

RR

TT

RRTT



## The impact of canola on profit and herbicide resistant ryegrass in crop sequences in southern NSW

Tony Swan, Mark Peoples , James Hunt, Laura Watson & Tony Pratt  
CSIRO Plant Industry, Canberra

CSIRO PLANT INDUSTRY/SUSTAINABLE AGRICULTURE FLAGSHIP

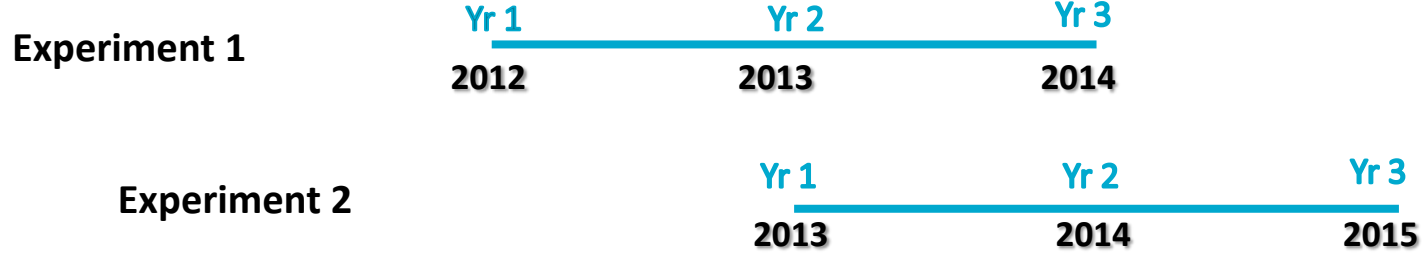


Canola/wheat/wheat sequence is very profitable and we need to maintain both canola and wheat in a sustainable way

## Research Questions

- **Can resistant ryegrass be managed cost-effectively under canola and other break crops?**
- **Can canola and other break crop be as profitable as a cereal in there own right?**
- **Do the rotational benefits of break crops improve the profitability of subsequent cereal crops?**

# Experimental Design



*Year 1 : Canola (high or low input), pulse crops (grain & BM), wheat (high or low input), fallow*

*Year 2 : Canola (RR), wheat (high or low input) and wheat (hay)*

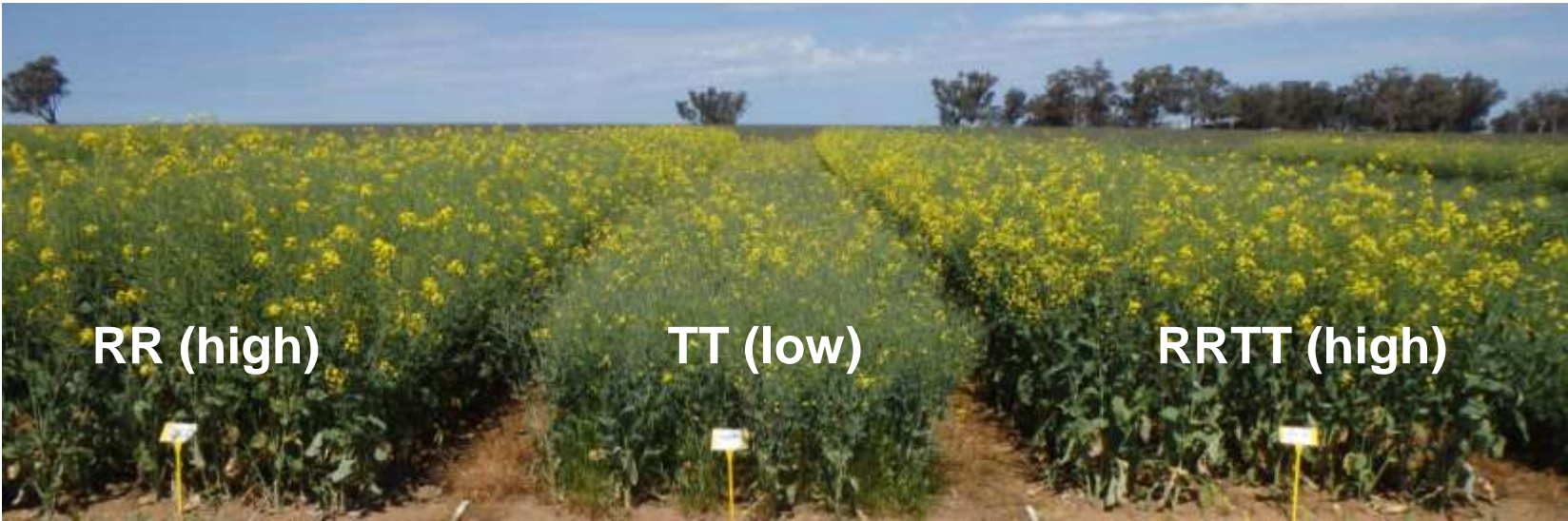
*Year 3 : Wheat – fertilised to achieve 5t/ha grain yield*

*Canola (high input) = RR or RT varieties , more fertilisers, more expensive herbicides*

*Canola (low input) = TT varieties less fertilisers, cheaper herbicides*

*Wheat (high & low input) = 150 cf 75 plants/m<sup>2</sup>, more fertiliser & more expensive herbicides*

# Crop & Input Categories



RR (high)

TT (low)

RRTT (high)



Lupins - grain



Wheat - low input



Wheat - high input



Field Peas (BM)



# Can herbicide resistant ryegrass be managed cost-effectively in crop sequences using canola?

## Results from plant samples

	% Resistant	
	Exp 1	Exp 2
Factor <sup>(R)</sup>	0	5
Select <sup>(R)</sup>	55	5? Too low
Verdict <sup>(R)</sup>	70	90
Axial <sup>(R)</sup>	65	50
Hussar <sup>(R)</sup>	95	60
Intervix <sup>(R)</sup>	NT	30
Glyphosate	NT	0
<b>Initial paddock ryegrass seedbank – April (m<sup>2</sup>)</b>	<b>1800</b>	<b>2770</b>



# Profitability of canola & other break crop sequences!

## Exp 1, year 1: Crop & ryegrass DM, grain yield, gross margin & profit/cost ratios in 2012

Crop & input 2012	Crop shoot DM (t/ha)	Ryegrass DM (t/ha)	Grain yield (t/ha)	Gross margin 2012 <sup>a</sup> (\$/ha)	Profit/cost ratio
RR Canola (H)	12.0	0	3.5	\$1,259	1.8
TT Canola (L)	8.3	0.3*	3.0	\$1,166	2.6
Lupins – grain	6.5	0.1	3.1	\$683	2.1
Wheat (H)	8.4	0.3	3.2	\$257	0.4
Wheat (L)	5.0	1.6	2.0	\$250	0.9
Peas BM	4.5				
Isd (P<0.05)					

\* = estimated DM based on panicle

- Poor wheat grain yield & GM
- Ryegrass DM high in low wheat @ 1.6t/ha
- Ryegrass DM similar in high wheat & low canola @ 0.3t/ha

<sup>a</sup>**Note:** Grain prices used in the calculations were current at the around the time of harvest & assumed delivery to Junee except RR canola to Stockinbingal (extra freight cost = \$5/t).

# Profitability of canola & other break crop sequences!

Exp 1, yr 1: Crop grain yield, 2 year gross margin & 2 year profit/cost ratio

Grain yields yr 2 – Canola (avg 3.3 t/ha), Wheat (1.5 – 5.2 t/ha)

Group	Crop x Input: Year 1	Crop & Input Year 2	Average 2 year Gross Margin (\$/ha/yr)	Average Profit/Cost ratio (2 yrs) \$ profit / \$1 spent
1	<b>Canola (L or H)</b>	Wheat (Hay, H, L)	> \$823	5 most profitable 2 year sequences involved canola in year 1
2	Pulse grain	<b>Canola</b> Wheat (L or H)	> \$667	
3	Fallow Wheat (L) PeasBM	<b>Canola</b>	< \$600 - \$430	Top 10 of 21 sequences involved canola or pulse grain in year 1 or 2

# Profitability of canola & other break crop sequences!

Exp 1, yr 1: Crop grain yield, 2 year gross margin & 2 year profit/cost ratio

Grain yields yr 2 – Canola (avg 3.3 t/ha), Wheat (1.5 – 5.2 t/ha)

Group	Crop x Input: Year 1	Crop & Input Year 2	Average 2 year Gross Margin (\$/ha/yr)	Average Profit/Cost ratio (2 yrs) \$ profit / \$1 spent
1	<b>Canola (L or H)</b>	Wheat (H or L)		
2	Pulse grain	<b>Canola</b> Wheat (H or L)		
3	Fallow Wheat (L) PeasBM	<b>Canola</b>		
4	Wheat (H)	Wheat (H or L)		
5	Fallow Wheat (L or H)	Wheat (H or L) Wheat (H or L)		
6	PeasBM Wheat (L)	Wheat (H or L) Wheat (L)	< \$300 \$182	\$0.70 - \$0.80

**BUT !!**  
 What is the effect of establishing canola or other crops in reducing ryegrass populations and ultimately improving the long term sustainability of the system?



# Managing resistant ryegrass cost effectively

Exp 1, year 1: Ryegrass control costs, ryegrass panicle numbers (m<sup>2</sup>), and ryegrass DM (t/ha) in 2012

Crop & Input Year 1	Ryegrass Control Costs (\$/ha)	Ryegrass panicle No (m <sup>2</sup> )
Wheat (L)	\$56	504
Wheat (H)	\$142	78
Lupin (Grain)	\$65	43
TT Canola (L)	\$62	32
RR Canola (H)	\$46	1
Pea BM	\$66	0
Fallow	\$35	0

Only treatments to fully control ryegrass seed set in year 1

# Managing Ryegrass Seedbanks

The effect of two years of various herbicide regimes reducing ryegrass seed bank?

**Autumn Year 1 ARG seed bank = approx 1800 seeds/m<sup>2</sup>**

**Exp 1: Autumn Year 2 and Year 3 annual ryegrass seed bank**

Crop & input Year 1	Autumn Year 2 Seedbank (seeds/m <sup>2</sup> )
Wheat (L)	5492
TT Canola (L)	505
RR Canola (H)	208
Wheat (H)	777
Pea BM	464
Lupin	748
Fallow	290

# Managing Ryegrass Seedbanks

The effect of two years of various herbicide regimes reducing ryegrass seed bank?

## Autumn Year 2 and Year 3 annual ryegrass seed bank

Crop & input Year 1	Autumn Year 2 Seedbank (seeds/m <sup>2</sup> )	Autumn Seedbank Yr 3 Canola or Hay Yr 2 (seeds/m <sup>2</sup> )
Wheat (L)	5492	865 (C)
TT Canola (L)	505	NA
RR Canola (H)	208	166 (Hay)
Wheat (H)	777	250 (C)
Pea BM	464	250 (C)
Lupin	748	250 (C)
Fallow	290	NA

  
Double Break

# Managing Ryegrass Seedbanks

The effect of two years of various herbicide regimes reducing ryegrass seed bank?

## Autumn Year 2 and Year 3 annual ryegrass seed bank

Crop & input Year 1	Autumn Year 2 Seedbank (seeds/m <sup>2</sup> )	Autumn Seedbank Yr 3 Canola or Hay Yr 2 (seeds/m <sup>2</sup> )	Autumn Seedbank Yr 3 HIGH wheat Yr 2 (seeds/m <sup>2</sup> )	Autumn Seedbank Yr 3 LOW wheat Yr 2 (seeds./m <sup>2</sup> )
Wheat (L)	5492	865 (C)	3874	14254
TT Canola (L)	505	NA		
RR Canola (H)	208	166 (Hay)		
Wheat (H)	777	250 (C)		
Pea BM	464	250 (C)		
Lupin	748	250 (C)	403	6908
Fallow	290	NA	NA	NA

450 kg/ha wheat grain loss for every 1t/ha ryegrass DM

  
Double Break

# Summary

- **TT-canola > wheat sequence**

- Very profitable if no grass weeds and nitrogen (N) supplied.

- **Pulse > wheat**

- Close behind on \$'s even with low pulse prices.
- Result in enhancing available soil N for wheat.

- **RR-canola > high input wheat**

- A very profitable response to a ryegrass weed problem, but is it Sustainable?

**One year break crop control of ryegrass was found to be insufficient because of high residual seed bank in all the sequences above.**

- **Pulse > RR-canola, or RR-canola > wheat hay**

- May be more effective in terms of gross margins in the long run as can provide 2 years of complete seed set control of ryegrass.

**Question: Do we need a 3<sup>rd</sup> break? To be examined in 2015!**

# Questions?

CSIRO Plant Industry  
Tony Swan

**Phone:** 02 6246 5142

**Mobile:** 0428145085

**Email:** [tony.swan@csiro.au](mailto:tony.swan@csiro.au)

PLANT INDUSTRY/SUSTAINABLE AGRICULTURE

[www.csiro.au](http://www.csiro.au)



CSIRO



# WEEDS: Annual Ryegrass Weed Surveys

Percentage of paddock in southern & western NSW, SA & Vic with herbicide resistant annual ryegrass (resistant or developing resistance)

Year	Hoegrass <sup>(R)</sup>	Sertin <sup>(R)</sup>	Select <sup>(R)</sup>	Achieve <sup>(R)</sup>	Glean <sup>(R)</sup>	Intervix <sup>(R)</sup>	Simazine	Treflan <sup>(R)</sup>
2007 S.NSW	81	43	21	NA	70	65	1	6
2010 W.NSW	56	70	4	32	53	38	0	0

Source: 2007 data (Southern NSW) - Broster, Koetz & Wu 2011 Plant protection Quarterly, Vol.26 (1).  
2010 data (Western NSW) – John Broster pers. comm. Unpublished. (Graham Centre, Wagga Wagga NSW).

Region	Year	Hoegrass <sup>(R)</sup>	Select <sup>(R)</sup>	Axial <sup>(R)</sup>	Glean <sup>(R)</sup>	Intervix <sup>(R)</sup>	Treflan	
		Populations resistant (%)						
SA-Mid North	2008	76	40	59	73	NT	40	
Vic-Northern	2011	55	8	31	87	29	0	
Vic-Southern	2009	79	23	68	88	39	0	

Source: data provided by Chris Preston in GRDC 2013 NSW Advisor Update, Temora Feb 2013