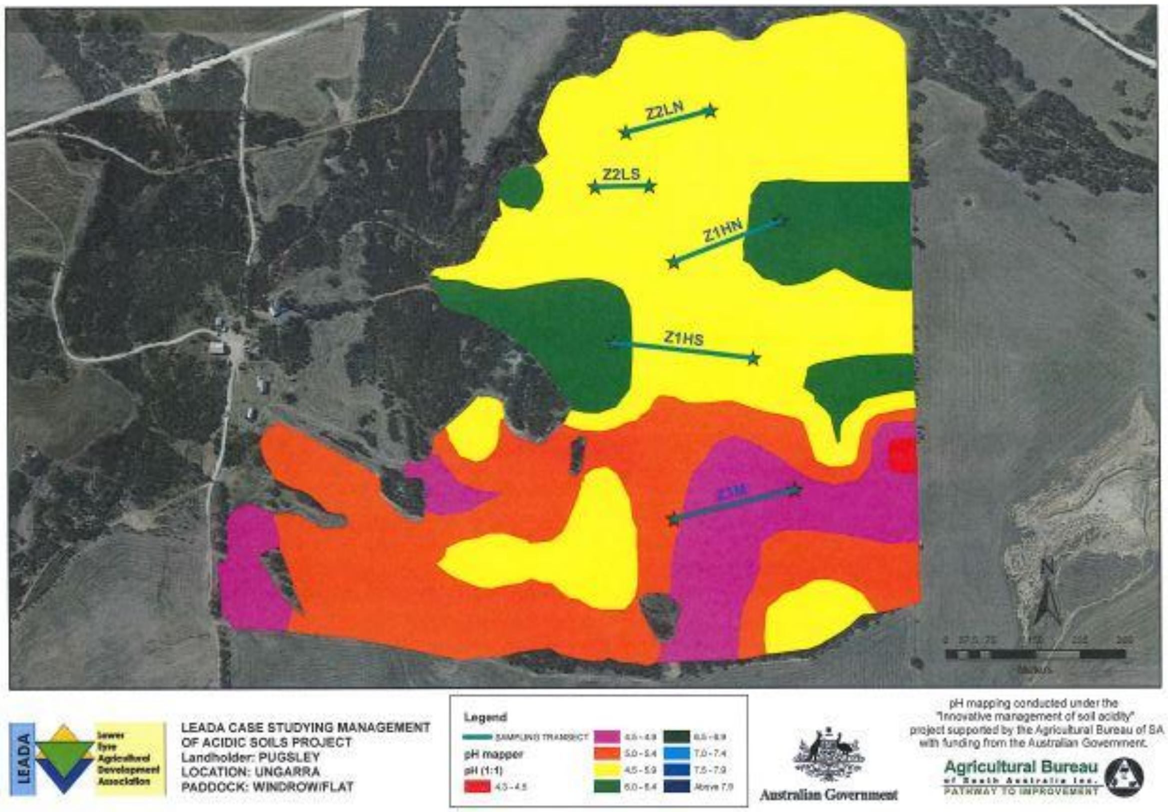


Figure 3. Pugsley pH map and soil sampling transects (southern half unlimed, northern half limed).

The data gathered under this project gives the landholders some confidence in the impact of their liming applications and provides a starting point to devise management strategies for the site and other paddocks on the property. Ground truthing the production zones indicated by yield maps through targeted soil sampling has linked some of the yield variability to soil type. By describing the soil profiles associated with the production zones, inferences can be made as to the expected rate of acidification and the likely soil pH response from a lime application. Both landholders consider that the key to cost-effectively managing soil acidity is to identify soil pH levels with soil testing and determine the distribution within and between paddocks is the key to cost effectively managing the issue. The pH mapping has demonstrated the effectiveness of lime applications in raising soil pH at these sites and shows the areas of the paddock where low soil pH may still be the overarching issue. Being able to generate paddock scale pH maps is considered a major opportunity for managing soil acidity, by enabling landholders to better tailor lime application rates and increase the cost effectiveness of the liming operation overall.

Acknowledgements

The author would like to thank the landholders Mark and Tamara Modra and Ben and Brooke Pugsley as well as Jarrod Kemp, Landmark Tumby Bay for providing site data and management information. He also wishes to acknowledge Andrew Harding, PIRSA Rural Solutions SA Clare and Brendan Torpey, Precision Agriculture Bendigo for undertaking the pH mapping on these sites.

These projects are supported by the Lower Eyre Agricultural Development Association, Natural Resources Eyre Peninsula and Agricultural Bureau of SA through funding from the Australian Government and Department of Environment, Water and Natural Resources.

Logos

Agricultural Bureau of SA. DEWNR, EPNRM, Australian Government, GRDC

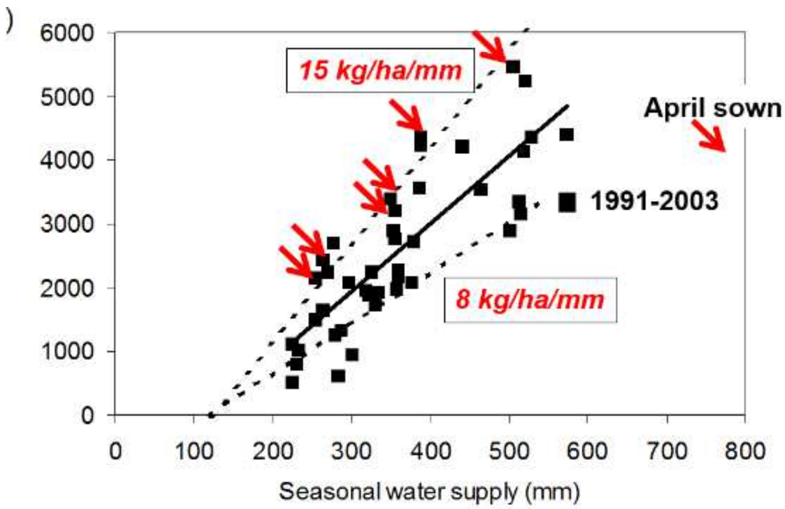
Further Reading:

Masters, B (2015) "Awareness of the effects of acidity and low pH on lower EP soils" – Final Project Report, PIRSA Rural Solutions SA, June 2015.

CANOLA AGRONOMY –

Andrew Ware, SARDI Pt Lincoln

Research conducted over a number of years by John Kirkegaard (figure 1), CSIRO Canberra, has shown that the largest improvements in water use efficiency and yield of canola in eastern Australia can be achieved through sowing canola early.



Robertson and Kirkegaard (2005) - Crops grown 1991 to 2003

Figure 1. Effect of time of sowing on canola water use efficiency.

Field experiments conducted in 2014 showed the selection of variety, and an understanding of the factors driving development of each of the varieties becomes even more important when seeding early. This is especially the case if pushing seeding earlier than ANZAC day.

Differences in yield observed within each variety across sowing times, can in part, be explained by understanding the triggers that drive the development of each variety. There are three main controls of the development of canola; vernalisation response, photoperiod response and basic temperature response. Each of these will play a differing role in every variety.

Data from the 2014 trials showed that Hyola 575 CL, when planted early, raced through its development and wasn't able to benefit as much from the early sowing opportunity as other varieties such as Pioneer 45Y88CL sowed at the same time. This from this it is thought that its development is largely triggered by thermal time which can be a real benefit when planted in a more traditional sowing window, but might mean that it isn't as suited to early sowing.

Table 1. Yield results from Yeelanna and Wanilla sites in 2014

Location	Cultivar	Time of sowing			
		30-Apr	6-May	16-May	28-May
Wanilla	Hyola 575CL	1.41	1.49	0.91	0.65
Jan-Mar rf: 83mm	Pioneer 45Y88CL	1.41	1.50	0.70	0.51
Apr-Oct rf: 399mm	P-value	<0.001			
	LSD(P=0.05)	0.14			
		15-April*	5-May	2-Jun	19-Jun
Yeelanna	Pioneer 44Y87CL	1.96	2.06	1.38	Did not harvest
Jan-Mar rf: 89mm	Pioneer 45Y88CL	2.26	2.17	1.13	
Apr-Oct rf: 346mm	ATR Gem	1.64	1.82	0.73	
	Hyola 559TT	1.89	2.07	1.08	
	Hyola 575CL	2.21	2.34	1.18	
	Hyola 971CL	0.54	0.27	0.20	
	P-value	<0.001			
	LSD(P=0.05)	0.30			

Table 2. Flowering dates Yeelanna site in 2014

Location	Variety	Time of sowing			
		15-April*	5-May	2-Jun	19-Jun
Yeelanna	Pioneer 44Y87CL	8-Aug	7-Aug	12-Sep	15-Sep
	Pioneer 45Y88CL	1-Aug	9-Aug	12-Sep	15-Sep
	ATR Gem	1-Aug	10-Aug	15-Sep	15-Sep
	Hyola 559TT	5-Aug	18-Aug	12-Sep	15-Sep
	Hyola 575CL	10-Jul	11-Aug	12-Sep	19-Sep
	Hyola 971CL	-	-	-	-

Table 3 Flowering dates Yeelanna site in 2015 (as at 18 Aug)

Variety	**15-Apr**	**30-Apr**	**14-May**
44Y89CL	17-Jul	8-Aug	
45Y88CL	2-Aug	14-Aug	
Archer	7-Aug	17-Aug	
ATR Gem	22-Jul	9-Aug	
ATR Stingray	30-Jun	30-Jul	15-Aug
AV Garnet	20-Jul	12-Aug	
Hyola559TT	20-Jul	8-Aug	
Hyola575CL	16-Jul	4-Aug	
Hyola750TT	2-Aug	15-Aug	

Some of the slight differences in flowering dates between the two years can be explained by the cooler temperatures observed in 2015, compared to 2014.

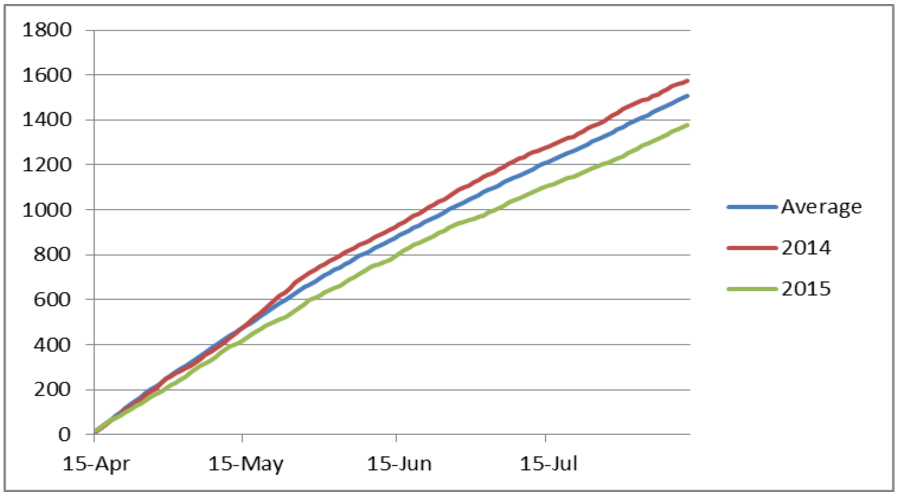


Figure 2. Thermal time (maximum daily temperature + minimum daily temperature divided by two) accumulation for Cummins from 15 April in average years (since 2007), 2014 and 2015.

Garnet TOS1 Garnet TOS2 Garnet TOS3

Figure 3. Photos of Garnet plots at Yeelanna, taken on 29 July.

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NEW HERBICIDE CHALLENGES AND SOLUTIONS

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***GRDC project code*: (if applicable) UA00144, UA00113, UA00121, UCS00020**

***Keywords*:** herbicide resistance, pre-emergence herbicides, canola, weed control

Take home messages

- Trifluralin resistance in annual ryegrass has dramatically increased across the Eyre Peninsula since 2009.
- Resistance to four mode of action herbicides was detected in Indian hedge mustard.
- Using alternative pre-emergent herbicides well is essential to controlling resistant ryegrass and mixture products to control resistant Indian hedge mustard.
- Seed set control tactics on annual ryegrass are essential to reduce the impact of resistance.
- Pre-emergent herbicides alone are insufficient to effectively manage ryegrass in break crops.
- Increased competition provided by hybrid canola varieties will improve the performance of pre-emergent herbicides.
- Crop topping in canola offers an opportunity to reduce ryegrass seed set.
- Resistant testing is important to identify effective herbicide options.

Herbicide resistant annual ryegrass in the Eyre Peninsula

Random surveys show herbicide resistance to trifluralin has increased dramatically from 5% in 2009 to 34% in 2014. Resistance has increased in both the upper and lower EP Increased use of trifluralin due to reduced cost and increasing rates are likely contributors. In contrast, increases in Group A and B herbicides were generally not observed between 2009 -2014 suggesting there are still opportunities for existing in-crop herbicides. Resistance testing is important to confirm specific resistance levels for individual paddocks. A new finding is the confirmation of three samples exhibiting resistance to triallate, with one of these showing elevated resistance to Boxer Gold and Sakura at reduced rates. This information should serve as a warning to not reduce rates. Glyphosate resistance was detected in 1% of samples that is significant if it can be detected randomly. Interestingly, no resistance to the Group D herbicide propyzamide was detected, even thought half the samples were resistant to trifluralin which is also belongs to the Group D mode of action class. This indicates that there is no cross-resistance between these two products.

Table 1. Extent of resistance in annual ryegrass collected in random surveys across the Eyre Peninsula in 2009 and 2014 and treated with recommended field rates. Populations were considered resistant if survival was ≥ 20% in outdoor pot trials conducted in the winter of 2015.

	2009 (179 paddock surveyed)			**2014** (170 paddock surveyed)		
	Total	Upper	Lower	**Total**	Upper	Lower
Trifluralin	**5**	1	10	**34**	10	51
Propyzamide	**-**		-	**0**	0	0
Triallate	**-**	-	-	**1**	0	3
Boxer Gold	**-**	-	-	**0***	0	0*
Sakura	**-**	-	-	**0***	0	0*
Hoegrass	**30**	2	66	**47**	10	73
Glean	**78**	71	87	**80**	75	85
Intervix	**47**	30	70	**47**	39	53
Axial	**30**	3	64	**18**	0	32
Select 250ml/ha	**11**	0	25	**8**	0	15
Select 500ml/ha	**-**	-	-	**4**	0	7
Glyphosate	**-**	-	-	**1**	0	1

*elevated survival at lower rates

Table 2. Extent of resistance in Indian hedge mustard collected in random surveys across the entire Eyre Peninsula in 2009 and 2014 and treated with recommended field rates. Populations were considered resistant if survival was ≥ 20% in outdoor pot trials conducted in the winter of 2015.

	2009	2014
Glean	52	64
Eclipse	57	71
Intervix	-	14
2,4-D	0	7
Brodal	-	36
Atrazine	-	7
Glyphosate	-	0

'-' not tested

Resistance in other species:

In the 2014 survey other weed species including wild oats, brome, barley grass, sowthistle, Indian hedge mustard and wild turnip were collected. Apart for Indian hedge mustard (IHM), the trials for the other species have not finished yet. The survey has highlighted resistance to four mode of action herbicides in IHM which is of real concern and will make control in some circumstances difficult (Table 2).

For the other species, preliminary results indicate that in barley grass 5% of samples are exhibiting resistance to Group A's and 10-20% of samples are resistant to Group B's (sulfonylureas) but not

Intervix. In Brome, about 5% of samples are exhibiting Group B sulfonylurea resistance but not to Intervix or Group A herbicides. In wild oats, its unlikely that any sample will be resistant to Group A or B herbicides or Avadex. No results for sowthistle are available at this time. These results indicate that for wild oat, brome and barley grass, resistance to Group A and B herbicides remains low.

Getting the best out of pre-emergent herbicides

In the absence of effective post-emergent herbicides, ryegrass management has to rely on pre-emergent herbicides and non-chemical tactics. In getting the best out of pre-emergent herbicides it is important to understand some of their characteristics and how they will perform under different conditions.

Trifluralin and Stomp (pendimethalin) have low water solubility so tend to stay where they are applied. Therefore, they need to be placed in close proximity to the weed seed. These herbicides are also volatile, so need incorporation shortly after they are applied to avoid losses. They bind tightly to organic matter including stubble. If there is too much stubble, some will need to be removed to get these herbicides to work effectively.

Boxer Gold (prosulfocarb + S-metolachlor) has high water solubility and will move readily through the soil. It typically requires 5 to 10 mm of rainfall over a week to activate the herbicide. If heavy rainfall occurs after application, some crop damage may occur. Wheat is more sensitive than barley, so damage will be greater in wheat crops. Boxer Gold has medium binding to organic matter, so will move more readily in low organic matter soils. If heavy rainfall occurs after application, some crop damage may occur. Boxer Gold has relatively short persistence, so late emerging weeds will be a problem in high rainfall zones.

Sakura (pyroxasulfone) has lower water solubility, making it less likely to move in soil. It requires more rainfall than Boxer Gold to activate; 10-15 mm. Sakura is not bound tightly to soil, but its low water solubility means that it is normally not highly mobile. However, in soils with low organic matter or after high rainfall events some crop damage may occur. Sakura is active for an extended period of time.

Triallate on its own will only control ryegrass at high rates. Avadex Xtend (600g/L triallate) from Nufarm has just been registered as a standalone ryegrass herbicide at 2.7L/ha. Triallate is volatile and requires incorporation. It is more mobile in soil than trifluralin and binds less tightly to organic matter. Avadex is primarily absorbed through the coleoptile rather than the roots, so controls deeper emerging weeds.

Rustler (proyzamide) is similar to Sakura in its behaviour. It has low water solubility and medium binding to organic matter in the soil. This means it usually does not move far through the profile, but can do so with heavy rain. Rustler is only registered in canola. Canola tends to be sown shallower than wheat, so the herbicide is closer to the crop. Therefore, Rustler damage to canola is more likely with high rainfall.

We conducted a series of 6 trials in high rainfall zones to determine how to get the most out of pre-emergent herbicides. Pre-emergent herbicides generally perform better in lower rainfall zones, because there is not extended germination of ryegrass that occurs in high rainfall zones. Therefore, these trials demonstrate the full value of the products. The trials also examined season long control of annual ryegrass by counting the number of seed heads present at harvest. As a rule of thumb it is necessary to reduce ryegrass populations by 97% or more in order to keep the seed bank the same.

The results are in Figure 1 as a box and whiskers plot where the mean is the line in the middle of the box and the whiskers are the range of results. Some of these trials were conducted with populations that are resistant to trifluralin, affecting the performance of this herbicide.

Sakura on average performed better in these high rainfall environments than did Boxer Gold or trifluralin. Adding Avadex Xtra to any of the other pre-emergent herbicides improved control. New registrations for Boxer Gold will provide increased flexibility in gaining higher control of annual ryegrass populations.

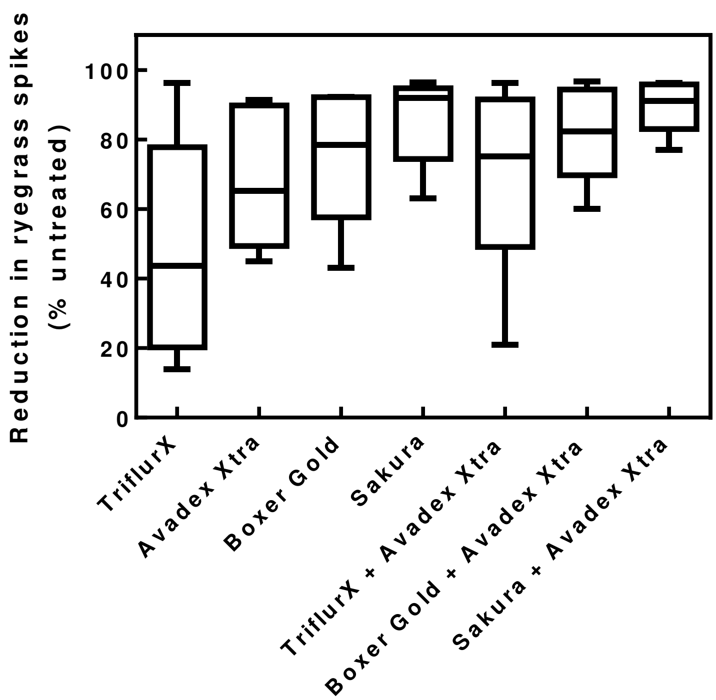

Figure 1. Season-long control of annual ryegrass by pre-emergent herbicides in 6 trials conducted in high rainfall zones.

Breaking the ryegrass seed bank

Obtaining high control of seed set is essential for breaking the seed bank of ryegrass. We conducted a multi-year trial at Roseworthy in South Australia to determine the effects of management strategies on ryegrass seed banks. The treatments used are listed in Table 2. After the first year of oaten hay, we used a low, medium and high level of management (Management Strategies 1, 2 and 3 respectively) and measured the seed bank.

Table 2. Long-term weed management strategies investigated for the control of annual ryegrass (ARG) at Roseworthy from 2009 to 2011. All herbicides were applied at recommended label rates and timings.

Management strategy (MS)	Year 2009	2010	2011	2012
1	**Oaten hay**	**Kaspa field pea** Trifluralin IBS	**Axe wheat** Boxer Gold IBS	**Scope barley** Trifluralin IBS
2	**Oaten hay**	**Kaspa field pea** Trifluralin IBS + Select POST	**Axe wheat** Sakura IBS	**Scope barley** Trifluralin IBS
3	**Oaten hay**	**Kaspa field pea** Trifluralin IBS + Select POST + Roundup PowerMax CT	**Axe wheat** Boxer Gold IBS + Roundup PowerMax CT	**Scope barley** Trifluralin IBS

Abbreviations: IBS, incorporated by sowing; POST, post-emergence; CT, crop-topped

In this trial, the oaten hay crop reduced the high seed bank of more than 4000 seeds m^{-2} by more than 80% (Figure 2). However, failure to keep pressure on the population (MS 1) caused the population to rebound immediately. Two years of strong control reduced the seed bank by more than 90% and allowed a further reduction with just a pre-emergent herbicide in the wheat crop (MS 3).

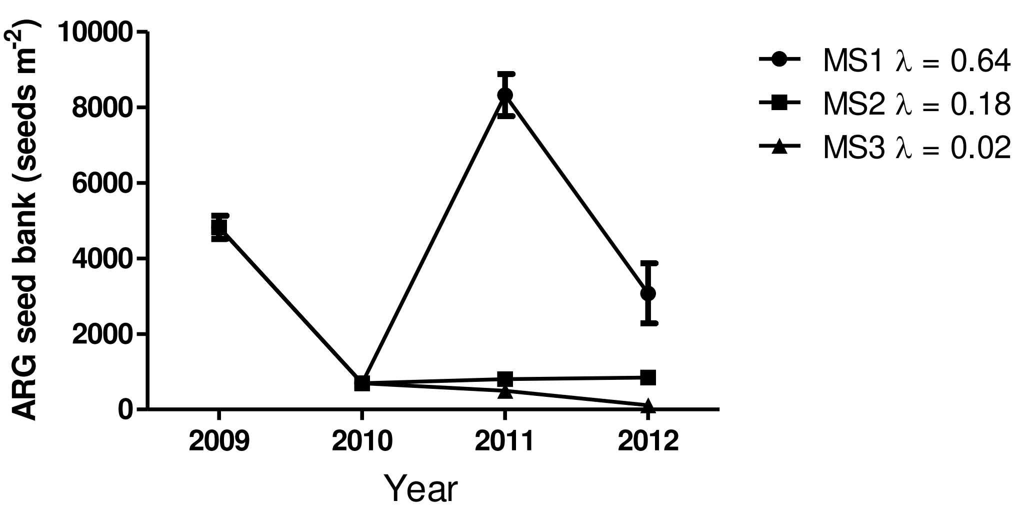

Figure 2. Effect of different long-term weed management strategies on pre-sowing (March) ARG seed bank at Roseworthy from 2009 to 2012 under three different management strategies (MS). Bars represent SE of the mean. Seed bank change from 2009 to 2012 expressed as lambda value (λ); (λ value < 1 = seed bank decline; λ value >1 = seed bank increase).

Managing clethodim resistance in annual ryegrass

Weed surveys across the Eyre Peninsula have highlighted that between 7-15% of cropping paddocks in 2014 contain ryegrass with resistance to clethodim. Clethodim is the last Group A herbicide that provides effective control of herbicide resistant annual ryegrass. It has become an exceptionally important herbicide in annual ryegrass weed management strategies. The loss of clethodim to resistance will make ryegrass management more difficult. In order to address this problem, we have been looking at alternative herbicide strategies to clethodim in break crops.

Hybrid canola varieties offer greater competition than TT open pollinated varieties. This can help limit seed production from surviving ryegrass plants (Table 4). In the Roseworthy trial we compared TT canola (ATR Stingray) with a Clearfield hybrid (45Y82). However, annual ryegrass has widespread resistance to the imidazolinone herbicides and this was present at the site, as was some resistance to trifluralin. This limited the options available for control of annual ryegrass in Clearfield canola. Pre-emergent herbicides performed better in the hybrid canola than in the open pollinated canola due to the increased competition provided by the Clearfield hybrid. Rustler pre-emergent with clethodim post-emergent was one of the better treatments despite resistance to clethodim being present.

Table 3. Ryegrass plant numbers, seed production and TT Canola grain yield at Roseworthy, SA in 2014 following a variety of treatments to control clethodim resistant annual ryegrass.

Treatment	Ryegrass plants (m^{-2})	Ryegrass seed (m^{-2})	Grain yield (T/ha)
Atrazine (1.5 kg/ha) Pre + Clethodim (500 mL/ha) Post	522^{ab}	6785^{a}	1.69^{abc}
Atrazine (1.5 kg/ha) Pre + Clethodim (500 mL/ha) + Atrazine (1 kg/ha) Post	361^{a}	2956^{a}	1.88^{a}
Atrazine (1.5 kg/ha) Pre + Clethodim (500 mL/ha) + Factor (80 g/ha) Post	282^{a}	3274^{a}	1.84^{ab}
Rustler (1 L/ha) Pre	354^{a}	32781^{bc}	1.49^{cd}
Rustler (1 L/ha) Pre + Clethodim (500 mL/ha) Post	324^{a}	13396^{ab}	1.74^{abc}

Values with different letters within a column are significantly different (p = 0.05).

Table 4. Ryegrass plant numbers, seed production and Clearfield Canola grain yield at Roseworthy, SA in 2014 following a variety of treatments to control clethodim resistant annual ryegrass.

Treatment	Ryegrass plants (m^{-2})	Ryegrass seed (m^{-2})	Grain yield (T/ha)
Trifluralin (2 L/ha) + Avadex Xtra Pre + Intervix (750 mL/ha) + Clethodim (500 mL/ha) Post	632^{ab}	5404^{a}	1.71^{abc}
Trifluralin (2 L/ha) + Avadex Xtra Pre + Intervix (750 mL/ha) + Clethodim (500 mL/ha) + Factor (80 g/ha) Post	128^{a}	7915^{a}	1.79^{a}
Rustler (1 L/ha) Pre	553^{ab}	17270^{ab}	1.65^{abcd}
Rustler (1 L/ha) Pre + Clethodim (500 mL/ha) Post	385^{ab}	3663^{a}	1.84^{a}

Values with different letters within a column are significantly different (p = 0.05).

Crop topping canola

Late in 2014, Weedmaster DST was registered for use as a crop-topping application in canola. This provides an opportunity to control grass weed seed set in canola crops. The registered uses are to apply over the top of the crop from 20% canola seed colour change or under the windrower. To use Weedmaster DST effectively for crop topping the correct timing, rate of herbicide, water volume and environmental conditions need to be followed.

The main problem for over the top use is to get the herbicide through the canola canopy and onto the ryegrass growing underneath. Higher water rates and coarse spray quality will help achieve this. For under the windrow applications, water rates will always be low. In addition, windrowing may be done when environmental conditions are less favourable for glyphosate to work. Increasing the rate of Weedmaster DST may help overcome these issues (Figure 3). Ryegrass maturity can also have an impact when crop topping canola. Seed set will not be controlled on annual ryegrass that has matured at the time of windrowing.

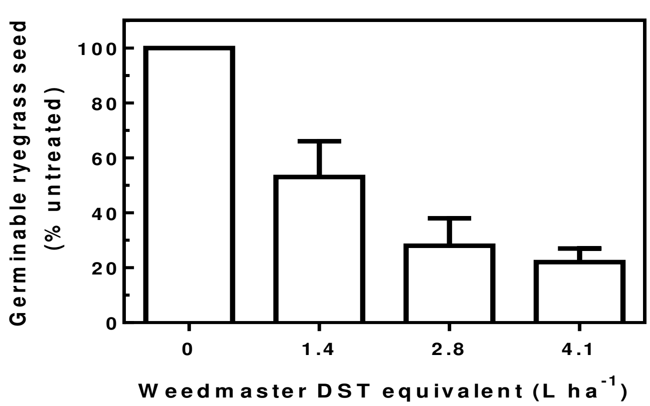

Figure 3. Germination of annual ryegrass seed following application of glyphosate at windrowing in canola. Average of 2 trials in mid-north of SA in 2010.

Resistance testing is a powerful tool to aid in the selection of effective herbicides and avoid farmers using herbicides that wont control a resistant population.

Table 5: Results of a farmer resistance test . If you were an advisor, would you recommend Axial?

Herbicide	Product Rate (ml or g/ha)	Herbicide Group	Survival (%)	Resistance Rating
Verdict + 1% Hasten	85	A-FOP	70	RR
Select + 1% Hasten	250	A-DIM	20	R
Select + 1% Hasten	500	A-DIM	0	S
Hussar + 1% Hasten	200	B-SU	90	RRR
Atrazine + 0.2% BS1000	2000	C	0	S
Triflur X	1000	D	0	S

Contact details
Peter Boutsalis, University of Adelaide, SA 5064

Email: peter.boutsalis@adelaide.edu.au

<u>Herbicide resistance testing:</u> Peter Boutsalis, Plant Science Consulting

www.plantscienceconsulting.com.au, 0400 66 44 60

NEW HORIZONS BRIMPTON LAKE 2014 RESULTS

Key points

- Non-wetting did not appear to be an issue on this site in 2014
- The addition of high rates of clay only resulted in surface sealing on the shallow incorporation treatment but when spaded delivered targeted clay percentages (between loamy sand and sandy loam texture)
- The trial showed that the best treatments can deliver dry matter production of at least three times and yields at least double that of the Control.

Background

New Horizons is a South Australian Government funded program to capture an additional $800 million in agricultural production per annum in South Australia. Up to 40% (4.1 million hectares) of the broadacre farming area of South Australia has soil constraints that could be overcome through the application of new advances in technology, machinery and soil management. These include non-wetting sands with low fertility and water holding capacity and heavier soils with poorly structured subsoils. In 2014, the South Australian government established three trial sites on sandy soils in the Eyre Peninsula, Murray Mallee and South East; Brimpton Lake, Karoonda and Cadgee respectively. The Brimpton Lake trial was developed in conjunction with the Lower Eyre Agricultural Development Association (LEADA). The trial is located on the property of Michael Kenny and is farmed by Greg and Luke Moroney. The site is flat to gently undulating and is used for cropping (cereal, canola, and lupins) in rotation with annual grass and legume-based pastures. The soil profile comprises a grey, sandy, topsoil to 8-10 cm over a bleached white sand with sodic clay at 30-50 cm deep. Grain yields at the site are generally less than half the yields of better soils in the district. Treatments were developed to address the major issues on sands and included the use of soil disturbance and/or the addition of various combinations of clay, organic matter and nutrients to depth.

Methodology

The trial involves 12 treatments (Table 1), with 4 replicates.

The site was sown to Corack wheat @ 80 kg/ha with 100 kg/ha DAP and 400 ml/ha flutrifol applied with the seed in all plots. Sulphate of Ammonia applied at 295 kg/ha on spaded and clayed (without nutrition or organic matter) treatments and at 119 kg/ha on the deep nutrition treatments.

Table 1: New horizons Brimpton Lake Trial treatments

Un-clayed Treatments	**Clayed Treatments**
Control (best district practice)	Shallow Clay incorporation
Deep ("Banded") Nutrition	Shallow Clay with Deep ("banded") nutrition*
Spading	Clay + Spading
Spading + Nutrition	Clay + Spading + Nutrition
Spading + Organic matter	Clay + Spading + Organic Matter
Spading + Organic matter + Nutrition	Clay + Spading + Organic matter + Nutrition

*"Nutrition" (spaded to 35cm) and "Deep nutrition" (banded at 20-25 cm treatments included additional 60 N, 30 P, 20 S, 4 Zn, 6 Mn, 3 Cu kg/ha)

** Organic matter – Lucerne hay @ 10t/ha

Measurements undertaken included:

- Soil sampling was undertaken post-spading in early May (but prior to the addition of fertiliser at seeding). Samples were analysed for nutrition, exchangeable cations, $pH_{(CaCl)}$, $EC_{(1:5)}$, organic carbon and bulk density. Clay samples were analysed for particle size, clay mineralogy and water retention.
- Pre-seeding and post-harvest soil moisture.
- Plant establishment counts conducted in mid-June and dry matter cuts in early August.
- Soil mineral nitrogen undertaken in early August.
- Soil samples for root DNA analysis collected in early September.
- Grain yield (t/ha), grain weight and protein at harvest.

Economic analysis of treatments including internal rate of return has also been conducted.

Results and discussion

Soil analysis identified that the unmodified sand component was 96% with 85% being coarse sand. The sand was neutral to slightly acidic with low inherent fertility. The Cation Exchange Capacity (CEC) of the Control in the 0-10 cm and 20-30 cm layers 2.94 cmol(+)/kg and 1.6 cmol(+)/kg respectively. Organic carbon (Walkley Black) levels were low in the topsoil (0.5%) and reduced to 0.14% at 20-30 cm. Bulk density (BD) in the 0-10 cm layer was 1.53 gcm^{-3} increasing with depth to 1.71 gcm^{-3} in the 20-30 cm layer. Bulk density levels of greater than 1.6 gcm^{-3} are considered to have potential for constraints to root growth.

The unmodified soil had moderate levels of phosphorus uniformly distributed through the profile (14-17 mg/Kg), this is unusual and suggests either some deep mixing has occurred previously or phosphorus has leached. Potassium levels are moderate in the topsoil but marginal in the bleached horizon.

Treatments resulted in large differences to both physical and chemical pre-seeding soil characteristics. Clay application:

- Increased clay proportions in the 0-10 cm layer from 4% in the Control up to 19% on the Shallow Clay incorporation treatment
- Heavy clay rates with shallow incorporation resulted in some surface sealing due to the sodic nature of the clay (it is expected that sodium will leach through the profile with rainfall, reducing the impact).
- Increased the pH of the topsoil by between 0.5-1 pH unit
- Increased soil potassium (approximately 120 mg/kg)
- Increased CEC, with the 0-10 cm layer of the Shallow Clay treatment recording the highest CEC of 9.62 cmol(+)/kg . This trend was also observed in the 10-20 and 20-30 cm layers of the Spading + Clay treatments, but due to lower pre-modification CEC and less clay incorporated to depth following modification the CEC values were lower.

Spading:

- Reduced bulk density with the most significant change occurring in the 10-20 cm depth.
- Had variable impact on mixing clay into subsoils

The application of organic matter (OM) resulted in higher organic carbon stocks (from 14 t/ha in the Control plots up to 20 t/ha on the organic matter treatments) and contributed large increases in mineral nitrogen (Figure 1) and potassium (70 mg/kg).

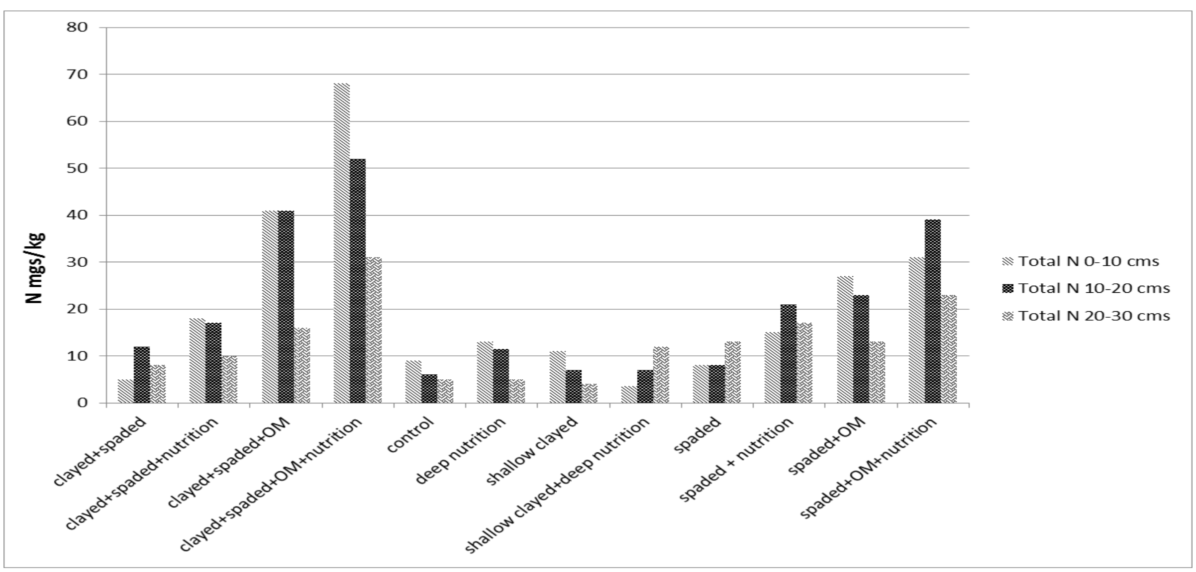

Figure 1. Brimpton Lake post-modification mineral N (does not include N applied at seeding).

Seasonal conditions were highly variable. Above average rainfall and warm conditions throughout May resulted in rapid germination and good early crop vigour. Rainfall recorded at the Bureau of Meteorology's Yeelanna (Brimpton Lake) station showed the site received well above average rainfall in June and July. This resulted in variable waterlogging across the site. The rest of the growing season was very dry with August and September rainfall monthly totals being very much below average with no October rainfall recorded.

While there was no significant difference in plant numbers between treatments the clayed treatments showed better early vigour than the un-clayed treatments, with the OM treatments standing out. The greatest biomass production was recorded on the Clayed + Spaded +OM + Nutrition treatment. The highest grain yield of 3.07 t/ha was achieved in the Spaded + OM treatment and measured against the Control's grain yield of 1.43 t/ha, was 2.2 times higher than the Control (Figure 2).

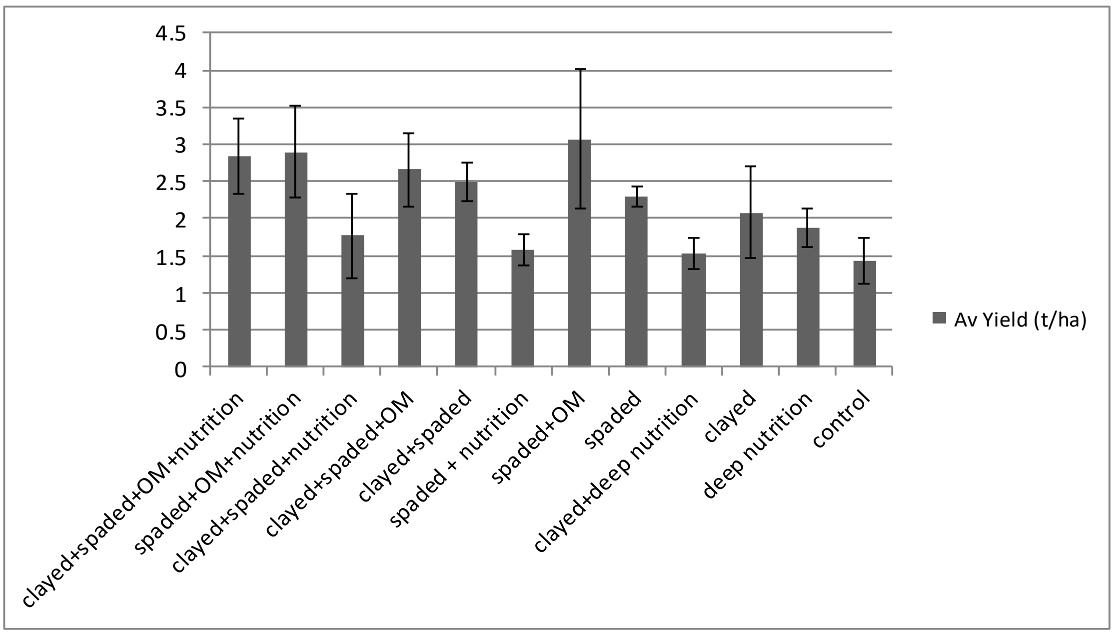

Figure 2. Brimpton Lake 2014 Grain Yield t/ha. (error bars represent standard deviation)

Economic Analysis

An economic assessment on the trials was problematic because the costs of implementing a scientific trial are different to the costs that are likely to be incurred at a paddock scale. For New Horizons, we used a highly expensive source of organic matter (lucerne hay or pellets) because we needed a homogenous organic matter source to remove as much variability as possible in the inputs. We wouldn't recommend this as an organic matter source, and there are many other, much cheaper organic matter sources that could be used that have similar levels of nutrients. Also the dry finish to the season appeared to affect yields on treatments with high biomass with conversion to yield comparatively greater on low biomass treatments. This suggests that in an average year the treatments that delivered greater biomass may have also delivered even greater increases in grain yields compared to the Control. Nevertheless, an economic assessment has been undertaken by external agronomic advisers on model farms in four locations (Upper Eyre Peninsula, Lower Eyre Peninsula, South Australian Murray Mallee and the South-East).

In general, it is the more moderately priced treatments (less than $500 per hectare) that deliver the highest internal rate of return (IRR) even though they generate the lesser increases in yield. However, where Organic Matter can be sourced at a cost of $500/ha or less this may be a viable option to add value to other treatments. These results are being treated with caution as this analysis is based on results from a single season. For example, in his analysis, spading would appear to be the most cost effective option. However, the analysis assumes that the results are carried forward 10 years and previous experience suggests that spading is the treatment that is least likely to be maintained in the long term.

2015 Activities

Conclusion

While extremely promising, the cost of the best treatments may restrict adoption and there is still significant uncertainty about which treatments are likely to be the most effective and profitable in any particular location.

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Maintaining Profit with Stubble Retention- Monitoring of the Nitrogen (N) Fertility of Key Lower Eyre Peninsula Soils

Blake Gontar, Andrew Ware and Therese McBeath
SARDI and Agriculture, CSIRO

Background

The best management practice for nitrogen (N) will depend on the specific combination of soil, season, crop and grower preference for yield vs. profit maximisation. As cropping systems continue to intensify on the Lower Eyre Peninsula (LEP), the pressure to manage N fertiliser for the most efficient outcome grows in parallel.

At the moment, the estimated N losses have been managed through high inputs of N relative to yield potential. Growers perceive that they are operating at low N use efficiency, particularly on the waterlogging-prone duplex soils, and recent LEADA trials support this notion. An ideal situation would be to minimise the losses of fertiliser N applied and ensure a better match between the timing of supply and crop demand for N.

With the objective of developing management strategies for a better synchrony between crop demand and supply, we plan to undertake some N audits to identify the efficiency of N fertiliser use and the potential for soils to supply N to crops under different sequences.

Aims

1. To document fertiliser use efficiency on key Lower EP soil types.
2. To develop estimates of the ability of these soil types to supply N to crops from the soil.
3. To link fertiliser efficiency and soil supply capacity to the profit and risk of N management on Lower EP farms.

Methods

We identified 12 wheat paddocks for monitoring to represent 6 key cropping soil types (sand at Mt Hill, sand over gravelly clay and sand over gravel at Greenpatch, deep clay at Cummins, gravelly loam over sodic clay at Yeelanna and red brown earth at Ungarra) on Lower EP. At the beginning of the growing season, and prior to sowing we collected replicate core samples to approximately 80 cm depth along a fixed transect from each paddock. These samples have been analysed for microbial biomass, N supply potential, mineral N, water, phosphorus (P) nutrition and pH and salinity (EC). In addition we are collecting crop history, fertiliser history, prior soil tests, crop yields and protein from the grower to complete the audit process. During the growing season we have sampled plants on the same transect at first node and we will sample at the end of flowering to measure biomass and N nutrition. At maturity we will collect the grain yield along the same transects. The information generated will be utilized to update case study farms developed through profit-risk workshops for further scenario analysis in early 2016.

Results to Date

Preliminary results from the paddocks revealed a few interesting characteristics. Firstly, the range of soil types and resultant fertility is readily identified in these early results with quite acidic through to slightly alkaline pH (Table 1). Secondly, some paddocks had quite low P status (Table 1) and this is being addressed through collaboration between the University of Adelaide and Landmark, Cummins. Comparison within a soil type pair did not show a clear effect of the previous crop type on soil mineral N at sowing (Table 1). Only 3 out of the 5 possible comparisons had more mineral N to 80 cm depth at sowing following a legume compared with following wheat or canola, while the mineral N in the top 10cm and the ability of the soil to supply N through mineralization (N supply potential) did not appear to be affected by the previous crop type.

Table 1. Selected pre-sowing soil test results from LEP wheat monitoring paddocks. The pH, Colwell-P, DGT-P and N supply potential were all measured to 10 cm depth. Cells shaded grey indicates prediction of a P deficiency. The mineral N (kg/ha) analysis is presented to 10 and 80 cm depth.

Soil Type	2014 Crop Type	pH $_{1:5\ H20}$	Colwell Extractable P (mg/kg)	DGT-P (µg/L)	N Supply Potential (mg/kg over 21 days)	Mineral N to 10cm depth (kg/ha)	Mineral N to 80cm depth (kg/ha)
Sand	Pasture	6.4	13	195	11.9	9	36
	Vetch	5.7	15	247	9.8	8	39
Sand over clay	Lupin	6.1	44	153	22.2	33	146
	Canola	4.9	55	95	16.8	33	111
Sand over gravel	Beans	5.9	120	399	21.9	21	121
	Canola	4.6	55	96		44	127
Deep clay	Beans	7.7	30	40	9.9	14	82
	Canola	6.5	34	55	12.3	13	48
Loam over sodic clay	Beans	4.9	43	109	13.2	18	97
	Canola	4.8	39	86	14.5	22	107
Red brown earth	Wheat	7.8	29	31	6.4	17	67
	Beans	7.8	21	21	7.4	11	85

At the Cummins time of sowing trial site, preliminary sampling of plants that have been fertilised with urea containing a tracer to directly measure the recovery of fertiliser N applied has indicated that the technique has been successful. This means that we know for certain that the plants have successfully utilised the fertiliser applied and the highest level of uptake of the early July applied fertiliser was for the plants sown at the optimal time (TOS 2). The absolute amount of fertiliser N recovered will be measured by sampling plants at maturity.

Acknowledgements

Thanks to the grower collaborators for the provision of access for sampling and for information to allow us to complete the audit. GRDC and LEADA have provided funding for the monitoring through the Stubble Retention Initiative (project LEA00002). Thanks to Vadakattu Gupta for the provision of nitrogen and biological soil analysis and the provision of expert advice. Thanks to Ed Hunt for his support in the profit-risk analyses and impetus for undertaking the audit.

EYRE PENINSULA GRAIN AND GRAZE 3

Jessica Crettenden, Research Officer SARDI

Grain and Graze 3 (G&G3) is the third phase of mixed farming investment by the GRDC and covers the low, medium and high rainfall zones in Southern Australia. The project is being delivered by five groups, SARDI at Minnipa, the Ag Ex Alliance, Southern Farming Systems, Birchip Cropping Group and Mallee Sustainable Farming through group activities, on farm demonstrations and extension from 2014 to 2017.

Three topics are being investigated in the project:

- **Enhanced grazing of cropped land:** both stubbles over summer and growing crops in winter. Focus will be on getting the most out of stubbles, grazing canola in winter, understanding what environmental conditions post grazing lead to grain yield loss and the impact of grazing on weed densities.
- **Improvements to crop and pasture rotation:** designing better mixed farming rotations that achieve multiple benefits in the farming system. Increasing herbicide resistance, rising nitrogen costs and the limited diversity in a crop only system are challenges that may be solved with clever integration of fodder and livestock.
- **Transition integration and balance (enterprise mix) at the farm level:** complex issue of planning and implementing integrated systems that consider risk between as well as within enterprises on the farm. Most growers have a preference for the physical running of the business, however with greater price and climatic variability, it is becoming increasingly important to enhance thinking around risk and strategic running of the business.

Ultimately the G&G3 program aspires to help farmers and advisors design and manage flexible farming systems. An overview of the trials currently being undertaken through Eyre Peninsula G&G3 is listed below.

We are currently looking for Lower Eyre Peninsula farmers willing to be involved in livestock and stubble research over the summer period (please contact jessica.crettenden@sa.gov.au if you wish to be involved in the project).

The impact of livestock on paddock health

The majority of farms in low rainfall areas use sheep to provide enterprise diversity, however grazing also offers a range of other system benefits that are generally not accounted for in mixed farming enterprises. Studies have shown that grazing offers a useful tool for managing weeds and pests, improving crop nutrition and yields and providing an option to mitigate risk in pasture crop rotations. In these systems there is a perception of declining performance of the pasture ley, as a result of increasing cropping intensity. As a result, there has been work to show the benefits of increasing crop and pasture inputs, as opposed to district practice crop seeding and fertiliser rates and pasture regeneration from residual seed banks.

The aims of the long-term (2008-2017) trial are:

- to assess the impact of grazing on crop and pasture production and soil health and also to evaluate this from a systems perspective
- to determine whether productivity can be improved under a higher input system compared to a lower input and more traditional system and what affect this has on soil fertility

With no decrease to wheat yields over seven years, so far the trial has proven that sheep don't negatively impact on any component of the cropping system, including water use efficiency, soil quality, soil nutrients (nitrogen, organic carbon and phosphorous), pests or diseases in the cropping phase as a result of sheep grazing. Further work in 2015 and 2016 will consider the cost versus the benefit of the four different systems.

Mechanisms that lead to yield loss after grazing across agro-ecological zones

The trial is focuses on research into understanding the mechanisms that lead to yield loss after grazing cereals across agro-ecological zones.

The aims of the trial are:

- to determine the grain yield recovery potential of two different wheat varieties and if there are genetic differences, other than simple phenology, in the way varieties respond after grazing
- to determine whether nitrogen is able to assist in grazing recovery and yield and/or protein compensation

Ensuring effective nodulation in medic pastures – how to get the most 'free' nitrogen

The trial is focuses on research into designing better mixed farming rotations that achieve multiple benefits in the farming system and assist to overcome current enterprise challenges such as rising nitrogen costs.

The aims of the trial are:

- to determine the most productive and cost efficient method of managing medic pastures in the break phase of a cropping rotation for optimal nitrogen fixation
- to ensure effective nodulation in medic pastures by determining differences between management practices, including inoculation treatments on both sown and regenerating medic stands
- to determine if grazing medic pastures in the break phase of the rotation benefits or impedes nodulation, therefore nitrogen fixation, for the following crop

Minnipa Agricultural Centre livestock research update

Comprehensive measurements are still being carried out on the Minnipa flock are still being carried out in anticipation for future requirements for the data recorded on individual animals (through the use of electronic identification) with funding opportunities in the near future.

Current measurements include:

- Pregnancy scanning
- Weighing (at all age stages, including birth)
- Pedigree (sire and dam)
- Maternal temperament and lamb vigour scores
- Fleece weights and wool quality
- Fat and eye muscle depth
- Visual classing (top, flock, culls) and visual scores (breech and body wrinkle, wool colour, face cover)

LEADA - 10 YEARS AND GOING STRONG

4TH May 2005

First meeting of a group to discuss the potential for a group on lower EP. 26 people (farmers, agronomists and agribusiness) attended the meeting, facilitated by Michael Richards from the YP Alkaline Soils group.

A Lower EP farming systems group with strong farmer leadership and representation was seen to be in a much better position to secure funding for research, development, demonstration, extension and training activities in the future

Issues Identified:

- Sodicity/sub-soil problems
- Snails and slugs
- Pulse production
- Impact of tightening rotations with less pulses
- Managing herbicide resistance in ryegrass
- Fungicides for disease management in cereals and pulses
- Evaluation of guidance systems (GPS), Precision Agriculture, variable rate technology, EM technology
- Fluid fertilisers, seed dressings and trace elements
- Variety trials, esp. canola
- Non-wetting sands
- Lupin yields, wide row spacings
- Frost management
- N management
- Water use in the late season
- Lime/gypsum
- Subsoil constraints
- Subsoil nutrition/complete nutrition
- Grazing management
- Pastures
- Low input cell grazing

11th May 2005

Meeting to discuss possible structure of a farming systems group. Needed to avoid duplication with existing groups.

Interim Executive Group:

Kingsley MacDonald – Acting Chairman
Randall Wilksch
Shane Nelligan
Darren Rule
Jim Egan

Greg Secomb (Rural Solutions SA field crop consultant) - part-time coordination role

Tim Richardson and Richard May were been added to broaden input from agronomic service providers on Lower EP

The interim committee was given priority tasks to:

- Develop more formal structure for the group, including a constitution
- Decide a name for the group
- Develop a process to elect and install an on-going Chairperson and Executive Committee
- Plan for meeting with all local groups around March 2006
- Program activities for 2005

Issues / activities for 2005:

- Spraying technology
- Canola workshop/meeting
- Inter-row cropping
- Variable rate technology demonstration
- Subsoil amelioration
- "Grain and Graze" project
- Survey of trifluralin resistance / options for ryegrass control / burning windrows (OK for canola) / inter-row tillage.
- Field day/s at trial sites

24th October 2005

The Lower Eyre Peninsula Agricultural Development Association finalised and submitted its Constitution to the Office of Consumer and Business Affairs to formalise the Incorporation of the Association.

14th November 2005

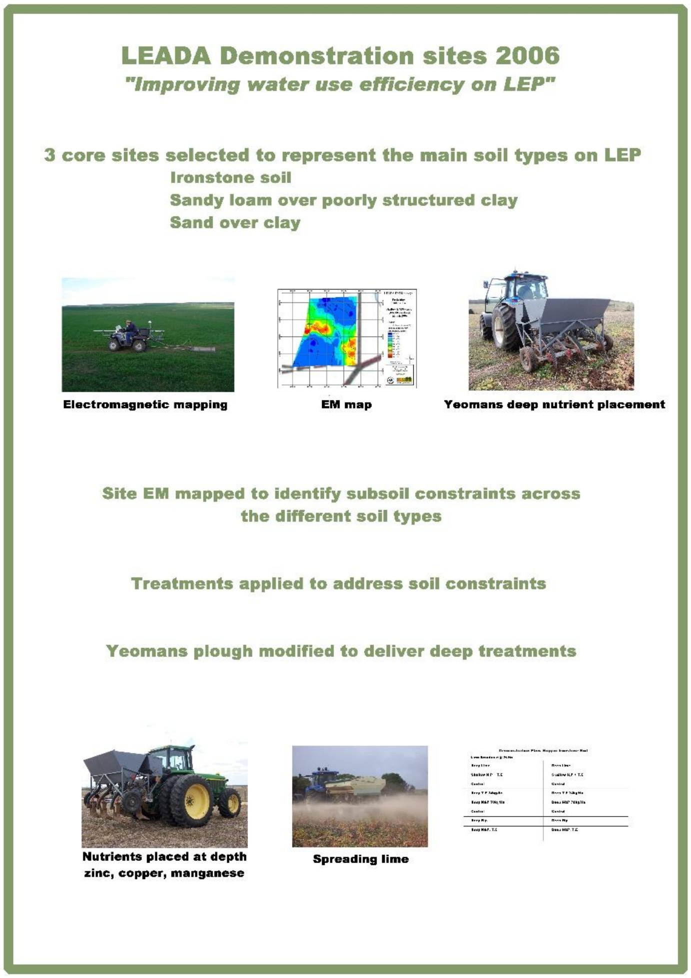
The Lower Eyre Agricultural Development Association was approved by the Office of Consumer and Business Affairs. The purpose of the Association to promote the development of sustainable agriculture.

2006

Committee: Kingsley MacDonald (Chair), Mark Dennis, Jim Egan, Kieran Wauchope, Richard May, Tim Richardson, Anthony Fatchen, Darren Rule, Andrew Ware, Andrew Bates, Ron Simpson, Brenton Growden, David Davenport, Jarrod Doudle, Mark Modra

- Trip to WA – gained GRDC funding
- NLP project
- Spray drift project – trial pre and post emergent herbicides. Low drift nozzles were most effective
- Saw the need to seek input from local farmers on research priorities for the region
- Investigations on a central site

- Sought public liability insurance



Topical issues:

- Strategies to beat black leg
- Comparing new canola genetics
- New industry for EP – canola biodiesel
- Better malting barley

2007

Committee: David Giddings / Mark Modra (Chair) Kingsley MacDonald, Anthony Fatchen, Andrew Bates, Julian Doudle, Jarrod Doudle, Brad Claughton, Jordan Wilksch, Tim Richardson, Martyn Chandler, Richard May, ABB rep, either Steve Whillas or Roger Laube, Ron Simpson/Brad Foster, Jim Egan, Kieran Wauchope

- SANTFA trials –had a successful seeding rate vs. ryegrass competition trial. Looking at disc seeders vs. conventional, row spacings, and varieties for weed competition
- Goal setting
- The ABB land adjacent to the Cummins Receival Site secured as a 'permanent' trial site
- First Ag Expo at Cummins – 50 attended
- Facilitated strategic planning workshop

- WUE project running - options discussed: ‘graveyard treatments’, row spacings, ripping, ripping + deep nutrients
- Spring Crop Walk - would provide LEP farmers a valuable and informative day and would help raise the profile of LEADA in a positive way
- Discussions with Alan Mayfield re potential GRDC project eg. ryegrass control and nitrogen management. Farmer survey feedback:
    - Barley – spot form net blotch, black point, nitrogen management, rotations
    - Canola – GM potential, insect issues, windrowing, blackleg

2008

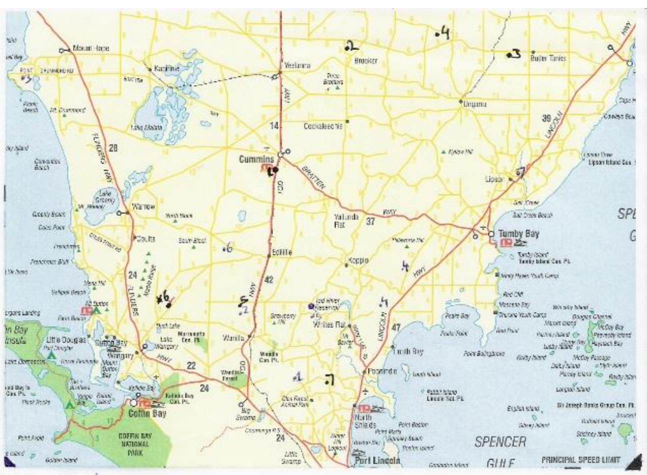
Committee: Mark Modra (chair), Andrew Ware, David Giddings, Jim Egan, Andrew Bates, Jarrod Doudle, Anthony Fatchen, Martin Chandler, Jordan Wilksch, Jo Crouch, Ron Simpson, Mark Dennis, Michael Treloar, Ed Hunt, Kieran Wauchope, Neil Ackland, Kingsley MacDonald and Tim Richardson

- GRDC placed a heavy emphasis that all of the projects they fund improve water efficiency by at least 10%
- Ag Expo – 30 attended
    - Balance between cropping and sheep on the program – with a higher emphasis on cropping to be included in next years program
    - Timing – aim to have it a couple of weeks earlier at the start of March
    - Advertising – aim to use the local media more prior to the Expo
- GRDC trials:
    - Canola – blackleg and windrowing
    - Barley – black tip and spot form net blotch scoring

- Agreement that Focus site needs to be shifted from the ABB Cummins Receival Site because of the large variations across the site
- Caring for our Country: Landcare: indicating LEADA had been successful in gaining one year of funding for the project “Building on improved options for managing changing climatic and economic environments through addressing soil constraints”
- AGM summary
    - GRDC funding of $500,000 being obtained over 5 years
    - 13 field trial sites established this year
    - 70-80 people at this years field day
    - 16 people went on a GRDC funded trip to Victoria
- Discussions with PIRSA re potential to trial GM canola still progressing

Topical issues:

- Canola
    - Blackleg – worse than other places
    - IPM – paddock demonstration
    - Windrow- compare with direct heading
    - Nutrition – canopy management, sub soil
- Barley
    - Spot form of net blotch
    - Black point
- Rhizoctonia



NLP Projects:
1. John Whillas
2. David Byles
3. Doudles
4. Tumby Hills - Andrew Mills
?5. Trevor Canaeu - need to check c Brett
6. Terry Secker
7. B Selly

GRDC Sites
1. Cummins Focus
2. Peter Clover
3. Andrew Bates
4. Anthony Fatchen
5. David Giddings - barley.
6. John Giddings - CAS - Canola - getting checked.
7. Mark Modra.

2009

Committee: Mark Modra (Chair), Andrew Ware, Kieran Wauchope, Martyn Chandler, David Giddings, Anthony Fatchen, Neil Ackland, Tim Richardson:, Mark Fitzgerald, Jo Crouch, Scott Sivour, Mark Stanley, Michael Treloar, Jim Egan, Ron Simpson, Mark Dennis

- Planning session outputs:
  - To be premier canola research group
  - Improve water use efficiency
  - Producing high yielding malting barley
  - Farming systems that include highly productive pasture
  - Improve linkages with Ag Bureaus, Minnipa Ag Centre
- Ag Expo not getting large numbers although program seen as good
- AGM summary
  - Success of blackleg survey with resistance breakdown – gave us a lot of credibility and something we should be proud of
  - AgExpo – great program which received great reports but not well supported
  - Spring Crop walk – went very well, good numbers and positive feedback

2010

Committee: David Giddings (chair), Tim Richardson, Roy Latta, Kieran Wauchope, Michael Treloar, Andrew Ware, Mark Modra, Dan Adams, Anthony Fatchen, Melissa Siegert, Nigel Meyers, Jordan Wilksch, Martyn Chandler

- Melissa started as admin officer
- Soil moisture probes for key sites
- Discussion re LEADAs IP
- 32 attended Ag Expo – good feedback
- Development of regular Newsletter

Topical issues:

Barley

- Feed barley trial – high yields, Barley disease management, Nitrogen management, Canopy management – high yield, water logging, Water logging

Canola

- Seed source, Harvest – direct heading, windrowing, IPM, DBM – Residues

Pulses

- Chickpeas – alternative crop to peas – snail management,
- Lupins – time of sowing vs excess bulk and seeding rates.

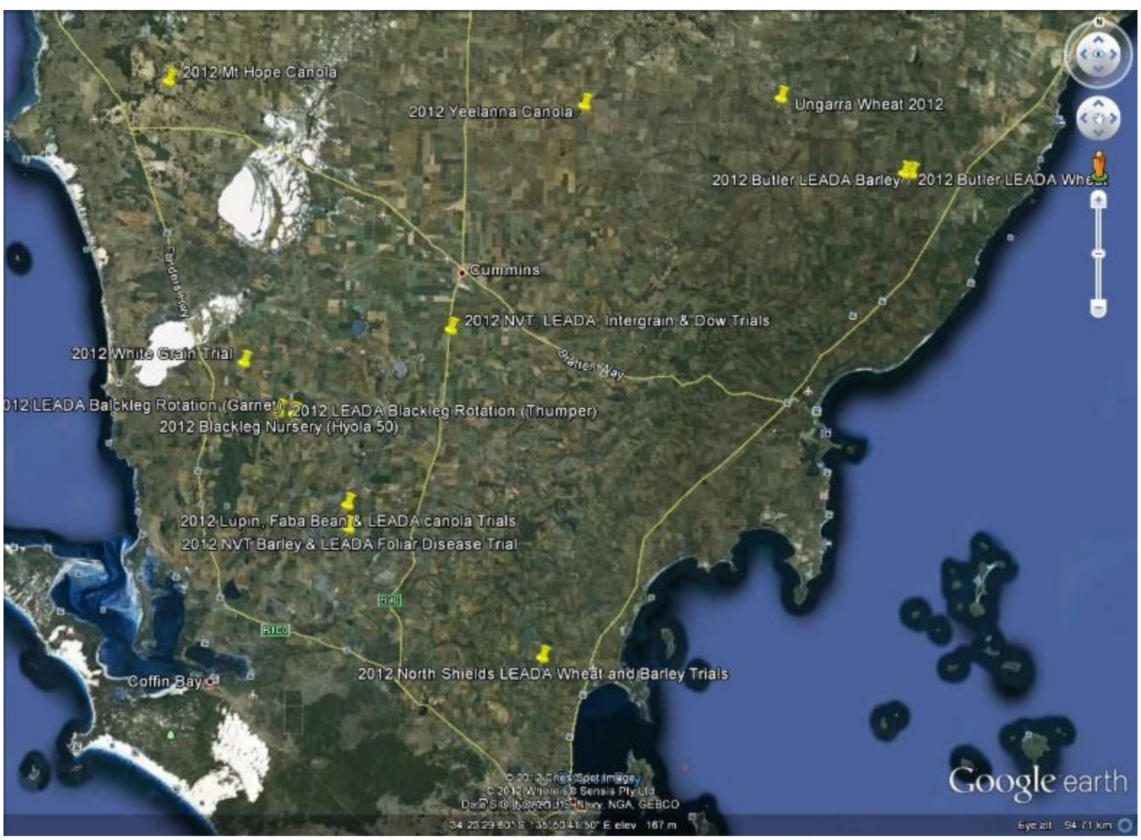
Wheat

- Pushing wheat yields to maximum – maximum input vs district practice. Economic analysis, Producing

2011

Committee: Dave Giddings (chair), Michael Treloar, Roy Latta, Anthony Fatchen, Jordan Wilksch, Dan Adams, Tim Richardson, John Richardson, Bruce Morgan, Scott Siviour, Dustin Parker, Stewart Modra, , Mark Modra, Andrew Ware, Martyn Chandler

- Potential risks with trialling chemicals not registered
- Spring Crop Walk attracted 90
    - Well advertised
    - People getting to know about it
    - Timing makes a difference
- LEADA boundary – northern and eastern
- Development of a Facebook page
- AGM summary
    - Strategic Plan – very important, having a vision and goals and defining these important for maintaining focus throughout the year.
    - Working through the development of a protocol for trialling unregistered products
    - Being organised – good preparation for the GRDC Southern Panel visit – getting our message across – has set us up in a positive way for future funding
    - Having a succession plan for committee structure



2012

Committee: David Giddings (chair), Kieran Wauchope, John Richardson, Michael Swaffer, Michael Treloar, Luke Moroney, Neil Ackland, Martin Burns, Andrew Ware, Jordy Wilksch, Roy Latta, Bruce Morgan, Dustin Parker, Tim Richardson, Mark Modra, Scott Siviour, Dan Adams, Nigel Myers, Arnd Enneking, Shane Nelligan

- Development of Syngenta sponsorship model
- Facebook page up and running
- LEADA was mentioned in Parliament as an example of how farmers care for the environment
- Development of a refined sponsor package with varying levels of sponsorship
- Kieran Wauchope started working for Syngenta
- Andrew Ware the lead SARDI Canola researcher with Trent Potters retirement

Topical issues:

- Blackleg fungicides
- Windrowing
- Cereal fungicide management
- Controlling powdery mildew
- Nutrient balance in cereals
- Snails
- Soil health

2013

Committee: **:** Jordan Wilksch (chair), Luke Moroney, Stewart Modra, David Giddings, Kieran Wauchope, Michael Swaffer, Neil Ackland, Brenton Growden, Andrew Ware, Jamie Phillis, Dave Davenport, Roy Latta, , John Richardson, Dustin Parker, Mark Modra, Mark Stanley, Scott Siviour, Martin Burns, Shane Nelligan, Tim Richardson, Nigel Myers, Arn Enneking, Dan Adams

- GRDC Stubble management project approved
- Brenton Growden interim Executive officer
- Highlights of trials:
    - No yield penalty from dry sowing canola
    - Butler and Nth Shields – Nitrogen response and yield was closely aligned to prediction from Yield Prophet
    - Cummins site – crop getting water from great depths, yields up to 5.7t/ha from 200mm of GSR

- New Executive officer / Regional Landcare Facilitator appointed – Helen Lamont
- Ag Expo – 85 attended, excellent feedback
- Final reporting for WUE project and finish
- Changes to financial management

- Start development of LEADA policies and procedures and contract / project management system
- Difficult year with the Executive officer role changing several times, funding difficulties, ongoing difficulties with the financial reporting and recording and lack of clarity on LEADAs financial position.
- New project – addressing nutritional issues

2014

Committee: Jordan Wilksch (Chair), Neil Ackland, Daniel Adams, Pat Head, Roy Latta, Mark Modra, Bruce Morgan, Jamie Phillis, John Richardson, Tim Richardson, Andrew Ware, Helen Lamont, David Davenport, Mark Stanley, David Giddings, Michael Treloar, Dustin Parker, George Pedler, Kieran Wauchope, Scott Siviour

- EP Rail Levy funding secured for two projects – leadership development and sub soil constraints
- Successful Herbicide Resistance Workshop – 70 attended
- Quick response workshop delivered on Beat Western Yellows Virus – over 100 attended
- New Horizons project with PIRSA – addressing sub soil constraints
- LEADA investing savings and developed small grants program for on farm research projects
- Soils and food program with PLHS students
- LEADA committee bus tour of region and committee members farms

2015

Committee: John Richardson (Chair), George Pedler, Andrew Ware, Jordan Wilksch, Dave Giddings, Kieran Wauchope, Helen Lamont, Bruce Morgan, Jamie Phillis, Pat Head, Mark Modra, Mark Stanley, David Davenport, Dan Adams (treasurer), Dustin Parker, Tim Richardson

- LEADA signs for three locations around region
- EPNRM Adapt Grant – case studying treatment for low pH soils
- LEADA Constitution reviewed
- Results from New Horizons – control vs best treatment – average 1.3-1.4t difference
- Potential project looking at Rhizoctonia
- LEADA decision to engage a research agronomist to support priority issues

Topical issues:

- Cover crops
- Efficacy of chemicals in stubbles
- Weed control – crop competition
- Nitrogen – how to double yield
- Legumes –

LEADA FUTURE DIRECTIONS 2015 -

Research & Extension

1. **What we want to do to address weeds in farming systems**

1.1 Manage emerging weeds

1.2 Develop farming systems that are not reliant on herbicides

1.3 "Cultural use" of herbicides

1.4 Dealing with the emerging issue of glyphosate resistance

1.5 What do we do for grass weed control in canola when Clethodin doesn't work?

2. **What we want to do to address research and extension capacity in the region**

2.1 There is capacity available if LEADA wants to / can pay.

2.2 LEADA committee needs ideas to be developed and implemented

2.3 Utilising the expertise and capacity of SARDI

2.4 Use local agronomists

3 **What we want to do to address break crops in farming systems**

3.1 Conduct a literature review on break crops for the region

3.2 Improve returns from bean crops

3.3 Revisit the ley farming system / role of fodder crops and pastures in rotations

3.4 Improve returns of peas on limestone

3.5 Need to grow lupins in lower EP farming systems, what will make them profitable?

3.6 Snails & Slugs are still a major issue in farming systems on the lower EP and require further research

4 **What we want to do to address soil issues in farming systems**

4.1 Subsoils constraints still the biggest issue on lower EP

4.2 Develop an extension program to raise awareness of issue and how to resolve it.

4.3 Examine options for weaker (sandy) soils that can't sustain intense rotations without a legume break

4.4 Examine the role of multi species cover crops on the lower EP

4.5 Why are farmers around Cummins deep ripping heavier soils?

5 **What we want to do to address nutrition issues in farming systems**

5.1 How much nitrogen do we need in our cropping systems - this still remains unanswered

Skill Development

6 **What we want to do to address business skills**

6.1 Access to farm business expertise

6.2 Role of benchmarking farm businesses

6.3 Using farm management software

6.4 Improve farmer confidence in on farm decision making

7 What we want to do to address transitioning of farming systems

7.1 Creating an environment to open people to the challenge/change

7.2 Identify problems with system and develop research options to solve these problems

7.3 Organise tours to areas with high adoption of new technologies, options to create new thinking

8 What we want to do to address communications

8.1 Provide training to improve communications skills with a range of stakeholders

8.2 Develop closer links with universities and multinationals

9 What we want to do to address workforce development

9.1 Options for workforce and time management

Leadership and Engagement

10 What we want to do to address engaging with young farmers

10.1 Understand who is being targeted

10.2 Develop strategies to engage young farmers

10.3 Develop a proper structure to engage agricultural students.

10.4 Investigate the Role of twitter and other social media to engage young farmers

11 What we want to do to address committee engagement

11.1 Employ a research officer for group

11.2 LEADA needs to sell itself by implementing the vision

11.3 Identify what is the next 'big thing'

11.4 Conduct an annual trail planning day

12 What we want to do to address taking on leadership roles

12.1 Need to provide greater support to current leaders and executive

12.2 Need to provide greater support to new leaders and executive

13 What we want to do to expand LEADA's influence

13.1 Create a LEADA web site

13.2 Tweet from trial sites regularly on progress and issues

14 What we want to do to ensure we have succession for the committee

14.1 What is the next 'big' thing to engage; the biggest problem / issue facing farmers

LEADA MEMBERSHIP REGISTRATION

($20 for membership till April 2015)

Name	
Business name	
Address	
Postal address	
Email	
Phone	
Fax	
Membership fee paid	

A tax invoice will be forward soon.