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Next Meeting	**'April Avengers: Getting Back in Control'**
Venue	**Richardson Theatre, Roseworthy Campus**
Date	**WEDNESDAY 15th APRIL**
Time	**7.30 pm**

Speakers

April Avengers, getting back in control of Mice and Snails!

After travelling around most of the state and surveying paddocks for summer weeds in recent months, I noticed some common issues. Firstly the presence of high snail numbers – everywhere - and quite a few active mouse holes in paddocks. With a good food supply of fresh grain on the soil surface from harvest, is it possible to prevent or at least manage the potential mouse troubles?

Michael Nash: SARDI, Entomology

Michael and the entomology group have been doing a great deal of work studying these prolific slime balls in a calcium shell. He will be speaking on the latest research on snails and best management strategies to win back control.

Greg Mutze: Biosecurity SA

Greg has had extensive experience working on management of mice. Come along to hear what there is to know about these despicable pests and how to best manage them. Greg is also keen to hear from Crop Science members on their experiences managing mice this year.

Screening for eyespot resistance: Findings from trials at Cummins, Tarlee and Templers in 2014

Margaret Evans, Greg Naglis and Hugh Wallwork, SARDI, Waite

Overview

- Sites were at Cummins (Lower Eyre Peninsula), Tarlee (Lower North) and Templers (close to Roseworthy on the Adelaide Plains).
- Due to high inoculum levels and good early rains, eyespot incidence (98%-100% of stems affected) and severity (85-93 on a scale of 0-100) was high in the worst affected entries.
- The range in response to eyespot amongst the bread wheat and barley entries screened means that varieties least likely to be affected by eyespot can be selected for paddocks with eyespot issues and those varieties most likely to be affected by eyespot can be avoided.
- Wheat varieties least affected by eyespot included Trojan, Emu Rock, Spitfire and Sunguard as well as the long season variety Gazelle. Varieties most affected by eyespot included Axe, Mace, Shield, Cobra and Corack. Some breeder's lines were intermediate in their response to eyespot and offer some added breeding opportunities. LPB06-0919 performed well at Cummins, but was not screened at the other sites due to limited seed supplies.
- It is interesting to note that the several of the varieties with crown rot resistance performed well in the presence of eyespot.
- Barley varieties were inconsistent in their response to eyespot. At Cummins they were less affected by eyespot than was bread wheat, but at Tarlee and Templers the variety La Trobe and Hindmarsh (a sister line) were badly affected by eyespot. Compass was least affected by eyespot at all sites. The possibility that these variations were due to differences in eyespot pathotypes between sites will be investigated.

Background

Eyespot is becoming an increasing problem in the higher rainfall grain growing areas of SA such as Lower Eyre Peninsula, the Mid North, the Adelaide Plains and the South East. This increase is mainly due to farming systems moving to stubble retention, direct drill and more cereals in rotations. Good crop management also contributes to eyespot problems as thick crops have higher humidity at the plant bases which promotes eyespot infection and growth.

Eyespot in cereals is caused by two fungal species, often referred to as the W-type (*O. yallundae*) and the R-type (*Oculimacula acuformis*). The latter has not been identified in Australia. This fungal disease is stubble-borne and affects stem bases, causing eye-like lesions which can girdle the stem and cause lodging. Eyespot can survive for up to 3 years on infected stubble.

Yield losses from eyespot occur as a direct result of the stem lesions and, secondarily, from plants lodging due to weakened stem bases which makes it difficult or impossible to harvest affected plants. Yield losses have not been quantified in Australia, but experience in the higher rainfall areas of the UK suggests yield losses can be as high as 40% in some circumstances.

In the UK and the Pacific North West, varieties with partial but useful resistance to eyespot have been developed but increasingly the prophylactic use of fungicides is being relied on to reduce yield losses from eyespot. In Australia yields and profit margins are smaller, so varietal resistance would be a preferred management option. As eyespot is a problem only in limited areas in Australia, breeding for eyespot resistance has not been a priority. This also means that resistance ratings for current varieties are not known. Anecdotal information, opportunistic assessment of National Variety Trials and results from a 2013 screening trial (6 entries) run by Landmark – Cummins Agricultural Services (Pat Head) all suggest there is variation in susceptibility to eyespot within Australian varieties.

Methods

Trial sites were established at Cummins (Lower Eyre Peninsula), Tarlee (Lower North) and Templers (close to Roseworthy on the Adelaide Plains). Sites were located in paddocks which had eyespot problems in the 2013 wheat crop and had a heavy stubble load carrying over from that crop into 2014. All sites were laid out in randomised block designs with three replicates.

Trial details are presented in Table 1. Note that Templers had much higher levels of eyespot DNA in the soil than the other sites. To encourage eyespot expression, trials were sown early in the seeding window, at a high plant density and with high nitrogen inputs.

Table 1. Details of resistance screening trials for eyespot in South Australia, 2014.

	Cummins	Templers	Tarlee
Soil eyespot DNA (cycles[#])	4,983,176	16,617,329	6,106,967
Stubble management	Mown	None	None
Seeding date	19 May	21 May	21 May
Target plant density	250	250	250
Plot size	5 row x 8 m	6 row x 12 m	6 row x 12 m

[#] This PredictaB test is new, so the unit of "cycles" will be used until the test can be calibrated for presentation as pg fungal DNA/g sample.

Entries (Table 2) were chosen to represent a range of genetic backgrounds and commonly grown South Australian varieties. Entries included long season bread wheats (Table 2) and bread wheats with crown rot resistance (Table 2). Bread wheat (30 entries), barley (4 entries) and durum wheat (1 entry) varieties were included to assess the relative susceptibility of the major cereal types.

The scoring scale (Scott and Hollins, 1974) used was:

0 = no lesions.
1 = slight eyespot – small lesion(s) on less than half the stem circumference.
2 = moderate eyespot - lesion(s) on at least half the stem circumference.
3 = severe eyespot – lesion(s) girdling the stem; tissue softened, lodging would occur readily.

Table 2. Entries screened for eyespot resistance in South Australia, 2014.

Cummins	Tarlee	Templers
ADV03.0056[LS]		
ADV07.0099[LS]		
AGT Katana[CR]	AGT Katana[CR]	AGT Katana[CR]
Axe	Axe	Axe
Bolac[LS]	Bolac[LS]	Bolac[LS]
Cobra	Cobra	Cobra
Compass	Compass	Compass
	Corack	Corack
Derrimut	Derrimut	Derrimut
EDGE06001b-10-01[LS]		
EDGE06039b-13[LS]		EDGE06039b-13[LS]
Emu Rock[CR]	Emu Rock[CR]	Emu Rock[CR]
Forrest[LS]	Forrest[LS]	Forrest[LS]
Gazelle[LS]	Gazelle[LS]	Gazelle[LS]
Gladius	Gladius	Gladius
Grenade CL+	Grenade CL+	Grenade CL+
Hindmarsh	Hindmarsh	Hindmarsh
Hyperno	Hyperno	Hyperno
La Trobe	La Trobe	La Trobe
LPB06-0919[CR]		
Mace	Mace	Mace
Orion[LS]	Orion[LS]	Orion[LS]
Scope	Scope	Scope
Scout	Scout	Scout
Shield	Shield	Shield
Spitfire[CR]		Spitfire[CR]
Sunguard[CR]	Sunguard[CR]	Sunguard[CR]
Trojan[CR]	Trojan[CR]	Trojan[CR]
Wakelin[LS]		
Wedgetail[LS]	Wedgetail[LS]	Wedgetail[LS]
Wyalkatchem	Wyalkatchem	Wyalkatchem
Yitpi	Yitpi	Yitpi

[CR] Crown rot resistance genes. [LS] Long season.

The scoring scale allowed calculation of eyespot incidence (% of stems showing visual symptoms of eyespot) and disease severity (disease index). The **disease index** (Scott and Hollins, 1974) produces a scale ranging from 0 (no eyespot) to 100 (all stems with severe eyespot) and was calculated as shown below:

$$(1 \times \text{tillers in score 1} + 2 \times \text{tillers in score 2} + 3 \times \text{tillers in score 3} / \text{total tillers scored}) \times (100 / 3).$$

Results and discussion

Plant establishment was good at Cummins and Templers but uneven at Tarlee, which will have contributed to the variability in results at that site. Volunteer Mace was present at Cummins, which means that entries may not show as clear an advantage as they should (Mace is susceptible to eyespot). Herbicide resistant ryegrass was a problem at Tarlee and probably contributed to the lower yields at that site. Yellow leaf spot and stripe rust (sprayed) were present at Templers.

The eyespot disease index provided the best discrimination between entries. It is interesting to note that the disease index appears to account for about half the differences in yield between the entries. This indicates that the disease index provides a good assessment of eyespot severity and the likely effects of the disease on grain production.

When analysing data for the whole trial, plant height was overwhelmed by the tendency of the entry to lodge due stems being weakened by eyespot (despite its height). If data for entries with similar susceptibility but different heights were analysed separately, it is probable the taller entries would have had higher levels of lodging than the shorter entries. Straw strength is also likely to influence lodging.

Eyespot incidence (% stems showing lesion/s – Fig. 1) and severity (disease index – Fig. 2)

The wheat varieties consistently least affected by eyespot included Trojan, Emu Rock, Spitfire and Sunguard as well as the long season variety Gazelle. The wheat varieties most affected by eyespot included Axe, Mace, Shield, Cobra and Corack. The single durum entry was intermediate in its response to eyespot when compared with the bread wheat entries. Maturity ratings may have influenced varietal responses to eyespot, but there was also a range of disease expression within the long season wheats. Gazelle was least affected, while Bolac and Orion were worst affected by eyespot.

Breeder’s lines were mainly sown at Cummins due to limited seed being available, with EDGE06039b-13 also being sown at Templers. This line was least affected by eyespot at Templers, but was significantly affected at Cummins – a reverse of the situation with barley (see below). Of the lines sown at Cummins, LPB06-0919 and EDGE06001b-10-01 were least affected by eyespot, with ADV03.0056 and ADV07.0099 also performing better than many of the commercial varieties.

The four barley varieties screened were least affected of all entries by eyespot at Cummins, but not at Tarlee and Templers. At the latter two sites, La Trobe and, to a lesser extent, Hindmarsh (a sister line to La Trobe) had significant disease expression with associated increases in lodging. It is unclear why this inconsistency in results occurred between the sites. The possibility that this anomaly is due to the eyespot isolate at Cummins differing from those at Tarlee and Templers is supported by some anomalies in the PredictaB results for the sites. This possibility will be further explored in 2015.

The variation in response to eyespot amongst these bread wheat and barley varieties means that where eyespot is a problem, locally adapted varieties least likely to be affected by eyespot can be selected and those varieties most likely to be affected by eyespot can be avoided. This variation in response to eyespot in commercial varieties and breeder’s lines will also provide a base for breeding commercial varieties with improved eyespot resistance. It is interesting to speculate whether the resistance genes for crown rot in Trojan, Emu Rock, Sunguard, LPB06-0919 and Spitfire also confer some reduction in response to eyespot.

Lodging (Fig. 3)

Higher levels of lodging were generally seen in the varieties with higher eyespot severity scores. Trojan, Emu Rock and Spitfire consistently had less than 5% of the plot lodged. Axe (30%-75%), Mace (28%-50%) and Corack (27%-33%) were consistently in the 3-4 varieties with the highest plot lodging percentages. Maturity ratings of the varieties may have influenced lodging levels, but again the long season varieties varied in lodging percentages, with Bolac and Orion having significant levels of lodging, while Gazelle and Wedgetail had no or low levels of lodging. The durum wheat entry lodged somewhat more than might have been expected given its intermediate response to eyespot at all sites.

Yield (Fig. 4)

All plots were successfully harvested without loss of heads and lodging did not affect grain harvest. Yield (Fig. 4) at all sites was high, with the best performing bread wheat (Trojan at all sites) yielding 5.26 t/ha at Cummins, 4.11 t/ha at Tarlee and 6.22 t/h at Templers. Other factors than eyespot will have contributed to differences in yield between varieties. Local NVT trial results will give a guide as to how varieties would have performed without eyespot being present.

Acknowledgements

This project was funded by GRDC through DAS0139 “Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease in South Australia”. Thanks to Jarrod and Jacqui Phelps (Cummins), Tony Clarke (Tarlee) and Gavin Schuster (Templers) for providing trial sites on their properties. Thanks also to those who assisted in planning for this trial –Roseworthy Rural Supplies (Chris Butler), Landmark – Cummins Agricultural Services (Pat Head) and Agrilink Agricultural Consultants (Mick Faulkner and Jeff Braun).

Figure 1. Effects of cereal type and variety on eyespot incidence in stems. **Raw data and standard errors are presented with bread wheat in blue, barley in green and durum wheat in orange.**

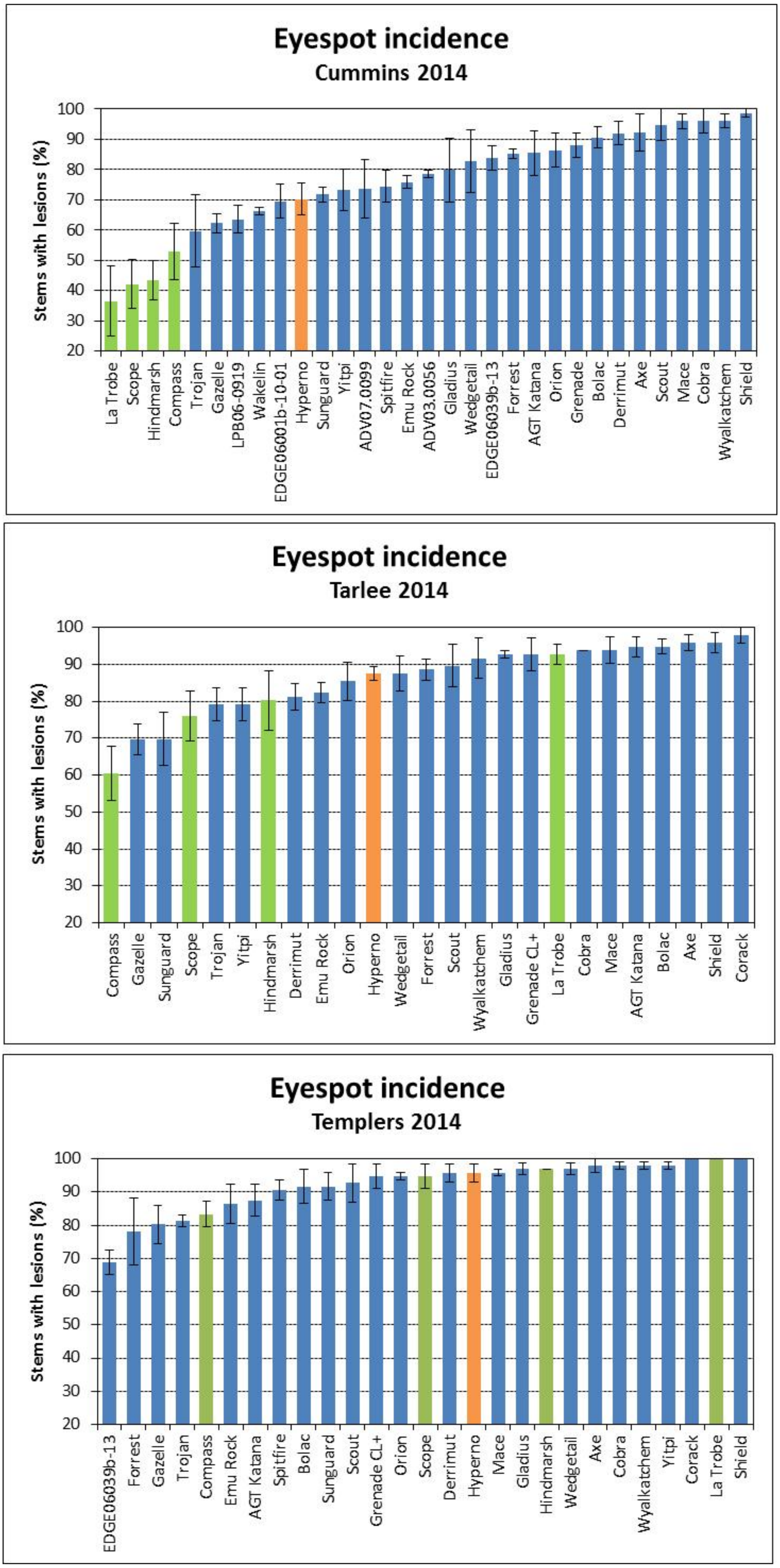


Figure 2. Effects of cereal type and variety on eyespot severity on stems. The Disease Index used is based on severity of basal stem lesions and ranges from 0 (no eyespot) to 100 (all stems with severe eyespot). **Raw data and standard errors are presented with bread wheat in blue, barley in green and durum wheat in orange.**

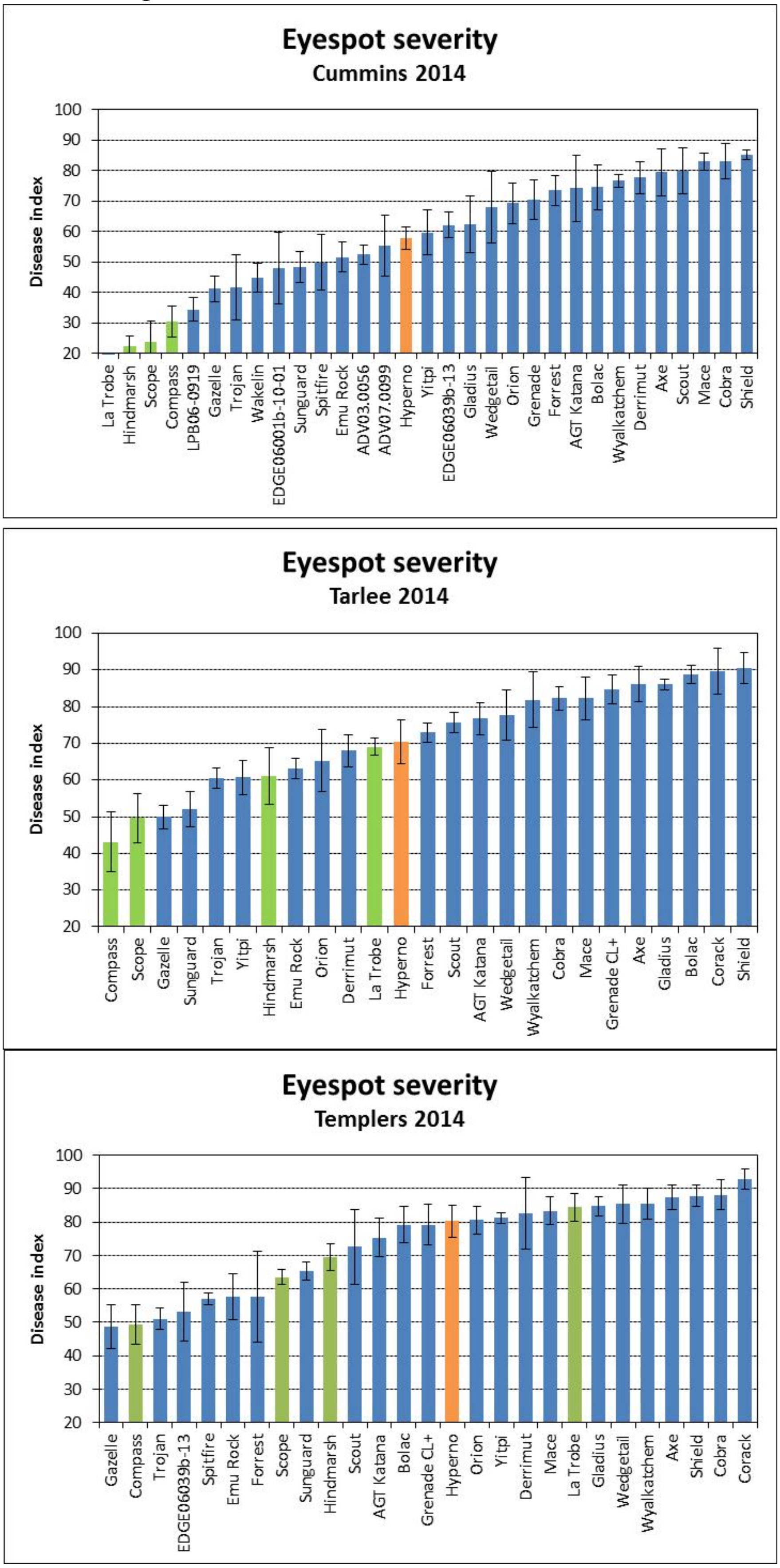
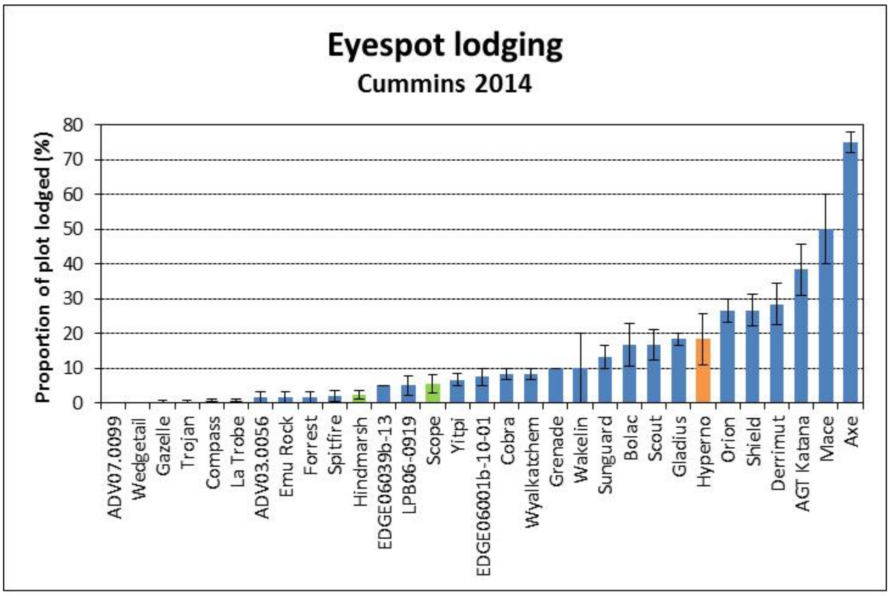
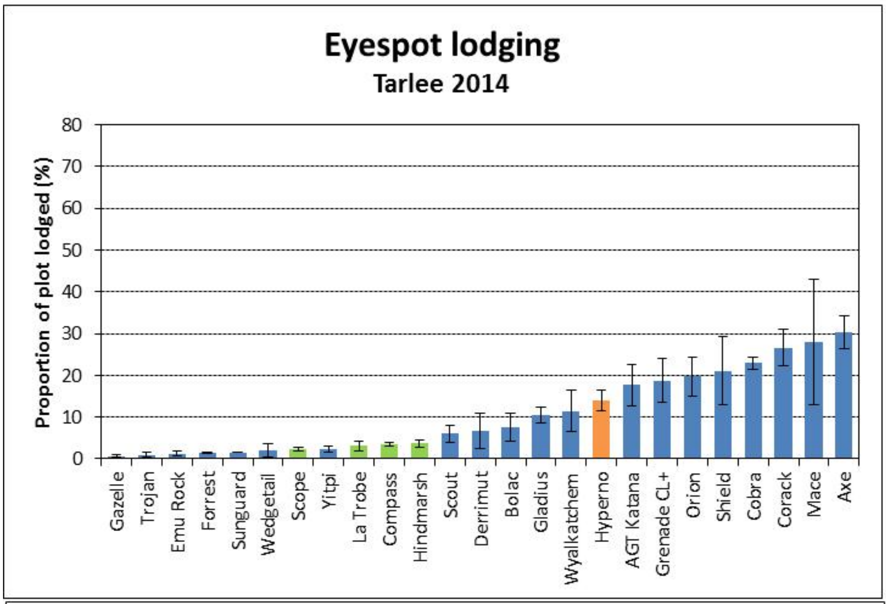


Figure 3. Effects of cereal type and variety on lodging severity in plots. **Raw data and standard errors are presented with bread wheat in blue, barley in green and durum wheat in orange.**





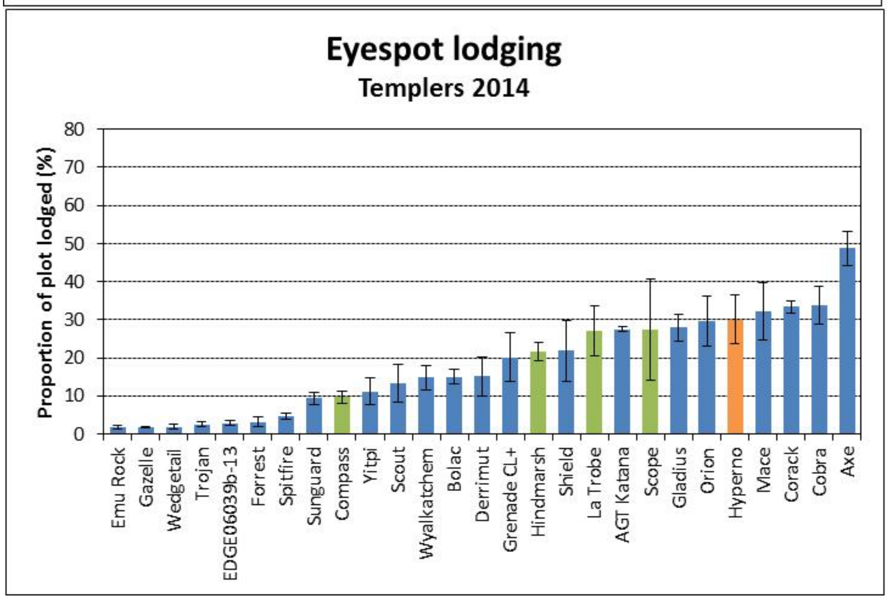
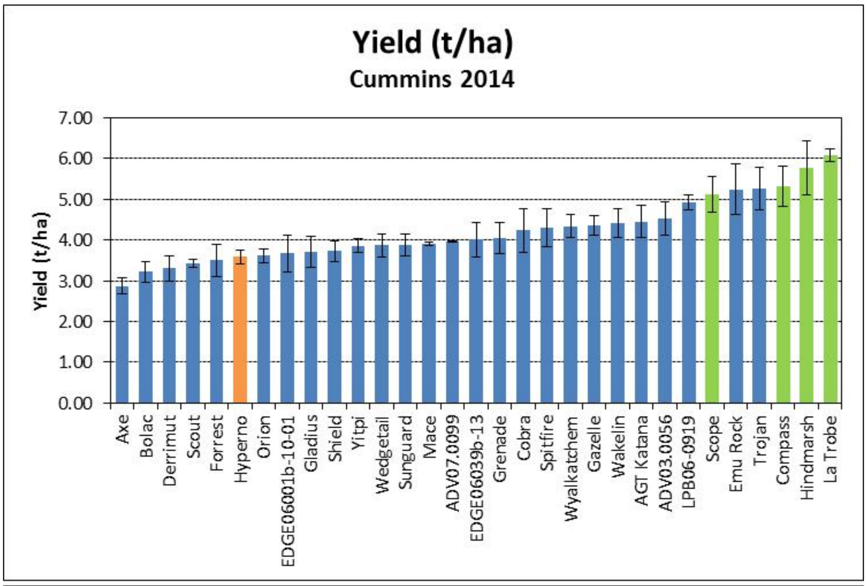
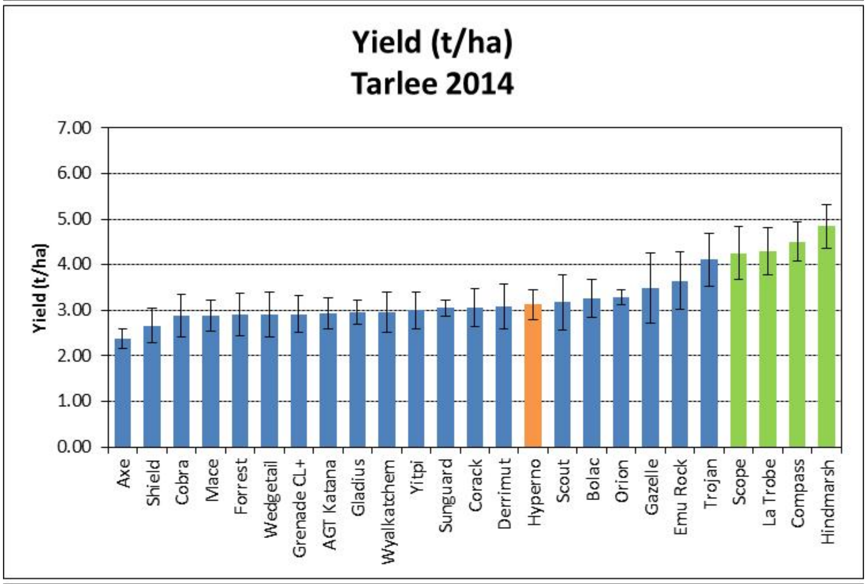
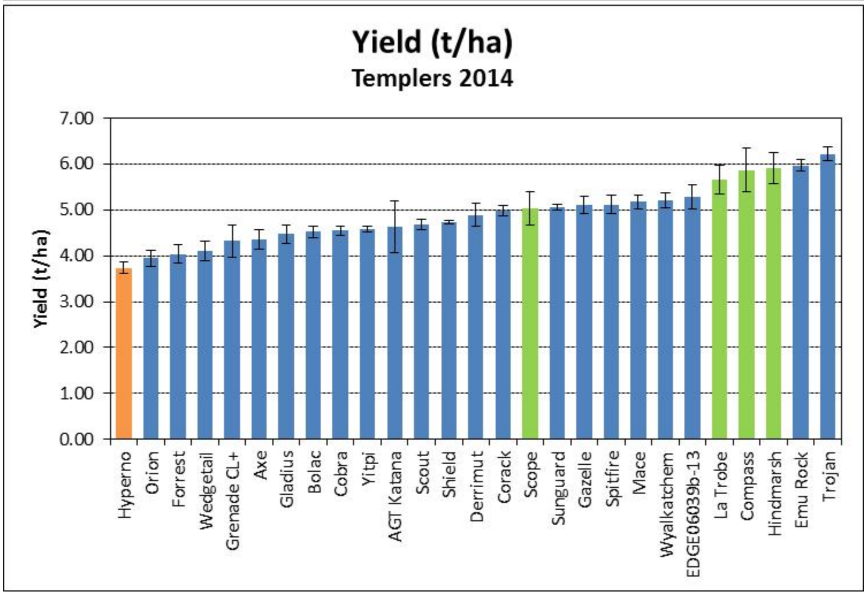


Figure 4. Yield of cereal types and varieties in the presence of eyespot. **Note** – other factors than eyespot will have contributed to differences in yield between varieties. Interpret these results using local NVT trial results as a comparator. **Raw data and standard errors are presented with bread wheat in blue, barley in green and durum wheat in orange.**







Can we use nitrogen research to better inform risky business?

Ed Hunt[1], Michael Moodie[2], Therese McBeath[3] and Jackie Ouzman[3]

[1]Ed Hunt Consulting, Wharminda, [2]Mallee Sustainable Farming, Mildura, [3]Agriculture Flagship, CSIRO

Take home messages

- Intensive cropping requires increased inputs of nitrogen (N) to maintain productivity, and fertiliser N efficiency is variable.
- Where there is a low frequency of grain and pasture legumes in the sequence, total soil N and organic N will decline.
- Farm businesses with crop intensive rotations make greater losses in poor seasons and the potential for upside gain may be constrained by sub-optimal N inputs.
- Advisors can utilise analysis of both probable responses to N management based on research and farm business strength to formulate their advice.

Managing N in intensive cropping

A move to more intensive cropping is likely to increase the loss of soil organic matter and contribute to a decline in fertility (Fettel and Gill, 1995). Angus et al (2006) reported that the concentration of total N in the top 10 cm of soil decreased from an initial value of 1.85 g/kg to 0.95 g/kg 14 years after a continuous cropping system was implemented. Early work on the Mallee Sustainable Farming Project showed net negative N balances under cereals and in some rotations (Baldock, 2003). Even with high fertiliser N inputs used in the MSF core trials (27 kg N ha^{-1}), negative N balances (13-30 kg N ha^{-1}) were obtained under cereal crops (Baldock, 2003).

Recent research at Karoonda has demonstrated the N-related benefits of incorporating medic-based pasture in the rotation (McBeath et al. 2015). In the first year following pasture, N supply potential increased by 8 to 16 kg N/ha/season more when compared to N inputs at sowing increased to 40 kg/ha. The benefits from the legume pasture decreased with time and in the second year after pasture the benefit against 40 kg N/ha at sowing was 0.4-9 kg N/ha/season.

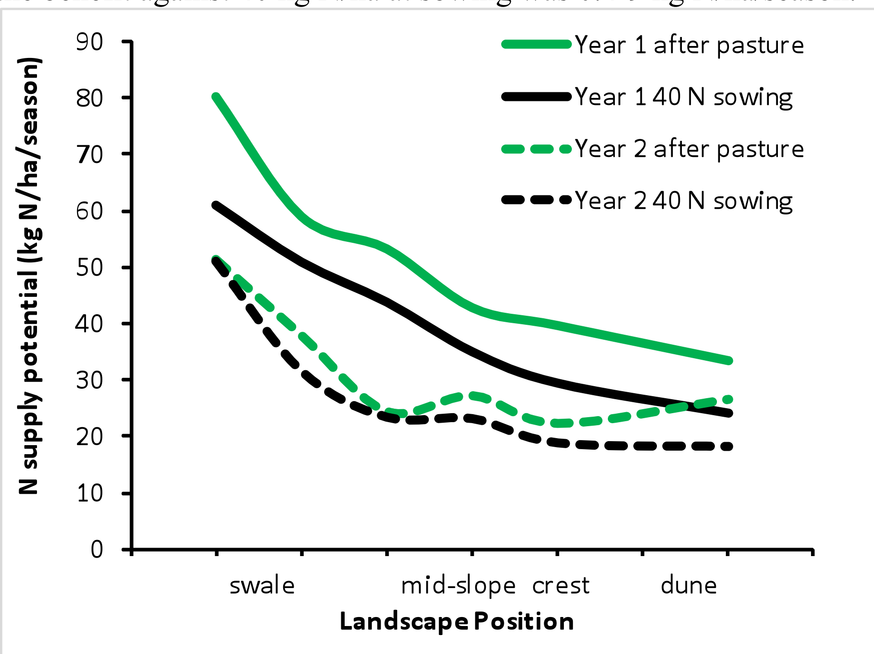


Figure 1. Soil N Supply Potential (kg N/ha/season) in the first and second year following pasture compared with the first and second year of increased inputs of fertiliser N (40 kg N/ha at sowing compared with 7-9 kg N/ha at sowing in previous seasons). Data courtesy of Dr Gupta Vadakattu.

Implications for farm business management

The effect of different strategies for managing N using more frequent legume phases in paddock rotations was compared to managing N "out of the bag" in a series of profit and risk workshops. These workshops looked at the core requirements of farm businesses to remain viable in an ever challenging environment of increasing costs and decreasing profits.

Workshops were run at West Wyalong, Birchip, Ouyen, Waikerie, Karoonda and Cummins. Participants, which included farmers, advisors and researchers, constructed a model farm that was representative of all aspects of their local farming systems, such as:

- Farm Size
- Machinery and labour requirements
- Enterprise mix
- Costs both variable and fixed, including extensive discussions on fertiliser and chemical strategies
- Yields of crops for different deciles - based on local trial data, APSIM/ Yield Prophet runs, paddock history and further input from the group
- Price - based on decile 5 values
- Off farm income

Here we will highlight the outcomes of workshops at Karoonda and Cummins where the focus was on nitrogen management.

Karoonda

Karoonda is situated in the Southern South Australian Mallee with a mean annual rainfall of 337 mm and growing season rainfall of 237 mm.

The key attributes of the farm developed at the workshop were:

- total size 2400 ha;
- two labour units drawing $50,000 per unit and $20,000 allocated to casual labour;
- starting equity position of the farm of 72 per cent;
- plant and machinery inventory $780,000 ($220/t grain produced);
- total fixed costs of $77,000; and
- a range of enterprise mixes were discussed but for the purpose of this article the 100 per cent cropping scenario contained 70 per cent cereal, 15 per cent canola and 15 per cent lupins.

There has been active research on nitrogen management since 2009. Due to the intensity of research, the soil types have been well characterized for the model APSIM and yields can be predicted for a range of season types with a reasonable level of confidence (Monjardino et al. 2013). Data from the trials at Karoonda were combined with APSIM modeled yields (to fill in the yield expected in a wider range of season types) and the experience and paddock records of the workshop participants to develop up yield tables in response to a range of management scenarios including differing inputs of N fertiliser and differing enterprise mixes. An example of the yields developed in response to N fertiliser management is given in Table 1.

Table 1. Cereal yield (t/ha) in response to Nitrogen (N) management strategy and season type (decile) for the Karoonda model farm.

N management	Soil	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
Fixed Low Input	Dune	0.2	0.4	0.8	1.2	1.8
30 kg/ha Urea all	Mid	0.5	1.1	1.9	2.1	2.5
	Swale	0.1	1.1	2.0	2.9	4.0
Fixed High Input	Dune	0.2	0.8	1.6	2.2	2.8
80 kg/ha Urea all	Mid	0.5	1.1	2.2	3.1	3.5
	Swale	0.1	1.1	2	3.5	4.5
Soil-specific Input	Dune	0.2	0.8	1.6	2.2	2.8
80 Dune, 40 mid, 20 swale	Mid	0.5	1.1	2.2	2.6	3.1
kg/ha urea	Swale	0.1	1.1	2.0	2.9	4.0

Nitrogen fertiliser inputs are a significant expense to the 100% crop farm, even in a decile 1 year. At least $50000 investment in fertiliser was made in the model farm. Recent research suggests that increased inputs of N on the sandy soil types will increase yield (Kirkegaard et al. 2014). However, increased inputs will increase risk to the farm business in low rainfall seasons with $109 000 downside risk from increasing inputs in a decile 1 season shown in Figure 2. One way to manage this risk is to only increase inputs on the sandy soil types and even moderately reduce inputs on the heavier soil types (Monjardino et al. 2013). This will moderate the top-end profit in a very wet season (upside gain in a decile 9 was $178 000 with soil specific input compared to $298 000 with high inputs across all soil types) but also substantially reduce the risk in poor seasons (i.e. downside risk reduced to $36 000). Logically, the best way to capture the gap in the upside gain that came from increasing inputs across all season types would be to increase inputs of N in-season in the better years. However, research at the Mallee Sustainable Farming Karoonda site in the SA Mallee have consistently shown that N inputs applied to sands at sowing are more effective than those applied in-season (Llewellyn et al. 2014). Furthermore, workshop participants highlighted that in-crop N inputs are difficult to manage due to extended periods with no rainfall in winter and large farm areas that hinder the application of N in a timely manner. For these reasons, farmers are increasingly applying N inputs up-front where there is a significant risk to the return on N investment if the season finishes poorly.

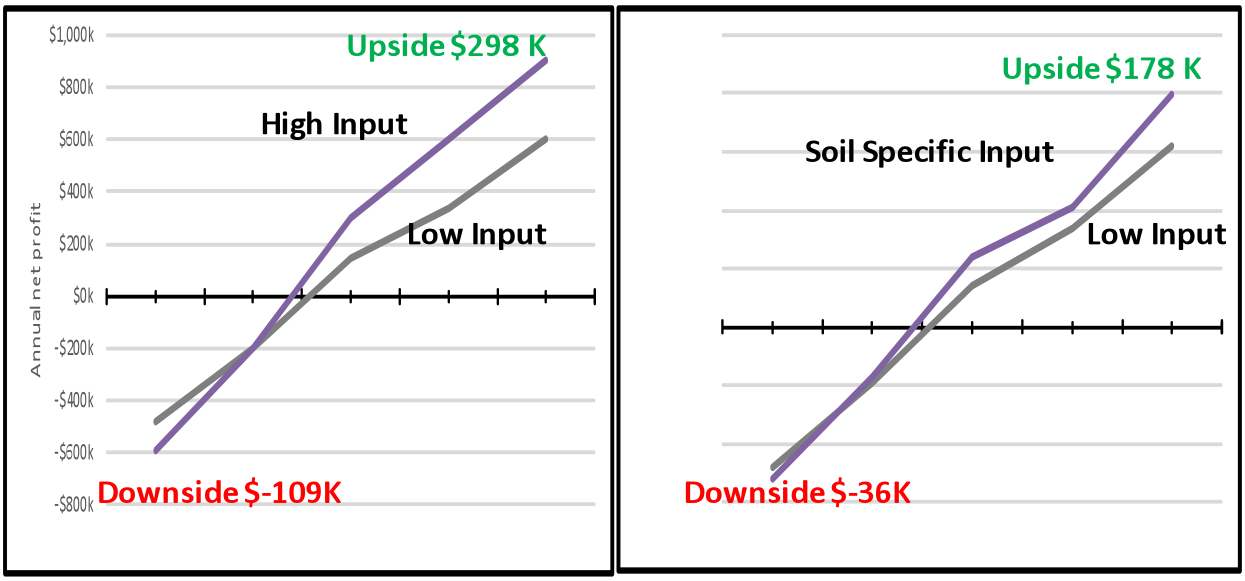
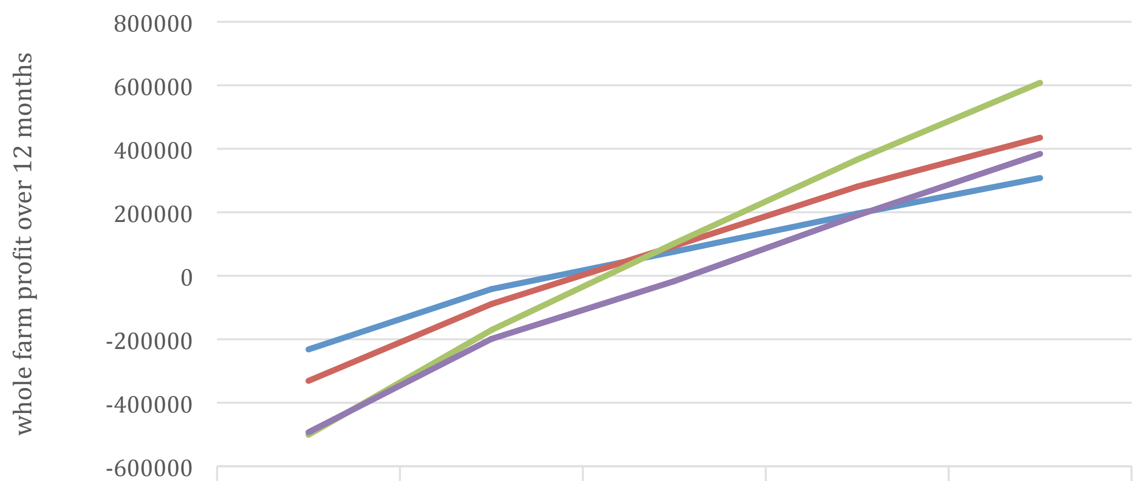


Figure 2. Annual farm net profit ($) at the Karoonda model farm resulting from low (30 kg Urea/ha across all soils) vs high input (80 kg Urea/ha across all soils) and low vs. soil specific (20 kg Urea/ha on heavy flats, 40 kg Urea/ha on mid-slopes and 80 kg/ha Urea on dunes).

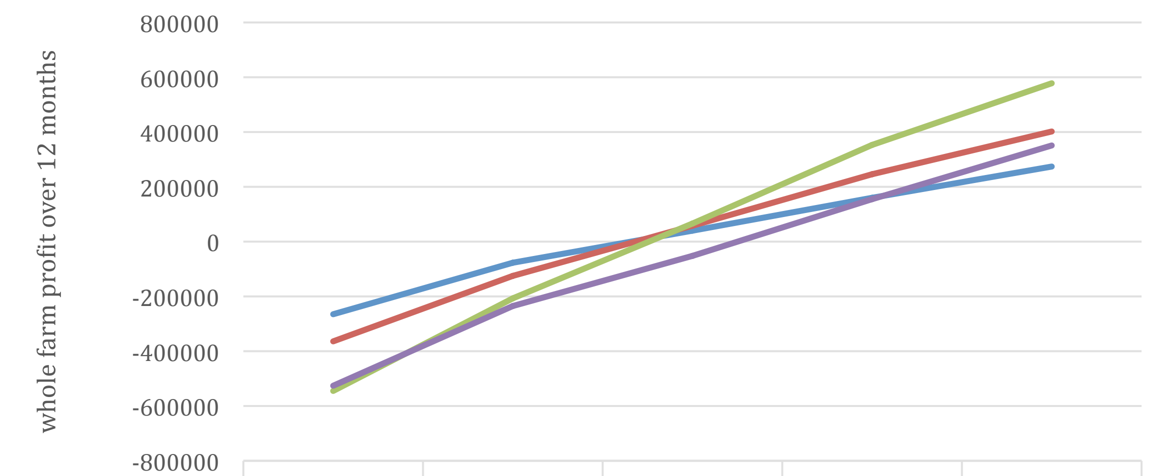
Research at the Karoonda trial site has demonstrated the benefits of the inclusion of breaks, in particular the increase in N supply from legume based breaks (including medic pastures) (McBeath et al. 2015). Analysis of the Karoonda model farm highlights how the move towards intensive cropping is increasing the business risk of modern day farming systems, that is, as cropping intensity increases, so do financial losses in poor seasons (Figure 3). At the most extreme, losses in the 100% crop farm are expected to be $170 000 or $70/ha greater in a decile 1 season compared to a farm with only 70% cropping intensity. A common thought is that high crop intensity will increase business profitability in better seasons. Figure 3 shows that the 100% crop scenario was significantly more profitable than all other enterprise mixes in decile 7-9 years, however the cereal intensive 100% crop example was least profitable. The farmers in the workshops said that they would not apply N fertiliser rates above 100 kg of urea per year and therefore, the yields achieved in the cereal intensive scenario are likely constrained by sub-optimal N inputs in high rainfall years. Profits in the rotations that maintain at least 30% break crops do not plateau as in the cereal intensive cropping system as increased levels of organic soil N have a greater capacity to respond to the season to meet crop demand in high rainfall seasons.



	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
50%	-232000	-42000	76000	196000	308000
70%	-331000	-89000	94000	281000	435000
100%	-501000	-171000	102000	366000	608000
100% cereal	-493000	-199000	-17000	190000	384000

Figure 3. Annual Farm Net Profit ($) over a range of season types (Decile 1,3,5,7 and 9) of four crop intensity scenarios for a 2400ha farm at Karoonda with a starting equity of 80%

Crop intensive rotations further increase risk when a farm has low business strength. When equity was 80%, both 100% crop scenarios made reasonable losses in below average (decile 3) seasons. However, when equity was reduced to only 65%, both scenarios made a substantial loss in a decile 1 year (Figure 4). In other words, the 100% cropping business with two decile 1 years in a row moved from 80% to 35% equity which is a difficult position to recover from.



	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
50%	-265000	-77000	40000	160000	274000
70%	-364000	-125000	58000	246000	402000
100%	-545000	-207000	66000	353000	578000
100% cereal	-526000	-235000	-52000	155000	351000

Figure 4. Annual Farm Net Profit ($) over a range of season types (Decile 1,3,5,7 and 9) of four crop intensity scenarios for a 2400ha farm at Karoonda with a starting equity of 65%

Cummins

Cummins is situated on Southern Eyre Peninsula (EP) with average annual rainfall of 424mm and growing season rainfall of 324 mm.

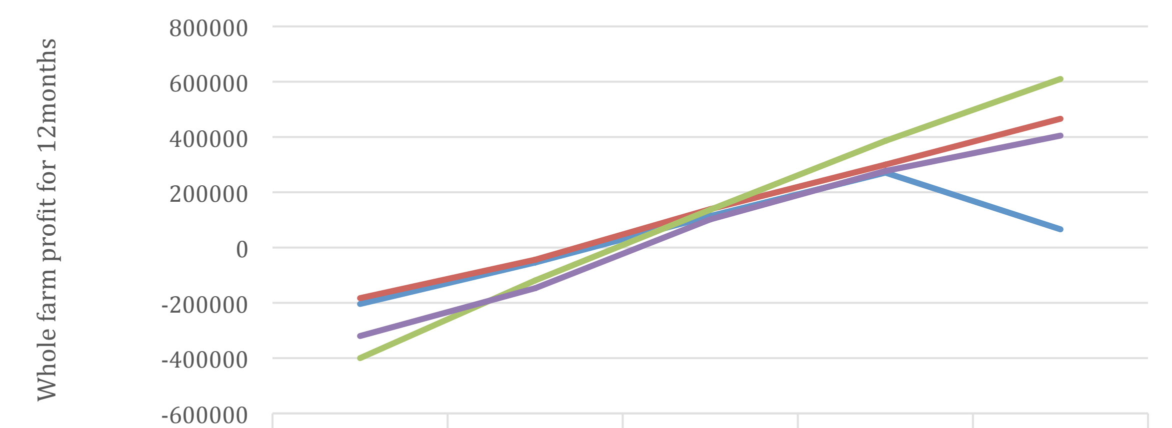
Nitrogen inputs in the region tend to be high (average Urea inputs in 2014 were 200 - 300 kg/ha) and nitrogen use efficiency low on the gravel soils. Consequently, there has been a number of N management trials delivered through the Lower EP Ag Development Association since 2008. Through the GRDC Water Use Efficiency Initiative, the key soil types were characterised and some, but not all, of these were able to be utilized to reliably predict yields across a range of season types using APSIM (McBeath 2012).

There were several model farms developed at the workshop, based around the key soil types (Cummins deep clay, Ungarra red clay loam and Greenpatch gravel-ironstone). The farms are based on two labour unit operations similar to the model farms in the other districts. The combination of research data, APSIM predicted yields and the experience and paddock records of the workshop participants were used to develop up yield tables in response to a range of management scenarios, including differing inputs of N fertiliser and differing enterprise mixes. An example of the yields developed for the Cummins model farm is given in Table 2.

Table 2. Yield (t/ha) in response to crop type and season type at the Cummins model farm.

Crop	Soil	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
Wheat	Clay	2.7	3.2	3.8	4.2	5.0
	Sand over loam	2.5	2.8	3.5	4.0	2.5
	Gravel	2.1	2.5	3.2	3.8	2.1
Lupins	Clay	0.5	0.8	1.4	1.8	2
	Sand over loam	0.5	1	1.8	2.3	0.8
	Gravel	0.5	0.8	1.5	2.0	0.8
Canola	Clay	0.8	1.4	1.8	2.5	2.5
	Sand over loam	1	1.4	1.8	2.3	1.2
	Gravel	0.8	1.2	1.7	2.3	1.1

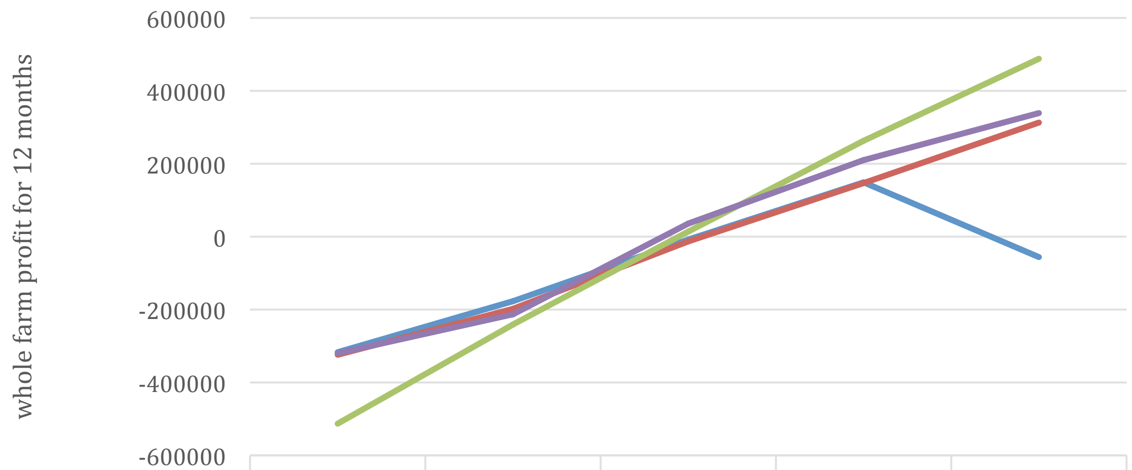
To date we have explored the baseline position of the model farms for Lower EP with more detailed analysis of the business response to N management to occur in March. While 100% cropping was acceptable at Cummins on a farm with business strength of 80% equity (Figure 5), when equity is reduced, continuous cropping quickly becomes a risky strategy.



	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
Cummins south	-204000	-54000	114000	271000	66000
Cummins	-183000	-44000	139000	300000	466000
Ungarra	-400000	-119000	137000	386000	610000
Ungarra sand	-320000	-147000	102000	277000	405000

Figure 5. Annual Farm Net Profit ($) over a range of season types (Decile 1,3,5,7 and 9) of the 100% cropping model farm scenario at four medium to high rainfall locations on the Eyre Peninsula. Each farm had a staring equity of 80%.

High land values on Lower EP allow large borrowings with financing costs eroding farm profit. A farmer at Cummins on 80% equity applying additional N to optimize yield is relatively low risk however at 65% equity the business has only marginal profit even in an average year. Figure 6 compares four farms on the Eyre Peninsula at a lower equity (65%) and with the following starting debt positions: Cummins South -$2.5m, Cummins -$3.5m, Ungarra -$2.5m and Ungarra sand -$1.25m. At 65% equity, even in the reliable lower Eyre Peninsula, the four farms are either having a small loss to marginal profit in a decile 5 (average) year. Cummins South with higher rainfall on poorer soil types struggles to capitalise in a decile 9 year due to waterlogging and poor N use efficiency. With this model farm losses occurred in decile 1, 3, 5 and 9 seasons. At lower equity, the ability to optimise yield using increased inputs of N fertiliser poses significant risk to the business. It is a clear demonstration that agronomic decisions cannot be treated in isolation from the business strength of the farm.



	Decile 1	Decile 3	Decile 5	Decile 7	Decile 9
Cummins south	-317000	-177000	-8000	149000	-56000
Cummins	-324000	-198000	-13000	147000	313000
Ungarra	-513000	-241000	14000	263000	488000
Ungarra sand	-320000	-213000	36000	210000	339000

Figure 6. Annual Farm Net Profit ($) over a range of season types (Decile 1,3,5,7 and 9) of the 100% cropping model farm scenario at four medium to high rainfall locations on the Eyre Peninsula. Each farm had a staring equity of 65%.

Decision making for the Advisor

The role of the advisor should be to aid farmers in their decision making not to be the decision maker. As farmers get busier, the trend is to outsource decisions to the advisor, and can have problems. The advisor takes this responsibility seriously and therefore ensures the recommendation will work. However, the advisor is often unaware of the farmer's business position. This can often result in recommendations that are low risk to production but may not be the best outcome for the business.

By documenting the production outcomes expected from a range of management decisions over the full range of season types and integrating the effect on the farm business, advice is more robust and the farmer will have more confidence in the right decision for their business. Farmers who rely too heavily on the advisor to be the main decision maker are actually losing confidence in their own decision making, and this potentially adds costs to the farm business. This is not a reflection on the advisor but rather a reflection of the increased intensity and complexity of farming. Understanding these issues will be a benefit to the farmer and the advisor into the future